Investigating the impact of water efficiency educational programmes in schools: a scoping study

An *Evidence Base* project

Final report, April 2012

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Portsmouth Water	Wessex Water
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Executive Summary

Water companies and other organisations undertake an array of work with schools, in order to provide water efficiency education to pupils. While a previous *Evidence Base* project has focused on the water savings achievable through retrofitting schools with water-efficient devices, the extent to which educational programmes in schools can help reduce water consumption (both within the school and at home) remains uncertain. Furthermore, the existence and extent of any interplay between school retrofit programmes and water efficiency educational efforts has not been examined to date.

This report aims to identify and bring together the water efficiency educational programmes that have been carried out to date, including, where relevant, the measures used to evaluate their impact.

A literature review was undertaken, covering published and unpublished reports from water companies and other organisations. Information was also requested directly from water companies, as well as other relevant organisations identified by the Project Working Group.

In order to begin examining the effectiveness of different types of water efficiency educational activities, categories of educational activity were discussed and decided upon through the Working Group associated with this project, these categories are:

- Self Led Resources
- Assemblies/Talks
- Active Class Sessions
- Site Visits
- Other

The most common approaches used to evaluate water efficiency educational programmes are questionnaires and feedback forms. Pledges made by children are also a popular way to measure success in educational programmes. For those programmes, where it was possible, the UKWIR spreadsheet of assumptions used by Ofwat was used to make an assessment of any water savings achieved.

This scoping study reveals that while a large number of different educational programmes are taking place in the UK, there is little evidence of the real effect that these are having on children's (and their parents') water-using attitudes and behaviours, and on water use in schools and at home. The majority of gaps discovered through this scoping study cover the collection of evidence and evaluation of educational activities. There is little understanding of the pre-existing knowledge of children taking part in educational activities and no evidence to suggest which, if any, of the categories of educational activities engage the pupils the most, or whether school retrofits aid any behaviour change as they are usually run separately to education programmes. Importantly there is no evidence to suggest long term behaviour change takes place. There is also little information provided on what type of evidence is collected or what incentives are offered to the respondents.

The lack of evidence should not be taken to mean that educational programmes do not work; instead, the lack of evidence suggests an urgent need to begin evaluating educational programmes more robustly and to disseminate these results.

Where evidence is collected surrounding an educational activity it should be done after a baseline understanding has been established, against which post-education activity results can be compared. Where an education programme consists of more than one activity, they should each be evaluated separately in order to better understand which activities are more effective on behaviour change. In all cases, water meter data and/or water bill figures should be used to assess reductions of water use in the school.

1 Introduction

Schools in the UK spend at least £70 million annually on the provision of potable water and the disposal of wastewater. The average annual water and sewerage bill for primary schools is £1,600 and for secondary schools between £3,200 and £8,600, although a large secondary school might spend up to £20,000.[1]

An array of work is undertaken with schools, by both water companies and other organisations, in order to provide water efficiency education programmes to pupils. While a previous *Evidence Base* project[2] has focused on the water savings and cost savings achievable through retrofitting schools with water-efficient devices, the extent to which educational programmes in schools can help reduce water consumption (both within the school and at home) through changes in attitudes and behaviour remains uncertain. Furthermore, the existence and extent of any interplay between school retrofit programmes and water efficiency educational efforts has not been examined to date.

In order to begin bridging this knowledge gap, this *Evidence Base* project has been designed to scope what kind of water efficiency educational programmes are currently being undertaken, as well as what information is available about the effectiveness of different approaches to educational programmes in schools. Bringing this information together is intended to be a first step towards improving understanding of water efficiency educational programmes, and potential next steps (discussed in Section 3).

2 Approach and Methodology

This report aims to identify and bring together the water efficiency educational programmes that have been carried out to date, the focus being on water company-led programmes with the inclusion of non water company-led programmes where these can be sourced, including, where relevant, the measures used to evaluate their impact. An initial one page document outlining this research project was submitted to the Evidence Base Steering Group for approval. Following this, a methodology was drafted and submitted to the Project Working Group and Project Peer Review Group, and amended where necessary following comments from these groups. The agreed methodology served as guidance for the execution of the project. The approach involved the following:

2.1 Categorisation

In order to begin examining the effectiveness of different types of water efficiency educational activity (please note that a water efficiency education programme may consist of a number of different activities), it was first necessary to decide on a system for categorisation so that similar activities could be examined together. The aim was to categorise educational activities that aimed to reduce actual water use in school and at home via behaviour change, attitude change and/or the use of water-efficient devices. The researchers drew on the expertise of the Working Group, and it was decided collaboratively the most appropriate categorisation based upon existing water company-led programmes. The resulting categories are outlined in Section 3.

[1] Department for Children, Schools and Families as cited in Evidence Base for Large-scale Water Efficiency Phase II Final Report – Waterwise, April 2011.
[2] Evidence Base for Large-scale Water Efficiency Phase II Final Report – Waterwise, April 2011.

2.2 Literature Review

A literature review was undertaken, covering published and unpublished reports from water companies and other organisations. In addition to reports held by Waterwise, searches were undertaken using the internet and the UKWIR WR25c database. Information was also requested directly from water companies, as well as other organisations identified by the Project Working Group.

Project researchers also requested relevant information through the following groups and publications:

- Water UK Water Efficiency Network
- Water UK Education Forum
- Waterwise website homepage
- *Evidence Base* Steering Group and Project Working Group

The study aimed to include material that was:

- From the UK only
- Produced from 2006 onwards
- Focused upon domestic-use water efficiency educational activities within schools
- Both grey and peer reviewed literature from a range of sources, including industry, government, regulators, consumer groups and academia
- Of suitable quality in terms of robustness and relevance to the research question

The aim of the literature review was to identify at least ten suitable sources of evidence based on existing knowledge of projects within Waterwise and the Working Group. Had it been found that there was insufficient evidence fitting the original criteria, the criteria would have been loosened to include evidence from earlier projects. A further possibility was to gather evidence from energy efficiency educational programmes, which could potentially inform the development of an approach to understanding water efficiency educational programmes.

The rapid literature review resulted in eighteen sources of evidence that fit original criteria. While aiming to include relevant and robust work, some educational programmes, for which details were lacking, were still included to ensure that the fullest possible picture of water efficiency educational programmes in the UK was presented. This was only the case when drawing upon information required to describe educational activities, incomplete information was not used to discuss the evaluation of education programmes.

In order to ensure transparency of the identification and selection process, all evidence gathered was systematically recorded in Excel, incorporating the following information:

- Full citation (e.g. author, year, publisher, etc.)
- Source (e.g. peer reviewed journal article, government report, etc.)
- Evidence type (e.g. primary, secondary, synthesis review, etc.)
- Key project information (e.g., number of schools, number of students, location of schools, etc.)
- Project evaluation method (e.g., meter readings, before and after survey, etc.)
- If rejected for inclusion in the scoping study, reason why

In total, eighteen educational programmes were considered in this scoping study. Of these eighteen programmes, details of fifteen programmes were provided by the organisation leading the work, while the other three projects were researched by Waterwise. Where possible, Waterwise also added additional details, such as information on additional elements of education activities as provided through company websites, to that provided directly by sources.

Information from the literature review was drawn together with a charting method, using headings to draw out key information from each piece of evidence. Results were then analysed.

2.3 Quality Assurance and Stakeholder Engagement

In line with the procedures implemented for Phase III of the Evidence Base, this study has been reviewed by all key stakeholders. A draft of the study was sent to all members of the Working Group for comment, following this, a draft was sent to the Peer Reviewers associated with this study. Before publication of this study, it was also sent to the Steering Group for final review. This is in addition to Waterwise's own internal Quality Assurance System.

2.4 Limitations

Due to the time-restricted nature of this project, it is possible that this report does not represent an exhaustive account of every single water efficiency education programme or project carried out since 2006. However, due to the wide range of programmes and projects included, it is felt that enough breadth has been achieved to provide a good understanding of the current situation overall.

Educational programmes tackle water efficiency alongside a variety of other water topics; this scoping was not able to look at this mixing in depth, nor was it able to consider whether educational programmes have an impact on other water issues.

There was limited access to available information regarding evaluation of water efficiency educational programmes. The lack of reliable and applicable data regarding evaluation, whether this being due to the information not existing, or due to Waterwise being unable to gain access to this information, makes it difficult for this study to include a good understanding of evaluation methods and how these may be used in conjunction with educational programmes.

In addition to this, while this study attempts to categorise individual activities, many water efficiency educational programmes incorporate more than one activity. Where effectiveness of an education programme has been assessed, it is done so on the programme as a whole and not on the individual activities that make up a programme.

2.5 Project Report

This study attempts to categorise and describe, with examples, the current activities that make up water efficiency education programme, these can be found in Section 4 of this report. Section 5 details other aspects of water saving educational activities, in this instance the use of 'giveaways' and school retrofits within educational programmes. Evaluation of water efficiency educational programmes has been discussed in Section 6, covering what

methods are currently being used as well as what evidence this has provided that these educational programmes can encourage behaviour change. Conclusions and implications of these findings have been included in Section 7.

3 Categorising Water Efficiency Educational Activities

In order to examine the effectiveness of different types of water efficiency education activity, a system for categorisation was developed based upon existing water company-led programmes.

It should be noted that a single water efficiency educational programme may incorporate only one of these activities (e.g. an assembly) or a combination of activities (e.g. a public access site visit followed by active class sessions).

Researchers and the Project Working Group agreed on five categories of water efficiency educational activities:

1. **Self-led resources for teachers** - Materials given out to schools that do not require additional support from external staff
2. **Assemblies and school talks** - These are usually delivered by a teacher, a water company staff person or contractor
3. **Active class sessions and workshops** - Interactive teaching and hands-on learning led by a member of staff involved in the water efficiency education programme
4. **Site visits** - Where children are taken on a trip to visit a local site of interest focussed on water
5. **Other**

The first three categories mainly differ in intensity of engagement, with self-led resources providing the lightest touch and active classroom sessions and workshops designed to provide deeper engagement. Public access site visits are different from the other categories in that these activities take place outside of the school setting, usually at a sewage treatment works, a local nature reserve or an education centre. The final category, other, brings together some of the less common water efficiency educational activities that do not neatly fit elsewhere (for example, theatre performances and competitions). At the time of reporting, the vast majority of water efficiency educational programmes fit under the first four categories.

4 Water Efficiency Educational Programmes

The educational programmes in this scoping study are outlined in Table 1. The remainder of this chapter provides further details of the water efficiency educational programmes, broken down by category.

While this scoping study is focused on water efficiency, many of the programmes included cover topics beyond water efficiency alone. Many programmes include water efficiency as a secondary subject underneath a broader water topic. This has been explained where possible.

Organisation	Project	Year	Age of Children	Number of Schools that have taken part to date	Self Led Resources				Assemblies/ Talks	Active Class Sessions	Site Visits	Other	Giveaways	Partners Used?	Alongside School Retrofit?	Evaluation Method (if any)
					Leaflets	Self Audit	Teacher Resources	Education Website								
Anglian Water	Ongoing Education Programme	Ongoing	KS2 (7-11)		No	No	Yes	Yes	No	No	Yes	No	No	No	No	
Cambridge Water	Water in ScH_20ol	2011-Ongoing	KS2 (7-11)	30	Yes	Yes	Yes	No	Yes	No	No	No	Yes, a variety of devices are either given away after the assembly or after being requested by parents	No	No retrofit but schools are given Cistern Displacement Devices (CDD) /tap inserts/ Shower Restrictors upon request.	Ofwat Water Efficiency Table
Essex & Suffolk Water	Little Green Riding Hood	2010-Ongoing	KS1 and KS2 (5-11)	298 schools in total, reaching 72,123 pupils. Approximately 23% of schools in the region.	No	No	No	No	No	No	No	Yes	No	Local theatre company – Fame Factory Spotlight	No	Pledges and Ofwat Water Efficiency Table
Keep Britain Tidy	EcoSchools	1995-Ongoing	KS1-KS4 (5-16)	Almost 17,000 schools signed up to date	No	No	Yes	Yes	No	No	No	Yes	No	EDF Energy, ASDAN, HSBC, Homebase, Various Water Companies	No	
Northern Ireland Water	Ongoing Education Programme	2007-Ongoing	KS1-KS3 (5-14)	Over 7,900 children have been contacted. 592 children visited centres/sites. NIW visited 116 schools reaching 6767 children	No	No	No	No	No	Yes	Yes	No	Yes – Water Bottles, book marks. CDDs and shower timers on request	No	No	

Organisation	Project	Year	Age of Children	Number of Schools that have taken part to date	Self Led Resources				Assemblies/ Talks	Active Class Sessions	Site Visits	Other	Giveaways	Partners Used?	Alongside School Retrofit?	Evaluation Method (if any)
					Leaflets	Self Audit	Teacher Resources	Education Website								
Portsmouth Water	Water is Life	Ongoing	KS2 (7-11)		Yes	No	Yes	Yes	No	No	No	No	No	No	No	
Severn Trent Water	Water Education Programme	2010-Ongoing	All ages, KS1 to University Students	Approx 300 schools and community groups per year.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes – minimum of shower timer or CDD. Directed to website for other products	Various: Local councils, environmental organisations, and others.	During one branch of the project, yes.	Pledges and Feedback (pre and post)
South East Water	Ongoing Education Programme	2010-Ongoing	KS2 (7-11)	21	No but stickers, posters and logo bugs with water saving messages are given out	No	No	Yes	Yes	No	No	No	Yes - 'Sally Shower' timers are given at the end of the talk	No	No but CDDs are provided upon school request	Feedback
Southern Water	Aqua Innovation	2011-Ongoing	KS3 (11-14)	10 secondary schools taking part	No	No	No	No	No	Yes	No	No	No	Global Action Plan	Yes	Questionnaires
Southern Water	Saints and Savers	2011-Ongoing	9-10	25	Yes	No	Yes	Yes	No	Yes	No	No	No	The Saints Foundation (Charity arm of Southampton Football Club), WWF-UK	No	Pledges and Feedback
Southern Water	World of Water	2011-Ongoing	KS2 (7-11)	11	Yes	No	Yes	Yes	No	Yes	No	No	Water Bottles	Brighton and Hove Albion in the Community	No	Pledges
South West Lakes Trust	Countryside Stewardship	2000-2010	5-11	Approximately 5 per annum. 50 School visits over 10 years	No	No	No	No	No	No	Yes	No	No	Natural England	No	Feedback

Organisation	Project	Year	Age of Children	Number of Schools that have taken part to date	Self Led Resources				Assemblies/ Talks	Active Class Sessions	Site Visits	Other	Giveaways	Partners Used?	Alongside School Retrofit?	Evaluation Method (if any)
					Leaflets	Self Audit	Teacher Resources	Education Website								
Sutton and East Surrey Water	Water Saving Talks and Workshops	Ongoing	KS2 (7-11)	In 2010/11 476 pupils had a class talk, 1133 an assembly talk and 548 had one of the above and a visit to an education centre. Engage with 60% of KS2 schools regularly	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes – Every Drop Counts beaker and a splash 'n' save game.	No	No	Questionnaires
Thames Water	Ongoing Education Programme	Ongoing	KS2-KS3 (7-14)		No	No	Yes	Yes	No	Yes	No	No	No	Global Action Plan for active class sessions	Yes	
The Water School	The Water School Website	Ongoing	KS2 (7-11)		No	Yes	Yes	Yes	No	No	No	No	No	Water Education Forum	No	
Veolia South East	Ongoing Education Programme	Ongoing	Various	6	No	No	No	No	Yes	No	No	No	No	Talks linked with WaterAid	No	
Wessex Water	Wessex Water Education programme	Ongoing	All ages but KS2 (7-11) mainly	300 schools and 11,000 pupils a year	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No	Questionnaires
Yorkshire Water	The Green Classroom	2010-Ongoing	KS2 (7-11)	**2010-2011:** 308 class packs sent out **2011-2012:** 6258 booklets to 127 schools	Yes	No	Yes	Yes	No	No	Do offer site visits	No	No	No	No	Ofwat Water Efficiency Table

Table 1: Educational programmes included in scoping study

4.1 Self-led resources

Self-led resources are materials given out to schools that do not require additional support from external staff. These can include, but are not limited to, leaflets, self-audit tools, work books and website downloads for teachers to use in the classroom. Examples for each of these different types of resources are described below.

4.1.1 Leaflets

Given out in conjunction with their Saints and Savers presentation programme, Southern Water's leaflet focuses on messages on the importance of water in the human body, and stresses the significance of saving water through a variety of methods around the home to ensure that there is enough water for everyone. The leaflet includes a quote from the manager of Southampton Football Club, stressing how vital it is that water is treated as a valuable resource to be conserved where possible. The leaflet also includes a diagram of the water source in the local area, showing children where the water comes from as well as a water-saving related crossword for the children.

4.1.2 Self Audits

Cambridge Water encourages self-auditing in the school, providing teachers with an extensive self-assessment pack. This pack helps promoting water saving within the school and encourages teachers to pass messages on to their pupils through signing up to award schemes and visiting websites which also provide child-friendly materials. Children are provided with their own audit that they fill in for water use at home and school, and are encouraged by the offer of winning £500 for their school in addition to a £100 water goody pack for themselves.

4.1.3 Teacher Resources

Yorkshire Water offers a nine lesson teaching guide for use in classrooms. These lesson plans are freely available to download from their green classroom website[3] and cover various topics such as where water comes from, how much water we use, the cost of water and how to change current behaviour. The lesson plans also encourage classes to run their own school assemblies on the topic and to audit school and home water use. For children who have shown extra dedication to the projects covered in these lesson plans there is also a certificate available to hand out. The education section on the Yorkshire Water website also includes additional learning resources for teachers and schools outside of the designated lesson plans.

Sutton and East Surrey Water give a teacher resource pack to every school which signs up to their education programme. This resource pack includes lesson ideas such as an investigation into how much water a dripping tap wastes. Extension questions, to encourage students to write to their head teacher to fix dripping taps, calculate how much water is wasted at home and design posters reminding others to turn taps off properly, are also suggested. The packs include an activity sheet on home water audits to help students identify where they use water outside of school and if any is being wasted. The results are used to start a campaign to raise awareness in the school about being careful with water

[3] http://www.yorkshirewater.com/education-and-learning/the-green-classroom.aspx

use. In addition to these two lesson ideas, the pack also includes maps, historical accounts, data for mathematical problem solving, simple science experiments, drama, art and literacy ideas and puzzles for the children to complete.

Wessex Water offers a range of resources for different age groups that can be requested from their website.[4] For primary schools they offer the 'All about water' pack which includes activity sheets for pupils and an 'Olly the Brolly' comic. The pack has sections covering an introduction to water, sources and supply, the water cycle, water treatment, pollution, sewage treatment, conservation, roman baths and water issues in developing countries. Similar topics are covered in their pack aimed at secondary schools; however, the packs are tailored accordingly.

Portsmouth Water provides teachers with their 'Water is Life' education pack upon request. This pack comprises information and activity sheets designed to educate children in the role water plays in the world. The sheets include information on planet Earth, the water cycle, sources of water, water efficiency, the whole water treatment process including quality, and the impact water or lack of it has in other parts of the world. The activity sheets enable children within a class structure to carry out easy experiments that support the information sheets. The experiments include making filters, a water cycle, how water is moved and others. The education pack also includes a short Portsmouth Water DVD, designed for use in the classroom, which was created to celebrate their 150-year history, and a leaflet on saving water.

4.1.4 Education Websites

One example of a 'one stop shop' for self-led learning is Wessex Water's Water School website.[5] The website allows educational professionals to see where a wider study of water efficiency provides opportunities for valuable learning experiences. Based on an original site that was solely a teacher resource, the Water School website comprises online activities for children, including water-related information, a games room with fun activities and access to rooms of the school where children learn about old inefficient water-using items and modern water-efficient items. There are information and activity sheets in 'The Teacher's Information', which challenge pupils to find library-based information. It also provides water audit software and extensive curricular information.

The website has been redesigned to complement The Water Family online game,[6] which has proved to be extremely popular with children both at school and at home. Children can explore each scene, find information, view animations, make decisions, accept a challenge and score points. They can compete with their friends and print of certificates to acknowledge their achievements. The sponsors of this website are all members of the Water Education Forum, which has been set up to support schools in their water related educational programmes.

While not the main focus of their education programme, Severn Trent Water offers a number of downloadable resources from their education website.[7] These include colouring-in sheets and puzzle activities, a water-saving guide, tips, posters and guidance and tools to host a

[4] http://www.wessexwater.co.uk/education/threecol.aspx?id=384
[5] http://thewaterschool.co.uk/
[6] http://www.thewaterfamily.co.uk/
[7] http://www.stwatereducation.co.uk/

'water hunt', using the same principles as a treasure hunt. They also include guidance and facilitator notes, photos and PowerPoint presentations for hosting school assemblies. The array of downloads on their education website are aimed at teachers and pupils and are self-led resources. In addition, there is a self-audit section for schools to assess their current water use.

Wessex Water has many online activities that can be looked at in the classroom and at home, including water experiments, such as their Kids Zone website[8] centred around Olly the Brolly.

Thames Water has a wide range of teacher resources available through their website,[9] including assembly packs, activity sheets, posters, an aquabatics DVD, comics and an interactive section of the website to be used in classrooms, all of which aid promotion of the water-saving message to pupils.

4.2 Assemblies/Talks

Many educational programmes include talks delivered to schools or particular classes within schools; these are often based around water efficiency. Talks are usually delivered by a teacher, a water company staff person or a water company contractor. There tends to be little variation in the way that these activities are delivered: the structure is similar across the board, with the main differences being who delivers the talk, the topics covered and whether talks are run in conjunction with any other activity.

Cambridge Water offers assemblies for schools upon request, focussed mainly on water use in the school and in the home. These are used in addition to their self-audits and learning materials.

South East Water runs school talks provided by in-house staff that have been trained as school speakers and are undergoing a BTEC training course. The presentation covers the water cycle, how South East Water sources and treats water as well as the value of being water efficient.

While Veolia South East has no formal schools programme in place, they do partake in ad-hoc visits with schools and scout groups if requested. These talks are based on water use in the home and cover practical examples of water savings measures, and are linked to WaterAid to demonstrate the importance of water and how much water weighs.

Severn Trent encourages self-led assemblies and talks through their downloadable content in their education website. The aim of these assemblies is to improve children's understanding of the importance of water for life at a local and global level, to encourage pupils to think about their own water consumption and how to reduce their water. They also use educational coordinators to deliver more in-depth assemblies and talks to schools, tailored specifically to the age of the children and designed to encourage audiences to think about water on the planet and how we all use it.

Sutton and East Surrey offer two different talks to schools, one on water treatment and the other on saving water. The talk on water treatment includes a practical demonstration and explains how river water is treated to make it safe to drink. Topics covered include the water cycle, importance of geology, bore holes and reservoirs, why the reservoir is located where it

[8] http://www.wessexwaterkidzone.co.uk/kidzone/
[9] http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/3494.htm

is and an explanation and demonstration of the different processes that clean water. The talk is encouraged as a precursor for a site visit so that children have an understanding before attending. The talk on saving water discusses water as a precious resource and how students should learn to preserve it if there is going to be enough for everyone. This talk is given to individual classes but can be shortened to be delivered as an assembly. The talk explores the problems of supply and demand, assists children in finding out how much water each person uses and discusses how water is wasted and how easy it is to save water. There is also a 'pairs game' included, which matches water saving to water wasting so that children can visualise key messages.

The water education team at Northern Ireland Water also run visits to local schools to cover curriculum-based topics to selected year groups of Eco-Committees. Topics include water conservation, water for health and the water cycle.

4.3 Active class sessions and workshops

This covers interactive teaching and hands-on learning. These sessions are usually run with a smaller number of students, for example, one class, and may consist of a workshop, interactive presentation and/or breakout sessions.

Southern Water's Saints and Savers programme is run in conjunction with the Saints Foundation, the charity arm of Southampton Football Club, with support from WWF. The programme consists of two active sessions in each school. The first is a classroom-based workshop and the second is a practical sports session. Both are delivered by an educational officer and a coach from Southampton Football Club. The classroom session involves a combination of presentation, film and group work. The focus of the programme is water saving in the home; this aim is achieved by educating children so that they champion water saving practices within their families. The message is sports-centric, for example telling children that the body is made up of nearly two-thirds water, and stressing the importance of rehydration. This message is then coupled with one on the importance of saving water.

Southern Water runs a similar programme called World of Water where a presentation is run based on the topic of where water comes from, water efficiency and water for health. This interactive presentation is done with the children and features videos of player and trainers from Brighton and Hove Albion football team; this is then followed by a more active session.

Severn Trent Water uses educational coordinators to deliver a variety of workshops and active class sessions. These include, but are not limited to, the following:

- Water Street - looking at different attitudes to water usage, participants use measuring beakers and action cards to calculate how much water different families use
- Bin It; Don't Flush It - a prop-based activity encouraging participants to consider the most appropriate disposal of everyday litter
- Water Market - investigating and analysing a household case study, participants make purchases and decide on water saving actions to take to reach a water saving target
- Water Supply Challenge - teams are challenged to design, build and test a fully functioning water supply network, simulating a real-life engineering project. At the end of the exercise, real water is run through to test the system and supply customers with water at a satisfactory flow from tower to tap

- The Water Use Game - using large water cylinders, dice and mats, participants are encouraged to think about alternative ways of doing everyday things that use water

Southern Water delivers their Aqua Innovate workshops through Global Action Plan (GAP); these workshops are focussed on water shortage and why that issue needs to be addressed. Included are a number of interactive games such as 'a day in the life' where teams of students are given a water allowance and have to act out a day in the life of somebody in another country and see how much water they have left. This enables the raising of awareness of water use and availability in different parts of the world. As part of one of the workshops, Southern Water runs a game called the 'water supply challenge'; this mirrors the logistics of a water company supplying a town with water. The students have to plan, design, cost, build and test a network with a result of running water to each town. They are given a budget and timescale, and the game gives them an insight into the water company process of supplying water. Alongside the workshops, an external contractor carries out an audit of each school and provides water-saving recommendations, the students then take ownership of these and identify where they need to save water and how to implement changes.

Similarly, schools in London can take part in the Thames Water Makeover programme. Workshops, delivered by GAP, introduce students and staff to the importance of water efficiency and give them the knowledge and resources to measure and reduce water consumption. Ten to thirty students form a School Action Team that is then responsible for championing the water-saving. The Action Team attends two workshops that show the importance of water conservation, and then develops ideas and campaigns to get the whole school to save water. GAP supports the action team throughout the campaign process.

Sutton and East Surrey Water expand upon their talk on saving water to deliver a 1-hour workshop on the subject. This workshop is designed as a maths-based activity to prove that water saving works and is used to calculate how much a water-wasting family uses and identify ways to save water. Once these water-saving methods have been discussed, the pupils recalculate the amount of water used in the family and then pledge to make changes at home.

Wessex Water offers a wide range of activities and interactive talks, given by one of their education advisors. They currently have twelve activity topics that can be tailored depending on a school's specific needs. These include a water supply talk, a 'down the plughole' and 'sewage soup' activity, practical experiments, a water conservation talk with activities, a water and health discussion and school habitat studies.

4.4 Site visits

Public access site visits are when children are taken on a trip to visit a local site of interest focussed on water. This is usually a sewage treatment works, a local nature reserve or an education centre.

4.4.1 Treatment Works and Education Centres

Yorkshire Water offers school visits to four treatment works sites, with two treatment works combined and visited together as a morning and afternoon session. These visits are mainly aimed at Key Stage 2 (ages 7-11) children and single site visits last approximately two hours. On arrival at the water treatment site the children are greeted by a member of staff,

then view a 45-minute presentation on the 'Baddies in the Works', which shows how water is treated and the ‘baddies’ removed. This is followed by a 30-minute guided tour of the works with headsets, and another 30-minute activity session; the visit concludes with a 15-minute summary session. Through these visits children are able to get hands-on, conducting experiments and working on a series of projects that help explain the water cycle and what Yorkshire Water do with water to make it safe to drink. The children are also given resource booklets to take back to the classroom.

Severn Trent Water offers visits to their education centres, offering the opportunity to visit a sewage treatment works for a pre-booked, half day tour. Tours are free of charge for schools and community groups within the Severn Trent region. They also offer visits to two of their reservoirs. These offer a day out for a school group to learn outside the classroom. Community groups may also benefit from self-led educational visits. Severn Trent has been developing Discovery Packs to help visitors plan a self-guided visit to the reservoirs.

Sutton and East Surrey Water have a purpose-built Education Centre at Bough Beech Reservoir and Treatment Works. They offer tours which last a day and aim to bring the topic of water treatment to life for pupils. Children are shown how water is cleaned and distributed on a large scale, and often given a ‘water treatment talk’. The children have the exclusive use of the education centre and are engaged in a number of activities, including climbing the dam to see the reservoir, walking through the tunnel underneath the reservoir and touring the treatment works. Each student receives a goody bag at the end that encourages them to take water-saving messages they have learnt throughout the day home with them.

Wessex Water has eight education centres in their region and each offers a different experience for the children who visit them. Sessions are tailor-made to suit individual school needs and new material is developed when needed. Depending on which site is visited, students can expect to learn about water and sewage treatment, reservoirs, river and pond dipping, habitat studies and the water cycle from source to sea.

Anglian Water has one mobile and four static education centres in their region. Their team of educators deliver programmes that suit the needs of the pupils, and can include National Curriculum requirements. Three of the centres are purpose-built classrooms based at wastewater treatment works; visits involve a tour of the site, offering an opportunity to find out more about wastewater treatment. They also have an education site at Rutland Water that offers environmental sessions. This offers pupils an opportunity to explore the natural environment. They also provide hands-on experience of observing animals and plants in their natural habitat, detailing how they are adapted to their environment, and interlink this with educating pupils about food webs. Activities include bird watching, pond-dipping and mini-beast safaris.

Northern Ireland Water has two dedicated education centres open for pupils to visit. The first of these sites is used to educate children on the local area, the importance of the valley and the history surrounding it as well as biodiversity, using practical activities to investigate why habitat protection is important. The other site is used to educate children about the Belfast sewerage system, past and present. Pupils can learn how sewage is cleaned and investigate how pollution affects the natural environment. In addition to these two sites, Northern Ireland Water organises visits to selected water and wastewater treatment works.

4.4.2 Conservation Areas

South West Lakes Trust offered visits for children to Roadford Lake, a dedicated conservation area. These included a variety of activities such as mini beasts, mapping, history, wildlife surveys, meet a tree, arts and crafts and pond dipping. The programme aimed to educate children about local wildlife and habitats as well as discussing the history of the site; the programme also discussed the effect of the environment on the local wildlife, linking this to water scarcity. These visits enable children to have a first-hand look at local conservation efforts. In addition to the countryside stewardship programme at Roadford Lake, South West Lakes Trust provided a variety of educational visits for children aged three to young adults at university, across a number of sites within their management. The majority of activities focus on wildlife and habitats with occasional requests for information and activities relating to the creation of the reservoirs and their history and water supply, including water conservation.

Portsmouth Water uses the local Country Park to deliver their educational programme. They provide guided sessions around the park that take in water efficiency as well as water assemblies held in the barns. They provide the pupils with an understanding of the water cycle, habitats, water treatment and the importance of saving water. This method combines workshops and assemblies with the novelty of being outside school.

4.4.3 Mobile Units

Anglian Water's Mobile Education Centre travels the Anglian Water area, visiting primary and middle schools, and community events. This programme aims to enhance young people's understanding of the water cycle and Anglian Water's role within it. Due to its popularity, they try to return for the next Key Stage 2 cycle; for example, if they see year 3, 4, 5 and 6 then they will attempt to return in four years time.

Similarly, Northern Ireland Water have set up a double-decker bus that acts as a mobile classroom, which travels throughout Northern Ireland and can accommodate up to seventeen pupils at a time. Pupils learn by presentation and demonstrations about the water cycle, water for health, water conservation, water and wastewater treatment, and are encouraged to meet Bob and Flo with Soggy the Dog, Northern Ireland Water's water mascots, as they watch a DVD on the topic of water.

4.5 Other

Many educational activities are carried out that do not fit neatly into the above categories.

Southern Water runs a competition where they task students to design a product, service or campaign that saves water. The workshops help students identify initiatives that will in turn save water, energy and money. As well as support from Southern Water and GAP, each school is allocated a product design STEM ambassador from the University of Brighton who supports the school. The winning school wins a stay in the Eco Lodges at the Lodge Hill Centre in Pulborough.

Essex & Suffolk Water works with a local theatre company, Fame Factory Spotlight, to deliver their Little Green Riding Hood performance to schools. It is a high-energy performance using four key characters that actively involves pupils, incorporating messages about changing water-wasting habits. After the performance children attend a 30-minute good and bad habits workshop, which reinforces lessons learned during the performance.

Using large stands the children categorise good and bad water habits and are encouraged to explain their choices and ask questions; they are then asked to write these good and bad habits on raindrops. The good habits are placed on a large rainbow display in the school to remind them about the good habits they are now going to adopt at school and at home. The interactive nature of the performance is designed to help teach the children how to use water wisely in a way that they will remember. It is hoped that subsequent reinforcing workshops would empower the children to take the messages home and share them with their families.

Keep Britain Tidy runs an international award programme that assists schools in becoming more sustainable, providing a framework to help embed principles into school life. Joining the Eco-Schools programme is free and makes tackling sustainable issues manageable for schools. Once registered, schools follow a simple seven-step process which helps them to address a variety of environmental themes, ranging from litter and waste to healthy living and biodiversity. Children are the driving force behind Eco-Schools; they lead an Eco-Committee and help carry out an audit to assess the environmental performance of their school. In conjunction with the rest of the school and the wider community, the pupils decide the environmental themes they want to address and how they are going to do it. One of the nine themes that pupils can choose to cover is water, where students can be expected to understand the water cycle, the importance of clean water, implement water saving activities in their school and understand that saving water is vital for quality of life.

One school who chose this topic was Mickle Trafford Village School, as shown in a case study provided by Keep Britain Tidy. They compared water use between countries on the same longitudinal lines as England, including France, Spain and Ghana. Year 5 children visited a water company educational centre, which they used as a starting point for their water conservation work, looking at their own use and extending this to the wider community. The visit motivated the children and as a result they wrote to their parents to explain ways of saving water at home and made their own cistern displacement devices to place in the school and home toilets. The children shared their work with the rest of the school using a photo story, which they posted on the school website and showed in an assembly, explaining their activities and encouraging others to do the same. A school magazine was also produced which was handed out throughout the school and displayed on the schools eco notice board. As a part of the schools charitable work, children were motivated to support WaterAid and coins were collected in empty water bottles in each class room.

5 Giveaways and Retrofits as Part of Water Efficiency Educational Programmes

Giveaways and/or school retrofits can be combined with educational activities within the programme, examples of where these have been used are identified and detailed below.

5.1 Product Giveaways

Some educational programmes that were part of this review involve giveaways to pupils in order to drive home the water-saving message. These giveaways may be simple promotional items with water-saving messages on them (e.g. a game) or water-saving devices (e.g., a cistern displacement device). It is thought that children see the giveaway as

a bonus item (not directly linked to education). Some companies, such as Cambridge Water, South East Water and Severn Trent Water give away water-saving devices, most commonly a cistern displacement device and/or a shower timer. Other companies, such as Essex & Suffolk, give away devices upon request, which encourages children to take the message home so that their parents can order devices through their water company.

Sometimes other items not directly water-saving are used to promote water-saving messages after an educational activity has taken place. Southern Water, for example, gives away refillable, branded water bottles that pupils can use repeatedly. Distribution of these helps reduce purchased bottled water and reminds children of the water efficiency messages long after the educational activity has taken place. Sutton and East Surrey Water provide a similar giveaway, an 'Every Drop Counts' beaker that can be used either in the bathroom for tooth brushing or as a standard beaker. In addition, they give children a Splash 'n' Save game, that is similar to Snakes and Ladders, and which is thought to help keep the water saving message fresh in children's minds.

5.2 School Retrofits

Water efficiency school retrofits are sometimes carried out before, after or alongside educational programmes. Severn Trent Water has run a project in which almost 600 schools were retrofitted alongside an educational campaign. All schools involved received educational material and teachers were asked to attend training. Retrofit products ranged from cistern displacement devices and tap inserts to dual flush toilet converters and urinal sensors.

Both Southern Water and Thames Water used a contractor to perform an audit of the school's water use. These audits run alongside an educational programme which provides evidence of the water-saving benefits of the products. Retrofit products included cistern displacement devices, tap inserts, dual flush toilet converters and urinal sensors. A number of companies that do not include retrofit with education do offer schools self-install products, which schools may request usually after performing a self-audit of the school's water use. Self-install products often include cistern displacement devices, tap inserts, showersaves and water butts.

However, retrofits happen much less frequently than giveaways; the majority of programmes reviewed for this scoping study did not include one.

6 Effectiveness of Water Efficiency Educational Programmes

Evaluation of water efficiency educational programmes is still relatively new and difficult to deliver; however, a number of companies have attempted to evaluate the impact and/or water savings associated with their educational activities.

6.1 Evaluation Methods Being Used

Methods used to evaluate water efficiency education programmes vary between programmes and while little evidence was available for this study, examples of these methods are detailed below where possible.

6.1.1 Questionnaires/Feedback

The most common way to evaluate water efficiency educational programmes is by gathering evidence through questionnaires and feedback forms. These may be aimed at teachers, parents and/or pupils. While questionnaires usually focus on water saving ideas and practices, feedback forms tend to focus on the delivery of the activity and any suggestions for improvement.

Southern Water's Saints and Savers project requests feedback from parents and teachers asking about the impact of the programme on children's water use at school and at home. Southern Water's Aqua Innovation project measures success through surveys, which are carried out at the beginning and the end of the programme to assess behavioural changes. Sutton and East Surrey Water give out paper-based questionnaires with their beakers, asking how the beakers are used and if they help remind family members to turn off the tap when brushing their teeth. South East Water ask pupils and teachers for feedback on the talks that they provide, not only to see if water savings are made, but also to ensure they are promoting the right messages to the children and that everyone gets the most of the talks. South West Lakes Trust also requires written feedback from the accompanying teacher on every visit to their site to make sure they are delivering the right messages to the children. Severn Trent measures the success of their project in two different ways: firstly they ask the groups taking part to rate the engagement and delivery carried out, and secondly they measure the level of behavioural change through pre- and post-programme questionnaires.

6.1.2 Pledges

Pledges made by children are a popular way to try to assess success in educational programmes. At the end of an educational programme children are asked to pledge to change behaviour: for example, to pledge to turn the tap off while brushing teeth. Southern Water's Saints and Savers project, in addition to feedback requests, looks at the most common pledges made by children, giving some indication of what actions are said to be made. Severn Trent also asks children to 'keep a promise', pledging to take on a behaviour change action. In the case of Southern Water's World of Water project, pledges are made by pupils after the completion of a water diary.

6.1.3 Ofwat's Water Efficiency Targets

Many educational programmes make use of the UKWIR spreadsheet of assumed water savings[10] to assess water savings to claim against Water Efficiency Targets. While this method does not assess the real impact of a water efficiency educational programme, it does offer a measurement of success for water companies. Yorkshire Water, Cambridge Water and Essex & Suffolk Water all used this method for their projects. Essex & Suffolk Water, for example, ask pupils at the end of an educational day to fill out water drops with good water use behaviours and bad water use behaviours. The good behaviour drops are displayed in the school while the bad behaviour drops are taken away by Essex & Suffolk who calculate water savings in accordance with Ofwat's reporting guidance. It is unknown whether this is an effective way to measure the real impact of an educational programme, given that water saving outcomes in reality may be different to those predicted through assumed water savings calculations.

[10] UK Water Industry Research Water Savings Database.

6.2 Evidence of effectiveness

While a variety of information was available about water efficiency educational programmes and associated activities that take place in schools – and in some cases how these activities are assessed – little evidence was provided on the effectiveness of educational programmes in achieving real water savings.

6.2.1 Questionnaires/Feedback

Little information from these methods was available to give a clear indication of how effective water efficiency educational programmes are in saving water at home and/or at school. The only evidence available was from a study to assess the impact on children's attitudes towards water conservation and the value of water of visits to Severn Trent Water's Education Centre and the Be Smart in-school award scheme.[11] While the latter of these no longer takes place, findings from the research show that the behaviour change message had an impact on pupils. Those that had direct learning experience of water conservation appeared to actually have better water-conserving habits. Also, despite the fact that in the questionnaire 71% of the visit group said they sometimes waste water, in the focus group they said they performed a lot of 'water-saving behaviours'. The children suggested that many of their behaviours have become automatic and part of their normal routine. The children also said that Severn Trent Water was the reason for them performing these behaviours, and that prior to contact with the programmes they did not think about water-saving behaviours. It seems as though active learning in an experiential manner made the positive behaviour more concrete.

6.2.2 Pledges

No information was provided or discovered to give any indication of how effective water efficiency education programmes were when assessed using this method.

6.2.3 Ofwat's Water Efficiency Targets

Two examples of savings assumed through educational programmes, calculated according to Ofwat's reporting guidance follow:

- Essex & Suffolk Water saved in 2010-2011 1.183Ml/day from delivering performances; a level of engagement between medium and high was approved by Ofwat
- Yorkshire Water saved 0.22Ml/day in 2010-2011; in 2011-2012 (to November), water saved was 0.15Ml/day

7 Findings

This scoping study has developed a better understanding of the kinds of water efficiency educational programmes that have been, and are still being, carried out in the UK. Categories have been developed to ensure like programmes are compared with like in future, and differences between programmes have been highlighted (mainly around the level of tailoring of activities to their audiences).

[11] Severn Trent Education - A research study, May 2007.

A large number of different educational programmes are taking place, but there is little evidence of the real effect that these are having on children's (and their parents') water-using attitudes and behaviours, and on water use in schools and at home:

- In most cases educational activities are not delivered alongside a school retrofit; water company feedback suggests that this is because a school retrofit involves more in-depth work, time and money as well as different water company staff and/or contractors. It is therefore not known whether the impact of school retrofit programmes and school educational programmes could be increased if the two were delivered together (or if indeed savings would remain the same or even decrease).
- There is little understanding of the pre-existing knowledge of children taking part in these educational programmes. Apart from a small number of studies, baselines against which to measure changes in consumption or behaviour are seldom established. In addition, no controls have even been used in the evaluation of such programmes. Therefore, it is not known whether children's behaviour is already water-efficient prior to the educational programmes, and whether the activities are responsible for the observed changes.
- It is not clear which types of water efficiency educational activities engage pupils the most, or which combinations are most effective.
- While many water companies are trying to evaluate the effectiveness of their educational programmes, most only quantify changes stated by pupils, teachers and/or parents; translating stated changes into water savings is often difficult and unreliable. There is no standard approach or any guidance currently available to assist water companies in evaluating educational programmes, other than Ofwat guidance on calculating assumed water savings from such programmes.
- Where evaluation activities have been undertaken, the methodology is not clearly explained. For example, there is little detail as to the specific questions asked, sample sizes, or incentives used.
- Where evidence has been collected it is unclear whether water savings and behaviour change relate to water use at school, at home, or both.
- Where long-term behaviour change is expected through the completion of pledges by children, this has not as yet been evaluated; there is no available evidence to support the occurrence of long-term behavioural change.

8 Recommendations

There is an urgent need to begin evaluating water efficiency educational programmes more robustly and to disseminate these results. This would help to improve the evidence base and assist water companies with justifying spend on educational programmes during the upcoming Water Resources Management Plan and Price Review processes.

This scoping study was a first step in gathering information on activities currently taking place. The following recommendations are the next steps toward being able to measure the success of such activities need to be taken:

- The evaluation of water efficiency educational programmes is limited and inconsistent. Water companies need to evaluate the effectiveness of their educational programmes. Existing and planned water efficiency educational activities should be evaluated to showcase how effective different approaches to educating

children in schools can be. This will help to build industry knowledge in as cost-effective a way as possible.

- A consistent approach to evaluation should be adopted to ensure that the evidence base for water efficiency educational programmes is as robust and reliable as possible.
- Initial guidance as to how to carry out evaluation of these schools programmes would be beneficial. This would provide a starting point for the water industry on how to allow practitioners to carry out evaluation and ensure that evidence is collected in a consistent way. This could include specific evaluation tools as well as advice on:
    - Appropriate evaluation methods (including low-cost options)
    - Establishing a baseline for evaluation of water-using behaviour
    - Understanding how to evaluate the wider benefits of educational programmes