

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

**Promote Tap Water Usage Among UBC International Students**

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**Themes: Water, Waste, Wellbeing**

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## **Executive Summary**

The research question of the study is what is the impact of a poster that highlights the safety of tap water on UBC international students' likelihood of drinking tap water and their perceived safety of tap water? The hypothesis is a poster that shows the process of tap water filtration and testing will increase their likelihood of drinking tap water and the perceived safety of tap water. Based on two single-sample *t*-test analysis, UBC international students' intention of drinking tap water and UBC international students' subjective judgment on tap water safety have increased after reading the poster that educates on tap water safety. Another correlation analysis reviewed that increasing subjective safety about tap water will increase UBC students' likelihood of drinking tap water. Thus, the current results support the hypothesis.

## **Introduction**

### ***Background Literature***

A study conducted in the USA on college students' choice between tap water and bottled water found that on campus, students prefer bottled water to tap water (Levêque & Burns, 2018). Another study that surveyed 2045 participants at Purdue University West Lafayette campus discovered that participants preferred drinking bottled waters as compared with drinking tap water with reusable water bottles (Saylor, Prokopy & Amberg, 2011). Besides, participants generally drank an average of 4.8 bottled waters per week and undergraduate students drank more bottled waters (Saylor et al., 2011). Undergraduate students drank an average of 6.9 bottled water which is two bottled water above the average bottled water drank by all participants (Saylor et al., 2011). Participants identified several reasons for increasing bottled water behavior, which include their preference for the taste of bottled water, their belief that bottled water is safer and tap water fountain is unsafe (Saylor et al., 2011). Besides, bottled water usage decreased when participants had a higher perceived safety on tap water (Saylor et al., 2011). Syme and Williams (1993) discovered similar results based on a study on perceptions of drinking water quality in several residential locations in Australia because Australians' acceptability of the water they drink is highly related to their trustworthiness in water quality. Therefore, gaining a community's trust and promoting knowledge on tap water quality may increase students' willingness to choose tap water over bottled water.

Similarly, the Past SEEDS project suggests that UBC students reported they had not drunk from a sink tap on campus because a majority of them did not trust the hygiene of facilities and tap water (Sadowski & Willock, 2010). In order to increase UBC students' trust in tap water, Sadowski and Willock (2010) suggest that educational efforts are critical to propagate the safety of Metro Vancouver's tap water. Based on previous studies, educational efforts on the safety of tap water are vital for increasing trust in tap water, which can facilitate more tap water drinking behavior. Another study on tap water drinking behavior reviewed that UBC students drank water the most from Student Union Building (SUB) and Irving K. Barber (Tran, Li, McNicholl, Noble, Van Dijk, & Lee, 2012). Thus, these two places may be a good place for investing in educational efforts.

### ***Psychological Insight***

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A study found that social settings of intervention and characteristics of the target population need to be considered when implementing a nudge (Ebrahimi, Wittman & Zhao). Nudging has found useful in gaining attention and triggering desired behavior outcomes in many high-income countries (Dreibelbis, Kroeger, Hossain, Venkatesh & Ram, 2016) Nudges, including environmental cues, can take in many forms, and they can engage in both automatic decision-making process as well as a controlled decision-making process. We will use visual cues targeting the population and the building of interest in our poster design. Moreover, we will simplify the poster so that students can receive our message with the least cognitive load according to research (Datta & Mullainathan, 2014).

### ***Research Question and Hypothesis***

What is the impact of a poster that highlights the safety of tap water on UBC international students' likelihood of drinking tap water and their perceived safety of tap water? The hypothesis is that a poster that shows the process of tap water filtration and testing will increase their likelihood of drinking tap water and the perceived safety of tap water.

## **Methods**

### ***Participants***

Based on an effect size of .406, an alpha level of .05 and power of .8, we need a minimum of 97 participants per condition. Thus, the total number of participants needed is 194 with 97 participants for each condition. For the baseline condition, a total of 97 participants are selected in the Irving K Barber Learning Center (IKB). Among the 97 participants selected in IKB, 39 students are excluded because they are not UBC international students. The baseline condition has 58 participants. We had originally planned to select 97 participants in IKB after putting up the education posters, but due to the current COVID-19 pandemic, we have to conduct a survey online. A total of 37 UBC Chinese international students participated.

### ***Conditions***

The study has two between-subject conditions. The first condition is the baseline condition that doesn't include the educational poster, and the other condition is the poster presentation condition which includes a poster that educates the safety of tap water. The poster informs about the whole tap water filtration system, which includes tap water filtration, disinfection with Ozone, UV and chlorine, and water quality testing at two different locations before and after being distributed to UBC (see Appendix A Figure 4). The poster aims to educate the participants about tap water safety.

### ***Measures***

We have two sets of survey questions to measure safety awareness in tap water and the likelihood of drinking tap water (see Appendix B and C). The survey for the Baseline condition has 6 questions, the first two of which are used to ensure that the participants are from our target population (UBC international students). The next two questions are intended to measure UBC international students' beverage consuming habits and tap water drinking habits on campus (see Appendix B). The last two questions are to inquire about UBC international students' safety concerns about tap water and the reasons for not drinking tap water (see Appendix B). This baseline survey acts as a guideline for improving tap water

usage on campus, and the same six questions are included for the poster presentation condition because different participants were selected for the second condition. However, one change is made to question 3. Though Question 3 is found in the baseline survey and the poster-presentation survey, participants answering the poster-presentation survey are allowed to select multiple answers rather than one answer in the baseline survey. This provides more choices and flexibility in the survey. Comparing the same questions between the baseline condition and the poster presentation condition can increase test-retest reliability and can identify possible confounds if the results differ. The last four questions are to measure participants' acknowledgment of reading the poster (see Appendix C Question 7), tap water safety (see Appendix C Question 8), the likelihood of drinking tap water (see Appendix C Question 9), the effectiveness of the poster on tap water filtration system (see Appendix C Question 10). Questions on tap water safety and the likelihood of drinking tap water are useful to support our hypothesis because the two questions measure the changes of tap water drinking behavior among participants after the introduction of the educational poster on tap water filtration system at UBC.

### ***Procedure***

In the baseline condition, participants were randomly selected in IKB. We briefly described our study and provided a consent form to the participants. Then participants were given a short survey (Appendix A). In the poster condition, due to the current situation of coronavirus, the study took place online instead of in IKB. Participants received a link to the survey (Appendix C). After reading through the consent form, they proceeded to the survey. The first part of the survey is identical to the survey used in the baseline condition. After finishing the first part, a poster was presented. Then a few questions were asked regarding their understanding of the poster and their intention to consume tap water after reading the poster.

### **Results**

The table 1, 2, and 3 are recorded separately as baseline condition and poster condition, however, these questions are all asked before the introduction of the poster, the data are collected at different times using different samples. Based on Figure 1, around 49% of our participants chose beverages from the cafe as compared with other choices, in the baseline condition, there are 48.3% participants chose beverages from the cafe, 22.4% chose tap water, 20.6% chose Bottled water, and 10.3% people chose bottled sugar/sweetened beverages. In the poster condition, we have 48.6% of participants who chose beverages from the cafe tap water is, 40.5% chose Bottled water, 27% of participants chose bottled sugar/sweetened beverages (see Appendix A Figure 1). Therefore, we can conclude that UBC international students favor beverages from cafes the most, followed by bottled water, tap water, and bottled sugar-sweetened beverages respectively. Based on the poster condition, there are about 23% of participants reported that they do not feel safe to drink tap water and 25% of participants do not like the taste, these factors both constituted to be the main reasons for not consuming tap water among UBC international students. The other popular concerns are "tap water is too cold" and "forget to take reusable bottles", both reasons occupied 16% each in participants' responses (see Appendix A Figure 2). In the questions asking

participants' acknowledgment of the UBC tap water filtration system and their perceived safety on tap water, there are 28 participants chose "Yes", they know that tap water in UBC is filtered, and 30 of them chose No in the baseline condition. While in the poster condition, 30 participants chose Yes and 7 chose No (see Appendix A Figure 3). There is a difference between baseline and poster condition in the choice of whether participants did not acknowledge the safety of tap water. Regarding the comprehension of our poster, there are 78.38% of participants chose "Yes", they understand the content on the poster, and 18.92% chose maybe, 2.7% chose "No", they don't understand. This confirmed that the information in our poster is understandable. A single-sample *t*-test revealed that the mean likelihood of drinking tap water of our sample of UBC international students ( $M=4.24$ ,  $SD=0.93$ ) is significantly different than the mean likelihood of drinking tap water in UBC international students ( $\mu=3$ )  $t(36)=8.17$ ,  $p<0.01$ ,  $d=1.34$ , 95%CI [3.93, 4.55] (see Appendix A Table 1). We can conclude that UBC international students' intention of drinking tap water is increased after reading the poster that educates on tap water safety. Another single-sample *t*-test revealed that the mean subjective judgments on tap water safety of our sample of UBC international students ( $M=4.00$ ,  $SD=1.08$ ) are significantly different than the mean subjective judgments on tap water safety of UBC international students ( $\mu=3$ )  $t(36)=5.63$ ,  $p<0.01$ ,  $d=0.93$ , 95%CI. [7.72, 8.44] (see Appendix A Table 2). Hence, we can conclude that UBC international students' subjective judgments on tap water safety are positively changed after reading poster education on tap water safety. There is a large positive correlation between UBC international students' subjective safety about tap water quality at UBC and UBC international students' likelihood of drinking tap water that is statistically significant,  $r(35) = .69$ ,  $p < 0.01$  (two-tailed) (see Appendix A Table 3). Since the positive correlation is significant, we can conclude that students' subjective safety about tap water quality will positively impact their likelihood of drinking tap water. Thus, increasing subjective safety about tap water will increase UBC students' likelihood of drinking tap water.

## Discussion

The results above show that most of the participants who read the poster can understand its content. Our sample of UBC international students show an increased intention to drink tap water, and their perceived safety of tap water increased as well. Therefore, the results support our hypothesis. Besides, by analyzing other questions in our survey, there are two important findings. Firstly, nearly half of the participants' most frequent drinks on campus are beverages from café (see Appendix A Figure 1). This provides a large target population and location for future tap water promotion on campus. Secondly, among those who do not consume tap water regularly, 25% revealed that they do not favor its taste, 23% do not feel safe to drink, followed by 16% indicated that tap water is too cold. The reasons besides tap water safety can also become good breakthrough points for increasing tap water consumption in the future. For instance, by satisfying their need for a better taste or higher water temperature, 41% of responders would potentially be more willing to drink tap water regularly on campus.

Due to the situation with COVID-19, UBC announced a campus closure after the first stage of our originally proposed study procedure. The original study includes three stages: a

pre-intervention survey that collects baseline levels of water consumption and knowledge for tap water safety; an intervention phase that puts up posters in IKB for a week; and a post-intervention survey that asks the same questions as the first survey as well as questions specific to the poster. Therefore, we modified the last two stages of the study. As shown in the method section, we asked for participants' reactions to the poster in the online survey instead.

The new method brings several limitations. Firstly, the sample is biased. In the first survey, participants were randomly approached in IKB, which includes international students of different nationalities and languages. However, in the second survey, participants were all Chinese Mandarin-speaking students from group members' social networks. Thus, the results may not be generalizable to all international students at UBC. Secondly, participants of the first survey were asked to complete the survey with the presence of one of the group members, the situation of which is different from the second survey that allows them to fill out privately. According to Figures 1 and 3 (see Appendix A), participants from the two conditions differ in their baseline beverage preferences and awareness of tap water safety. The differences can be attributed to the two limitations discussed above. In addition, the two surveys are not identical in form, that the second survey has shuffled choices and allows multiple choices for some questions (see Appendix B and C). Thus, the differences shown in Figure 1 (see Appendix A) can also be the result of an order effect in the first survey.

Future studies should assess people's actual behavior change after seeing the poster as proposed in our original study procedure. Also, a future study can examine whether poster presentation can have different effects on international versus domestic students.

### **Recommendations for UBC Client**

As Figure 3 (see Appendix A) illustrates, 37 over 95 participants do not know the safety of tap water at UBC. However, tap water safety was not mentioned in detail on the official website of the UBC Drinks Tap Water campaign (cite the website [h20mg.ca](http://h20mg.ca)). Thus, we recommend the UBC water campaign to focus more on education about tap water safety in the future. Since our study has shown the effectiveness of poster presentations on people's intention to drink tap water, the campaign could use posters that highlight the safety of tap water, such as including the process of tap water filtration and testing.

Besides a lack of knowledge of tap water safety, 16% of participants who do not drink tap water regularly state that not in favor of the low temperature of tap water is the reason for them not consuming. According to Mony et. al (2013), compared to iced water, people in many European and Asian countries prefer water at room temperature or hot water. And from the Planning and Institutional Research Office, around 16% of students of the Vancouver campus are from Europe and Asia (Demographic overview, n.d.). Drinking hot water is also good for the health of the stomach (Wakisaka et. al, 2011). Thus, we recommend installing hot water refill stations on campus so that students who need a warmer drink can have an option to drink from the tap.

Meanwhile, we also found that nearly half of the participants' most frequent drinks on campus are from café (see Appendix A Figure 1). Therefore, we recommend the UBC water campaign to also work with campus catering services to encourage tap water consumption.

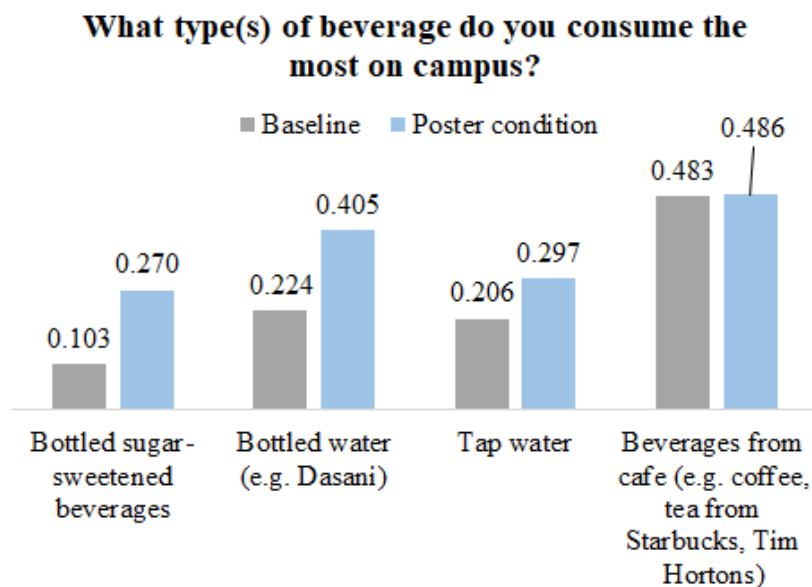
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## Appendix A

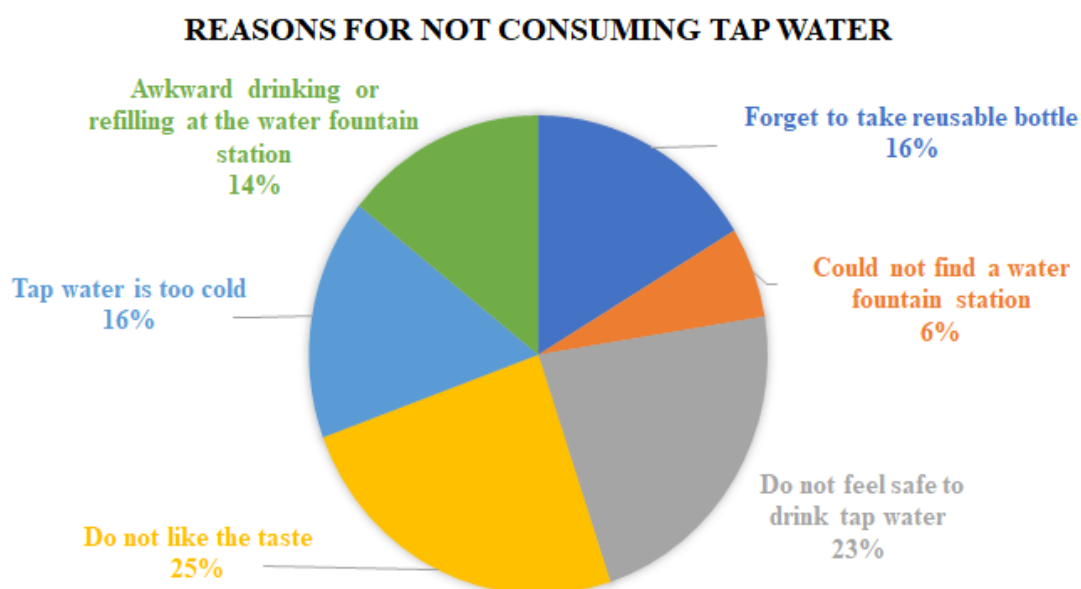
**Figure 1**

Response for question “what type(s) of beverages do you consume the most on campus”



**Figure 2**

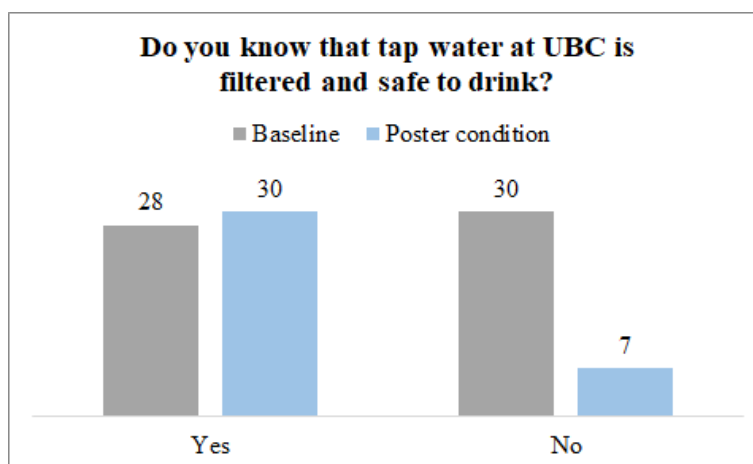
Response for question “reasons for not consuming tap water”



**Figure 3**

Response for question “do you know that tap water at UBC is filtered and safe to drink?”



**Table 1**

*Single-sample t-test for question “would the poster make you feel safer about tap water quality at UBC”*

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
Would the poster make you feel safer about tap water quality at UBC?	37	4.00	1.080	.178

**One-Sample Test**

Test Value = 3

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Would the poster make you feel safer about tap water quality at UBC?	5.632	36	.000	1.000	.64	1.36

**Table 2**

*Single-sample t-test for question “would you be more likely to drink tap water after acknowledging that it is filtered and tested?”*

**One-Sample Statistics**

	N	Mean	Std. Deviation	Std. Error Mean
"Would you be more likely to drink tap water after acknowledging that it is well filtered and tested?"	37	4.24	.925	.152

**One-Sample Test**

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
					Test Value = 3	
"Would you be more likely to drink tap water after acknowledging that it is well filtered and tested?"	8.174	36	.000	1.243	.93	1.55

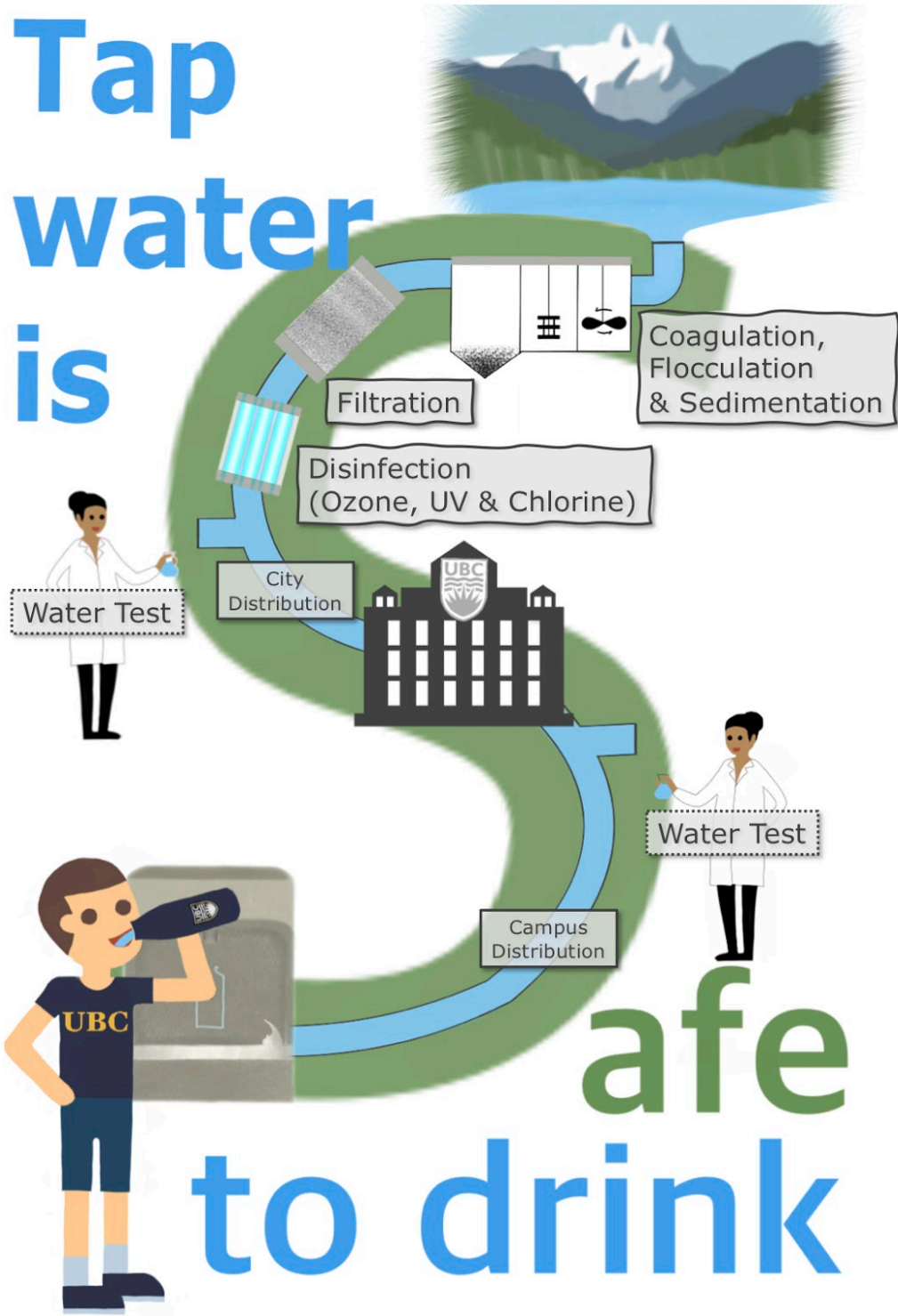
**Table 3**  
*Correlations*

		Would the poster make you feel safer about tap water quality at UBC?	Would you be more likely to drink tap water after acknowledging that it is well filtered and tested?
Would the poster make you feel safer about tap water quality at UBC?	Pearson Correlation	1	.695**
	Sig. (2-tailed)		.000
	N	37	37
Would you be more likely to drink tap water after acknowledging that it is well filtered and tested?	Pearson Correlation	.695**	1
	Sig. (2-tailed)	.000	
	N	37	37

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Figure 4**

Poster that illustrates water filtration and testing system



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**Appendix B**  
Baseline Survey

1. Are you a UBC student?

Yes

No

2. Are you an international student?

Yes

No

3. What type(s) of beverage do you regularly consume on campus?

Bottled sugar-sweetened beverages (e.g. juice, soft drinks)

Beverages from the stores (e.g. coffee, tea from Starbucks, Tim Hortons)

Bottled water (e.g. Dasani)

Tap water

4. How often do you drink tap water in a week on average?

At least once daily

3-4 times a week

1-2 times a week

I don't drink tap water

5. Reason(s) for not consuming tap water:

Could not find a water fountain station

Awkward drinking or refilling at the water fountain station

Tap water is too cold

Forget to take reusable bottle

Do not feel safe to drink

Do not like the taste

6. Do you know that tap water in UBC is filtered and safe to drink?

YES

I assume it is filtered

I don't know

**Appendix C**  
Poster Presentation Survey

1. Are you a UBC student?

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Yes

No

2. Are you an international student?

Yes

No

3. What type(s) of beverage do you regularly consume on campus? [shuffled choices]

*You can select multiple options.*

Bottled sugar-sweetened beverages (e.g. juice, soft drinks)

Beverages from the stores (e.g. coffee, tea from Starbucks, Tim Hortons)

Bottled water (e.g. Dasani)

Tap water

4. How often do you drink tap water in a week on average?

At least once daily

3-4 times a week

1-2 times a week

I don't drink tap water

5. Reason(s) for not consuming tap water: [shuffled choices]

*You can select multiple options.*

Could not find a water fountain station

Awkward drinking or refilling at the water fountain station

Tap water is too cold

Forget to take reusable bottle

Do not feel safe to drink

Do not like the taste

6. Do you know that tap water in UBC is filtered and safe to drink?

YES

I assume it is filtered

I don't know

[Poster presentation here]

7. Did you read and understand the contents on the poster?

YES  
Maybe  
NO

8. Would the poster make you feel safer about tap water quality at UBC?

Strongly agree  
Agree  
Neither agree nor disagree  
Disagree  
Strongly disagree

9. Would you be more likely to drink tap water after acknowledging that it is well filtered and tested?

Definitely yes  
Probably yes  
Might or might not  
Probably not  
Definitely not

10. What method did metro Vancouver use to filter the tap water that distributes to UBC campus?

*You can select multiple options.*

Ozone  
UV lights  
Chlorine  
Water fills system  
I don't know