

# **Water Conservation In Shower Behaviour Amongst Teenagers**

Avrille Aiello, Leyla Khasanova, Haley Strange, Julia Weissenberger, Abbey Young

*William Aberhart High School, Canada, RCMacdonald@cbe.ab.ca , [CEFehres@cbe.ab.ca](mailto:CEFehres@cbe.ab.ca)*

## Abstract

Showering is an essential element of the weekly routine of the average Canadian teenager to maintain personal hygiene. However, many of these individuals are unaware of the amount of water that is used during each shower. Our project intends to determine whether education has the ability to cause long-term change in the water conservation habits, specifically in the shower, within the teen demographic. A combination of pre and post-surveys, knowledge questionnaires, and the monitoring shower length were used to determine the effect of education on shower habits and water conservation knowledge in the short term compared to the long term.

## Introduction

Water is a fundamental resource for human survival, but there is only a finite amount on this planet. Currently, there is a small, but growing global population that lacks access to a water supply (UNESCO, 2013). If conservation does not become a priority in the near future, availability all over the world will decrease drastically (UNESCO, 2013). Individuals will lack water for hydration, hygiene, agriculture, and services. Consequently, overall quality of life will be irreversibly changed. Through our research, we found that Canadians are one of the world's top water wasters (Statista, 2016), using an average of 223 litres a day (Statistics Canada, 2015). Sixty-five percent of this water is used in the bathroom alone (Environment Canada, 2010). We also discovered that teenagers tend to be the demographic that wastes the most water (City of Winnipeg, 2014). An average teenager's shower lasts 7.41 minutes (News Corp, 2015) and about 59 litres of water is used (Alliance for Water Efficiency, 2016).

## Background

Stewart, R. A., Willis, R. M., Panuwatwanich, K., and Sahin, O. (2013) examined the influence that an in-shower display device showing shower duration, flow rate, and volume has on an individual's shower habits. The pre-survey indicated that participants were knowledgeable of the significance of reducing water wastage and showed a desire to reduce their water wastage in the shower. Despite this, the qualitative results collected by the technology used revealed that only a very short-term change occurred and that over time, the influence of the in-shower device was depleted. This study showed that a discrepancy occurs between the water conservation goals of the participants and the actual water consumption.

Russell, S., and Fielding, K. (2010) created an overview of psychological literature that explored the influences of water conservation. They found that attitudinal factors, personal capabilities, habits or routines, beliefs and contextual factors are the key determinants in reducing water consumption.

These studies are relevant to ours because they explore the effects of informing individuals of their water use as they shower and provide us with information on what factors affect a change in water consumption. We used this

information to better hypothesize our results and understand trends.

## Purpose

The main purpose of our project is to create an effective education framework to inform teenagers of ways to save water by focusing on their shower habits. Past studies have found that it is difficult to change an individual's habits regarding water consumption over a long period of time. We believe that our project will encourage students to waste less water by reducing their shower time through education and we hope that this awareness will also extend to their families and friends. If a change in water consumption doesn't occur now, eventually water will not be available to everyone who needs it.

## Hypothesis

Our hypothesis is that we will be able to alter the habits of the students regarding water conservation in their shower routine.

## Research Methodology

### Setting

Our survey was conducted at William Aberhart High School in northwest Calgary, Alberta. Calgary is a city in southern Alberta, in western Canada. *Huffpost Alberta* states that the population of Calgary in 2013 was 1,149,552 people. According to *Living in Canada* (2014), Calgary is one of Canada's wealthiest cities. Because of our location, our water source, the Bow river, coming from a source at a higher altitude, the Bow glacier, our water will continuously flow through the city/system whether or not we modify its course and use it. Northwest Calgary has diverse socio-economic standings. William Aberhart High School has a student population of 1,535 students. Students attending this school come from all corners of the city for its multiple programs including French immersion, Spanish bilingual, and Advanced placement.

### Participants

Participants were recruited in the following way. The researchers spoke in front of their classes for about two minutes telling peers about their experiment and survey. Fifty-five students (61.8% female and 38.2% male) signed up to participate in our survey, do a knowledge questionnaire, and fill in a log to track their length of shower. The students that came to take the survey and subsequent test on April 4th, 2016, were randomly assigned a number to keep their anonymity. In total thirty-one (19 female and 12 male) students came to the meeting to take the survey, do the questionnaire, and take home the log. All students were 18 years of age or younger for the duration of this experiment. The participants were restricted to the students in our classes and to our friends.

### Research Design

The data collected was both qualitative and quantitative and consisted of a survey (Appendix A), a knowledge test (Appendix B), and a log to record shower length (Appendix C). The survey consisted of multiple option and open-ended questions. The knowledge test was comprised of multiple-choice questions, and a few written response questions that required personal response. The log contained seven columns, one for each day of the week, to fill out with the amount of time spent in the shower daily. If the participant took a bath, they were not required to record the time spent. Data was collected on the week of April 4th, 2016 and for a second time on the week of May 4th, 2016.

## Data Collection

The students came to take the survey and the knowledge test on April 4th, 2016. They received instructions and then proceeded to take the survey. In the survey, we asked the teenagers questions such as “How often do you shower in a typical week?” and “Do you shower more than once a day?” (Appendix A). Students were all given the same survey and knowledge test. The purpose of the questions on the knowledge test was to get an understanding of their knowledge of water use and conservation in general. We reviewed the correct answers and discussed the significance of the information included in each question. We did this with the intent of making an impact on the students to instill water-conserving habits. Next, the students were given a shower log to track the length of their showers for one week and given instructions on how to use the log and time their results correctly. Students were all given identical logs. Finally, they were instructed to return to the meeting place the following Monday to return their completed logs. The subsequent meeting was held exactly a month later on May 4th, 2016. The participants were each given an identical survey and asked to complete it a second time. They were also given the knowledge test again. The participants were shown a table comparing their estimated length of shower and the average length of their shower based on their results in their log that they completed. The results of the second round of the survey and knowledge test were a reflection of how the entire study (including the knowledge test, survey, and information session) affected the behaviour of students towards water usage/wastage. The students were given a second log to take home and complete.

## Results

The purpose of our research project was to demonstrate water usage habits in the shower amongst teenagers. We hypothesized that we would be able to cause some change in the participants’ long term shower water usage. Results were derived from surveys, questionnaires, and individual shower log data. It is our intention to follow up with a second survey, questionnaire and log a month from the original date where we had collected data. These post procedures allowed us to compare between short term and long term data as well infer from the variation observed.

## Participants

The data regarding the purpose of our project was obtained through a presentation delivered by our research group, followed by a survey, a questionnaire and a shower log during April and May of 2016.

The presentation was presented by researchers to their high school classes. Participants voluntarily signed up to be a part of the study. They attended a meeting organized by the researchers. The meeting consisted of a presentation, which included background information on our study, the participants’ role in the study, and instruction on how to complete the shower log (see Appendix C). Thirty-one students participated in the pre-survey, and the pre-questionnaire. Twelve participants were of the male demographic, while 19 participants were female. The pre log was completed by 24 students, of which 7 were male and 17 were female. Fifteen students participated in the post-survey and questionnaire (six male, nine female) and 12 participants handed in their second logs (four male and eight female).

## Findings

**Pre-survey findings.** The questions asked on the survey obtained information on an individual’s gender, activities, and current water usage habits. We discovered that 12 of our participants were males and 19 were females. Out of the thirty-one students that participated in taking the survey, only twenty-four (17 female and seven male) students returned the next week to hand in their shower log. Eighty-eight percent of participants in the pre-survey said their household took measures to conserve water. The researchers also found that 71% of the participants waited for the shower to get hot before getting in and 50% reported that they wait longer than 30 seconds for it to warm up. Seventy-one percent participate in sports more than three times a week. Two out of the thirty-one participants do not take part in extracurricular activities hence require less showers (see Figure 3.2). Lastly, the survey allowed us to acknowledge that 17 of our participants had past interest in water conservation (see Figure 3.1), and all participants believed that they spent less than 30 minutes showering daily.

**Pre-questionnaire findings.** The questionnaire was comprised of 10 multiple-choice questions and three open ended questions. Although the theme of the multiple choice component of the questionnaire was related to water consumption, the written response questions all asked students to specify ways water conservation could be applied to their daily lives. One of the open ended questions explored the amount of water (in litres) believed is used in a week by an individual participant of the experiment. Most students believed they used 100 L or less of water, per day. On another question, which asked participants the number of litres that are used in an average shower in Canada, had only 43% of the participants answer correctly. (See Appendix B).

**First log findings.** From the information obtained by the log, we calculated the average shower time of each person. We then compared this average to their estimated shower times they provided in their surveys. We found that the average female shower lasted 10.0 minutes and the average male shower lasted 9.2 minutes. The average difference in minutes between the female participants’ estimated time

and their actual shower times was 4.3 minutes, and for males it was 5.1 minutes.

**Post-survey findings.** Fifteen students (five male, and nine female) participated in our post survey. In the post-survey results, the researchers found that 87% of the participants said that their households took measures to conserve water in their home. When asked about preference of shower or bath, 10/15 participants said they prefer taking a shower than a bath simply because it's faster and more convenient. Only one participant stated that they prefer taking a bath compared to a shower. The researchers also found that 53% of the participants said that they have had a previous interest in water conservation. The researchers calculated the average estimated length of shower to be 9.9 minutes. Surveys showed that 60% of participants were involved in vigorous extra curricular activities more than twice a week.

**Post-questionnaire findings.** The results in the post-questionnaire have improved since the first knowledge test (note that the second test was conducted a month after the researchers educated the participants). The majority of the participants chose the correct answer 60% of the time. Not a single person knew that the average Canadian uses 300-500 liters of water per capita per day. However, nine out of sixteen participants were aware that 30% of indoor water use occurs in the bath and shower. Over half of the students knew that the average shower uses eight liters of water every minute. Shockingly, only 25% of participants knew that 2.5 billion people do not have access to an improved sanitation facility. Sixty-six percent of the participants knew that 3% of all water on earth is fresh.

**Second log findings.** We calculated the average shower length of each participant from the data collected by the second log. We only received twelve logs from our participants, of those four were from male participants and eight were female. We discovered that eight out of the twelve participants who returned their logs reduced their average shower length. Three out of the four male participants reduced their shower length, while five out of eight female participants reduced their times. We also found that the average male shower lasted 7.3 minutes, while the average female shower lasted 10.2 minutes.

## Discussions

### Findings discussion

**Pre-testing findings.** When comparing the results obtained in the pre-survey and the first log, the researchers observed that the participants had marked down a longer shower length than they actually took (see Appendix D). We can conclude that in the short term, our education session had impacted their water usage. The researchers also found that the average female shower lasted 1.8 minutes longer than the average male shower. Regarding the knowledge test results, 43% of the participants did not know that Canadians use 300-500 litres per capita per day. Only 24% of participants were aware that 738 million people do not have access to an improved drinking water source. From the obvious low scores on the first knowledge test, we can make an assumption that their lack of understanding of the dire situations we are in concerning water is likely one of the causes of their previous lengthy showers. After the

students received the educational framework given by the researchers their showers were drastically shorter than the students said in their survey answers.

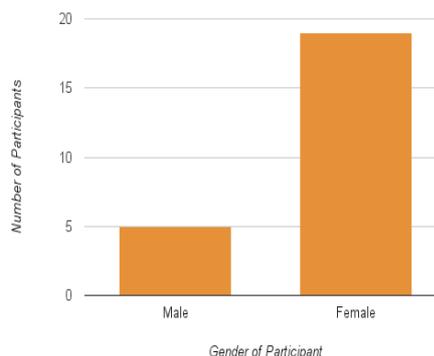


Figure 3.1: The Effect of Gender on a Previous Interest in Water Conservation

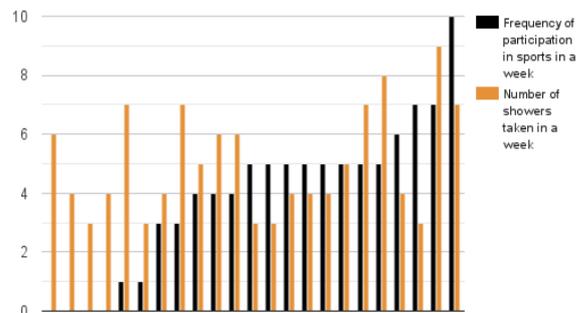


Figure 3.2: The Effect of Participation in Sports on the Number of Showers Taken in a Week

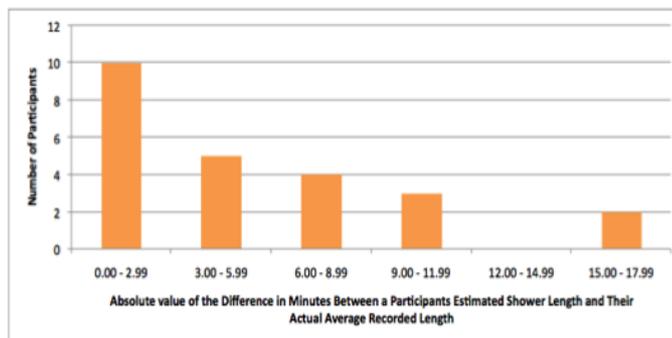


Figure 3.3: The Number of Participants that Recorded Actual Average Shower Lengths Within Various Ranges of Their Estimated Shower Lengths.

Graphs: The purpose served by the graphs is to present how the controlled variable of each statistic affected the responding variable. We hypothesized that those who had previous interest in water conservation, would have a more drastic change in their shower behaviour. In the first graph,

participants are divided into genders, as a result, more females than males had an interest in water conservation prior to participating in our experiment. Also, all the females held interest in water conservation, when only five out of seven males found water conservation methods of their interest. Therefore, it is appropriate to assume females attempted to apply more efforts in water conservation than males for this experiment. The second graph is a representation of the amount of participation of each individual in a physical activity (per week). Through the analysis of the graph, the results show that the level of physical activity does not correlate with the amount of shower time in a participant's week. Many of the individuals that did not attend sports during their week of logging, took more showers than students that lived a more athletic lifestyle. Logically, students that attend more sports would take more showers throughout the week. Therefore, this may have affected the answers of the survey. Specifically, the question that asked students to approximate the amount of water used (in litres) per week, may have been overstated by students that attend sports. Finally, Figure 3.3 depicts the accuracy and the awareness of the participants while estimating the average length of their showers. We discovered that the majority of students were unaware of the length of their average shower as few of the students' estimated shower lengths matched the average length that they had recorded during the experiment. The analysis of the data as shown by Figure 3.1, leads us to believe that teens may be ignorant to, and unaware of the length of time that they spend in the shower.

**Post-testing findings.** A total of 15 students came to the second stage of our experiment on May 4th, 2016 to take the post-survey, post-questionnaire, and receive the second log to take home and complete. At this time, all of the participants had listened to our educational framework and it had been exactly one month since the presentation. Out of the 15 students who completed the post-survey and post-questionnaire, only twelve handed their logs back. We believe that only fifteen out of the twenty-four students who handed in their initial logs returned for the second part of our experiment mainly because of loss of interest over the span of a month.

**Comparing the initial and final testing results.** We tested our participants twice with the same survey and questionnaire one month apart to see the long-term effect of our education program. We noticed that as the study went on, we were losing participants very quickly. Out of the 55 students that signed up to participate, 30 came to the lunch-time meeting. Of those 30 students, 24 handed in their completed logs. At the next meeting one month later, 15 students came and participated. Twelve of the fifteen students handed in the final completed shower log. Note that the researchers sent reminder texts and emails to the participants to remind them of upcoming meetings and deadlines. Overall, only 22 % of the participants that signed up to participate actually continued on to the end of the study.

When looking at the surveys we noticed that in the pre-survey 68% of the participants (out of 25) stated that they had a previous interest in water conservation and in the post-survey 60% of participants (out of 15) stated they had an interest. It is surprising to the researchers that this percentage did not increase in the post-survey. With the rapid decrease in participants, the assumption was that the participants that had no prior interest in water conservation

would not participate until the end in the study. When reviewing the surveys, the researchers noticed that when the students were asked "approximately how long do you shower", the participants had a much smaller range of estimations and the lengths were smaller in the post-survey. We can conclude that at the time of the post-survey, the participants now have an idea of how long their showers actually are now that they have already completed a shower log and have recorded their shower lengths for one week. In regard to the knowledge test, in the test a question asked "How many people in the world, do not have use of an improved sanitation facility?" In the pre-test, this question had a 62% succession rate and in the post-test only 27% of the participants got this question correct. These type of results were very similar with the other questions. The researchers figure that since the environment in which the post-test was conducted was more silent and less talking was occurring, the participants had less of a chance to discuss the answers with other participants. Note that in the session held one month prior to the post-testing, the researchers shared the answers to the questions on the test and had a group discussion about the answers. The researchers then concluded that since the participants had previously taken this test and discussed the correct answers that this drop in succession rate is due to the fact that the participants became uninterested. Finally, the logs gave us an inside look into what the average shower is like for teens. In the first log, the longest shower average was 15 minutes. The shortest shower average was 4.46 minutes. In the second log the longest shower length average was 17.23 minutes and the shortest average was 5.43 minutes. In the first log, the average female shower (8 participating females) lasted 10.0 minutes compared to 10.2 minutes in the second log. The average male shower (4 participating males) in the first log was 9.2 minutes and 7.3 minutes in the second log. The average female shower increased in the second test but decreased greatly with the male participants. The total average of the average shower lengths in the second log is 9.99 minutes. When looking at the average estimated length of shower and the actual average shower length, they are spot on ( the participants estimated 9.9 minutes).

## Limitations

Our sample size regarding the data retrieved from the surveys, questionnaires and the log is not of an adequate size to be reliable. The participations in the study were limited to the students in our grade level and in our classes. The gender ratio of participants was not evenly distributed; we had more females participating than males. We had to trust the integrity and honesty of the participants regarding their answers in the surveys, knowledge test and shower log. The students were not in a silent or private area when writing the test or completing the survey, which could have affected their results. They also communicated with each other during the time of completion. The participants did not have a regulated timer when timing their showers. We did not have access to technology that could give more information about the participants showers such as flow rate or volume of water, hence the data we collected from the participants regarding the length of shower was not accurately proportional to the volume of water they used. We also did not obtain information specific to what type of

showerhead each participants had. The researchers do not believe that one week measured by the shower log was sufficient to judge habits. A major limitation is that we were unable to test results over a longer time period.

## Implications and Recommendation of Further Study

As a result of our many limitations in this study, many future studies and inquiries could be made from our work. These include studying a larger, more diverse demographic, enforcing a time or water volume limit for the participants' showers, or utilizing a different education framework. This study could be extended over a longer period of time, such as over the course of a year or more, with multiple observations to observe changes in behaviour. In further study, it would be beneficial to conduct an interview with the participants at the end of the study to find out if they became uninterested during the one month gap, to see if they truly think their habits have changed, and if they think the educational framework was useful.

## Conclusion

The purpose of our study was to evaluate the water usage and conservation habits of Calgarian teens by focusing on their shower tendencies. We hypothesized that we would be able to alter the behaviour of the participants by educating them about water awareness and conservation. When we looked at our participants initial shower tendencies, we determined that males took shorter showers than females, and that most of our participants overestimated the length of their average shower. After the implementation of our education framework, and out of the remaining participants, more than half were able to reduce their average shower length. Despite these positive results, we were only able to test our participants over a month. We still hope to be able to instil long-term results by promoting continual water conservation habits and awareness amongst our participants. Through the knowledge learned by our participants, we go forward with the goal for our participants to pass on their knowledge to their peers, creating a population of better-informed and better educated youth. We studied the teen demographic specifically in order to impact those who will determine the future of our planet. In order to ensure that there is enough fresh water for the planet's growing population, water conservation must become a priority. Water is such a precious resource that is vital to our existence, and we hope that this study will encourage our generation to *want* to protect it.

## Acknowledgements

We would like to thank our amazing teachers, Ms. MacDonald and Ms. Fehres, for supporting and encouraging us throughout all of the stages of our project. We also would like to thank the students of William Aberhart High School for volunteering to participate in our experiment. We greatly appreciate the continuous support from our friends, family, and community.

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# Appendices

## Appendix A: Participant Survey Providing Background Information Regarding Water Conservation Habits

Assigned Number:

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Gender:

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Age:

Grade:

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How often do you shower in a typical week?

Everyday  Every 2-3 days  Every 4-5 days  Every 6-7 days

Do you shower more than once a day?

Yes  No  Sometimes

Approximately how long are your showers?

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Does your shower have more than one shower head?

Yes  No

Have you had a previous interest in water conservation?

Yes  No

Does your household take measures to conserve water?

Yes (please describe below)  No (why not)

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What sports or activities are you involved in?

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How many times a week do you participate in your activities?

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Do you prefer taking a bath or a shower?

Bath  Shower

Explain:

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Do you wait for the shower to get warm before getting in?

Yes  No

If yes, approximately how long do you wait for your shower to warm up?

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## Appendix B: Water Awareness Knowledge Questionnaire

**Water Awareness Knowledge Questionnaire**

Number: \_\_\_\_\_

1. How long is the average Canadian shower (mins)?
  - a. 6-8
  - b. 3-5
  - c. 10-12
  - d. 18-20
2. How many litres are used in the average shower every minute?
  - a. 4
  - b. 8
  - c. 10
  - d. 15
3. What percentage of indoor water use occurs in the bath or shower?
  - a. 15%
  - b. 30%
  - c. 65%
  - d. 80%
4. Out of the first world countries, \_\_\_\_\_ pays the most for municipal water, and \_\_\_\_\_ pays the least (per cubic metre).
  - a. the U.K., the U.S.
  - b. France, Spain
  - c. Belgium, Italy
  - d. Germany, Canada
5. How many people in the world, do not have access to an improved drinking water source?
  - a. 4.5 million
  - b. 748 million
  - c. 493 million
  - d. 1 Billion
6. How many people in the world do not have use of an improved sanitation facility?
  - a. 2.5 Billion
  - b. 100 million
  - c. 900 million
  - d. 760 million
7. How many gallons of water does is generally needed to fill up a bathtub?
  - a. 50 gallons
  - b. 65 gallons
  - c. 80 gallons
  - d. 70 gallons



**Appendix D: The Difference in Minutes between the Estimated Average Shower Length and the Actual Recorded Shower Length of Participants**

<b>Participant Number</b>	<b>Estimated time (minutes)</b>	<b>Actual average shower length recorded by participants (minutes)</b>	<b>Difference in time (minutes)</b>
3	10	10.67	0.67
4	10 - 15	5.05	7.45
6	15 - 20	7.5	10
7	15	8.99	6.01
9	10 - 15	5.17	7.33
10	30	13.67	16.33
12	5	4.46	0.54
13	10 - 15	12.57	0.07
14	15 - 25	16.5	3.5
16	15 - 25	10.82	9.18
19	6	5.47	0.53
21	5 - 10	4.63	2.87
23	10 - 20	11.38	3.62
24	10 - 15	7.54	4.96
25	20	13.93	6.07
26	20	9.07	10.93
28	12 - 15	9.14	4.36
33	20 - 30	9.33	15.67
44	10 - 20	15	0
45	5	6.66	-1.66
46	15	13.5	1.5
48	5 - 10	6.85	0.65
50	10	13.42	-3.42
51	15	13.29	1.71