How We Handle **Waste**, And For **What** Reasons.

A Lab experimenting with a decision everyone makes once a day, to flush.

Due Date: Friday January 24th 2020

A lab report by Amal & Sarah

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Abstract:

For this lab, we wanted to do a different lab related to an issue in our school and for several schools as well. Water usage plays a large part in our schools and board because of how much money can be spent on those expenses when there's a way our students can make a difference. Our lab wanted to focus on how we can measure the flow rate and how we can save extra water in our school. Our experiment will involve collecting data from our students to see how many individuals are aware of the proper flush handles to save more water. After getting the data we will analyze it and measure the impact we made. This way we are also finding ways to reduce water waste and energy within our schools. Our experiment will start by creating posters with the accurate information on how to properly flush for the right reasons. Using that information we can also create awareness and educate the female student body. We will additionally be taking detailed notes on how these posters affect the student's actions. By collecting all this crucial data we can make a difference.

Problem:

This lab is giving us a way to test a very important situation, which is also related to climate change and how we can address that in our day to day life. Energy makes up a big portion of global warming as many people often tend to waste it which can always have a bigger outcome at the end. When we flush, sometimes there are two different ways to turn the handle, one way uses way too much water is used for the wrong reason, the other uses the right amount if also used for the correct reason. Which way do people think? That is yet to be discovered. Our problem is that we don't know how much energy is going to the water from the school bathrooms when flushed, and how much of that can be reduced?

Question:

The objective of our experiment is to estimate how many people are using the flush handle in school for the wrong reasons. Is it because it's convenient for them? Is it too hard to take a quick look at the signs and make a better, more environmentally conscious decision? Even though saving energy in our school might not be the biggest concern for our students, it is something we should try and get them engaged in. While making the posters, collecting data, taking notes and educating our school we hope to get to the bottom of this experiment.
By the end of this experiment, we hope to create a more informed and mature female audience in our school.

Background Research:

Toilet History: The water we use is always changing and increasing. An average person uses 127% more water compared to 1950. Toilets that are much older can use 3 gallons of clean water with every single flush, a newer toilet however can use as little as 1 gallon. People around the world sometimes have to survive on 3 gallons of water, shockingly that same amount can be used by the flush of a toilet.

Water stats: *"On average, each person uses about 80-100 gallons of water per day, for indoor home uses."* The largest use of household water is actually the flush of the toilet.

"Many local governments now have laws that specify that water faucets, toilets, and showers only allow a certain amount of water flow per minute." Toilets like these will definitely save a lot of water and will have many benefits, but they are very costly and dont always fit into school

budgets. In a house, if you look closely at the head of a faucet, there might be “1.0 gpm " engraved, that means the faucet head will allow a maximum of 1.0 gallons every minute.

Every toilet manufactured since 1994 uses a maximum of 1.6 gallons per flush. A few newer models can use 1.28 gallons per flush. Earlier models that had poor flushing abilities, are now being defeated by low flush toilets that can do the hob even better.

Flow rate: Older Toilets
Older toilets made from 1980s to 1992 used around 3.5 gallons per flush (13.2 litres)
Ultra Low Flush Toilets (ULF)An Ultra Low Flush toilet flushes at a max of 1.6 gallons (6 liters) per flush. High Efficiency Toilets (HET)
Dual-Flush Toilets
Dual-Flush toilets are a type of HET with a full flush and a half flush capability. The average flush volume of a modern dual flush toilet is 1.1 gallons (4 liters) or less.

Hypothesis:

“**If** the female student body is educated on how to properly flush toilets **then** the school will save energy and water **because** students will be making smarter decisions for our school”

We wanted our hypothesis to include our main idea and reason for this entire lab, we also wanted to include the female student body as we are not conducting this experiment on the boys in our school as we would not know how to get the posters in and the right data considering other restroom options.

Material List:

These are the materials for the tests and data collecting as well as the posters.

Paper	**Teacher supervision**	**Rulers**
Scissors	**Chromebooks**	**Notebook**
Tape	**Student participation**	**Phones for pictures**
Printer	**Google softwares** **(docs, sheets, slides)**	**Lab package**
Printer ink and paper	**Stationary**	**Pen and pencils**

Variables:

Dependant variables - amount of water wasted

Independent variables - in every other stall there will be a sign on the proper flush handle functions

Controlled variables - bathroom schedule, grades/age of students going to the bathroom, estimated amount of students using bathroom daily, maintenance and school hours

Procedure:

Step number 1: Grab all materials (paper, phone, stationary, tape etc)

Step number 2: Make sure you have teacher supervision

Step number 3: Open up your chromebook and start a blank template

Step number 4: plan out what message you would like to put on the poster (it can be a simple message such as “ check the back of your toilet for flush handle options”)

Step number 5: ask the teacher to print out your paper

Step number 6: gather all your papers and cut out the text

Step number 7: *optional* glue message onto construction paper with any colour of your choice

Step number 8: add additional messages or text onto poster using markers

Step number 9 : take the posters to the bathroom stalls and stick them on the doors with tape

Stem number 10 : put up your survey sheets with the questions you want to take data from

Step number 11: keep posters in their designated location for as long as you need to collect data

Step number 12 : come back after the amount of time you have set to check up on your survey sheets, make sure to keep changing the sheets to get new data

Step number 13 : after your testing trial has been completed, collect all data and create your charts of choice

Step number 14 : analyze data and create charts of your choice to compare results

Step number 15 : compare data to your schools general water waste and present

Observation Charts:

Monday Jan 13 2020 stalls with signs:

How many people know about the different functions for the flush handle? (up and down) 17	How many didn't know about the different functions for the flush handle? (up and down) 15
How many people that know about it use it on a daily basis? 9	Did you flush up? 11
Did you flush down for the wrong purpose? 7	Did you flush down for the right purpose? 5

Monday Jan 13 2020 stalls without signs:

How many people know about the different functions for the flush handle? (up and down) 14	How many didn't know about the different functions for the flush handle? (up and down) 3
How many people that know about it use it on a daily basis? 11	Did you flush up? 7
Did you flush down for the wrong purpose? 3	Did you flush down for the right purpose? 7

Tuesday Jan 14 2020 stalls with signs:

How many people know about the different functions for the flush handle? (up and down) 33	How many didn't know about the different functions for the flush handle? (up and down) 29
How many people that know about it use it on a daily basis? 19	Did you flush up? 28
Did you flush down for the wrong purpose? 21	Did you flush down for the right purpose? 21

Tuesday Jan 14 2020 stalls without signs:

How many people know about the different functions for the flush handle? (up and down) 11	How many didn't know about the different functions for the flush handle? (up and down) 6
How many people that know about it use it on a daily basis? 6	Did you flush up? 10
Did you flush down for the wrong purpose? 5	Did you flush down for the right purpose? 3

Wednesday Jan 15 2020 stalls with signs:

How many people know about the different functions for the flush handle? (up and down) 27	How many didn't know about the different functions for the flush handle? (up and down) 10
How many people that know about it use it on a daily basis? 20	Did you flush up? 18
Did you flush down for the wrong purpose? 11	Did you flush down for the right purpose? 15

Wednesday Jan 15 2020 stalls without signs:

How many people know about the different functions for the flush handle? (up and down) 12	How many didn't know about the different functions for the flush handle? (up and down) 3
How many people that know about it use it on a daily basis? 8	Did you flush up? 10
Did you flush down for the wrong purpose? 6	Did you flush down for the right purpose? 6

Thursday Jan 16 2020 stalls with signs:

How many people know about the different functions for the flush handle? (up and down) 17	How many didn't know about the different functions for the flush handle? (up and down) 23
How many people that know about it use it on a daily basis? 8	Did you flush up? 4
Did you flush down for the wrong purpose? 14	Did you flush down for the right purpose? 6

Thursday Jan 16 2020 stalls without signs:

How many people know about the different functions for the flush handle? (up and down) 20	How many didn't know about the different functions for the flush handle? (up and down) 15
How many people that know about it use it on a daily basis? 12	Did you flush up? 7
Did you flush down for the wrong purpose? 18	Did you flush down for the right purpose? 10

Analysis:

Measures of Central Tendency (stalls without signs):

How many people know about the different functions for the flush handle? (up and down):
14, 11, 12, 20
Mean: 14 + 11 + 12 + 20 = 57
= 57 ÷ 4 = **14.25**
Median: 11, 12, 14, 20
= 12 + 14 = **26** ÷ 2 = **13**
Mode: 11, 12, 14, 20
= **11, 12, 14, 20 - no recurring number**
Range: 11, 12, 14, 20
= 20 - 11 = **9**

How many didn't know about the different functions for the flush handle? (up and down):
3, 6, 3, 15
Mean: 3 + 6 + 3 + 15 = 27
= 27 ÷ 4 = **6.75**
Median: 3, 3, 6, 15
= 3 + 6 = **9** ÷ 2 = **4.5**
Mode: **3, 3**, 6, 15
= **3**
Range: 3, 3, 6, 15
= 15 - 3 = **12**

How many people that know about it use it on a daily basis?
11, 6, 8, 12
Mean: 11 + 6 + 8 + 12 = 37
= 37 ÷ 4 = **9.25**
Median: 6, 8, 11, 12
= 8 + 11 = **19** ÷ 2 = **9.5**
Mode: 6, 8, 11, 12
6, 8, 11, 12 - no recurring number
Range: 6, 8, 11, 12
= 12 - 6 = **18**

How many people flushed up?

7, 10, 10, 7

Mean: 7 + 10 + 10 + 7 = 34

= 34 ÷ 4 = **8.5**

Median: 7, 7, 10, 10

= 7 + 10 = **17** ÷ 2 = **8.5**

Mode: 7, 7, 10, 10

= **7 and 10**

Range: 7, 7, 10, 10

= 10 - 7 = **3**

How many people flushed down for the wrong purpose?

3, 5, 6, 18

Mean: 3 + 5 + 6 + 18 = **32**

= 32 ÷ 4 = **8**

Median: 3, 5, 6, 18

= 5 + 6 = **11** ÷ 2 = **5.5**

Mode: 3, 5, 6, 18

3, 5, 6, 18 - no recurring number

Range: 3, 5, 6, 18

= 18 - 3 = **15**

How many people flushed down for the right purpose?

7, 3, 6, 10

Mean: 7 + 3 + 6 + 10 = 26

= 26 ÷ 4 = **6.5**

Median: 3, 6, 7, 10

= 6 + 7 = **13** ÷ 2 = **6.5**

Mode: 3, 6, 7, 10

3, 6, 7, 10 - no recurring number

Range: 3, 6, 7, 10

= 10 - 3 = **7**

Measures of Central Tendency (stalls with signs):

How many people know about the different functions for the flush handle? (up and down):

17, 17, 33, 27

Mean: 17 + 17 + 27 + 33 = 94

= 94 ÷ 4 = **23.5**
Median: 17, 17, 27, 33
= 17 + 27 = **44** ÷ 2 = **22**
Mode: **17, 17**, 27, 33
= 17
Range: 17, 17, 27, 33
= 33 - 17 = **16**

How many didn't know about the different functions for the flush handle? (up and down):
10, 15, 23, 29
Mean: 10 + 15 + 23 + 29 = 77
= 77 ÷ 4 = **19.25**
Median: 10, 15, 23, 29
= 15 + 23 = 38 ÷ 2 = **19**
Mode: 10, 15, 23, 29
10, 15, 23, 29 - no reoccuring number
Range: 10, 15, 23, 29
= 29 - 10 = **19**

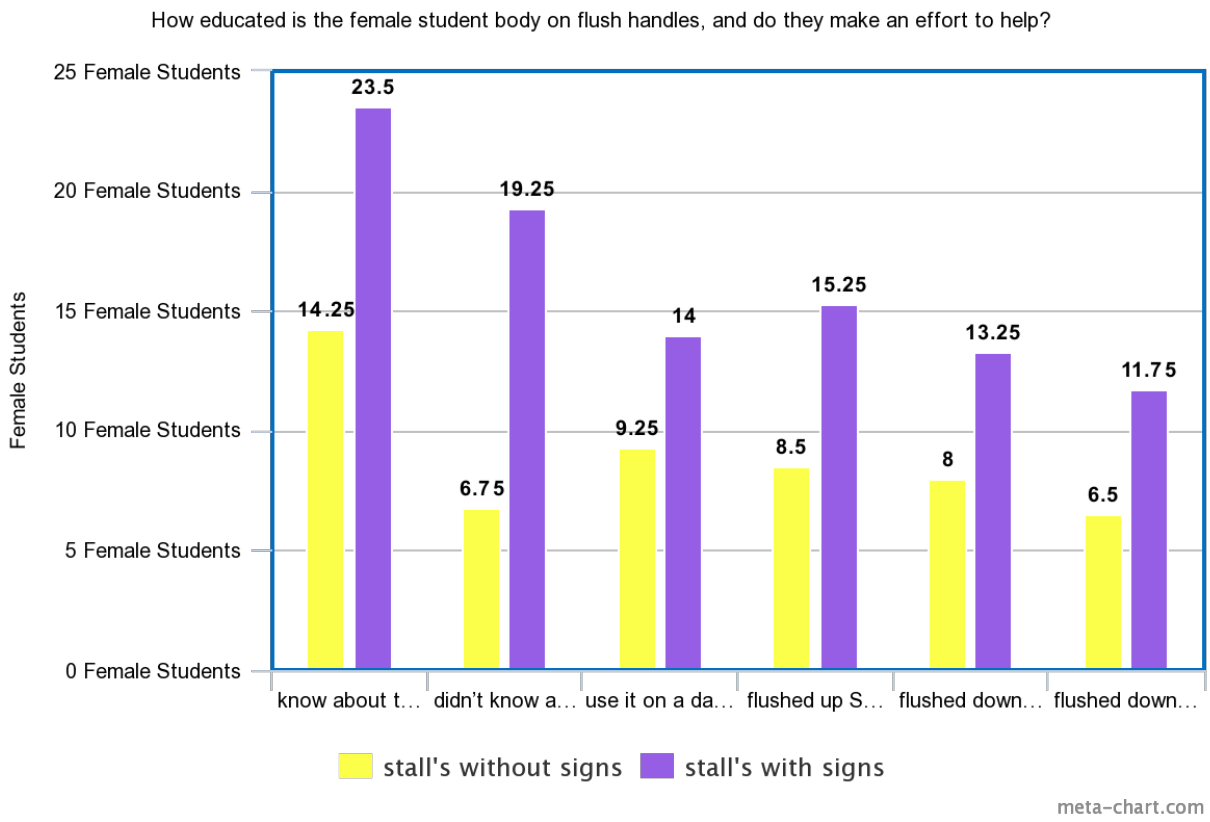
How many people that know use it on a daily basis?
8, 9, 19, 20
Mean: 8 + 9 + 19 + 20 = 56
56 ÷ 4 = **14**
Median: 8, 9, 19 ,20
9 + 19 = 28 ÷ 2 = **14**
Mode: 8, 9, 19, 20
8, 9, 19, 20 - no recurring number
Range: 8, 9, 19, 20
20 - 8 = **12**

How many people flushed up?
4, 11, 18, 28
Mean: 4 + 11 + 18 + 28 = 61
= 61 ÷ 4 = **15.25**
Median: 4, 11, 18, 28
= 11 + 18 = **28** ÷ 2 = **14**
Mode: 4, 11, 18, 28

= 4, 11, 18, 28 - no reoccuring number
Range: 4, 11, 18, 28
= 28 - 1 = **24**

How many people flushed down for the wrong purpose?
7, 11, 14, 21
Mean: 7 + 11 + 14 + 21 = 53
53 ÷ 4 = **13.25**
Median: 7, 11, 14, 21
11 + 14 = **25** ÷ 2 = **12.5**
Mode: 7, 11, 14, 21
= 7, 11, 14, 21 - no reoccuring number
Range: 7, 11, 14, 21
= 21 - 7 = **14**

How many people flushed down for the right purpose?
5,6, 15, 21
Mean: 5 + 6 + 15 + 21 = 47
47 ÷ 4 = **11.75**
Median: 5, 6, 15, 21
6+15 = 21 ÷ 2 = **10.5**
Mode: **5, 6, 15, 21 - no reoccuring number**
Range: 5,6, 15, 21
= 21 - 5 = **16**



Survey Questions

Flow rate calculations:

In order to know the flow rate of the water being used within our toilets, we have to measure it. With some background research on dual flush toilets and average water loads, we can make an equation: Flow rate = mL ÷ time, average water used : 4000 mL divided by 4 seconds

4000 ÷ 4 = 100 ml/s

(when the top flush handle is used about 200ml is used instead)

2000 ÷ 4 = 500 ml/s

Conclusion:

As we proceed to our conclusion for this lab and school experiment. We have obtained a lot of information about water flow and how it is being distributed throughout our school and restrooms. With lots of research and testing, we have collected a lot of data as a small insight into our school's female audience and what part they play. Originally we were going to collect data from both boys and girls in our school but we ruled the male audience out as we were specifically focusing on toilets and not any extra alternatives. We did our research and got lots of data followed by MCT and graphs. After calculating roughly what we think will be the water in the toilets flow rate, with all of our data and graphs we believe that it made a big difference for our students. Although we think that this still might take some time to get our students used to, it's a great start as more and more students are educated about our water systems and what we can do to make the smallest difference. We think that the experiment went fairly well as we got the data we needed because of our students' cooperation. The procedure was easy to follow and not many materials were needed. Our hypothesis helped us focus on our experiment by having a set “goal” and planned experiment. To answer our question, we do think that the main reason that students were not flushing the right way was that it was convenient for them to quickly flush down with a lot of power, wasting lots of water, about 2 gallons more. As for the hypothesis, we do think that with more time, our female student body will learn to make smarter decisions when in a hurry because they will remember how much water is actually being wasted because of them. If there was something we would do next time, we would try and get our students more engaged with this experiment, such as announcements and brighter posters to attract them. We would also take better notes in order to stay more organized throughout the experiment. Overall, this experiment was really fun because of all the planning we did, we enjoyed creating surveys and questions for our actual students. We hope to do a similar experiment again.

Extension

Abstract:

This extension will be primarily based on a **psychology hack**. We wanted to also pay attention to how a simple visual can essentially *trick* the younger girls into learning about the flush handles without knowing it. Our trick was going to be put to the test with a picture of eyes on a poster taped around the school bathroom reminding the kids that they are being **"watched"** and there can't be any "funny business" when it comes to going to the restroom, such as not flushing the toilet or leaving without washing their hands as it makes it harder for their peers to not get sick and our custodians to clean up any extra mess. This test would follow a similar procedure as our previous experiment, the materials and variables will also be fairly similar. This extension will give us a chance to explore a different side of the school, the younger audience. Since our first experiment was held with an audience around the same age as us, the kids were more mature and informed because of the amount of information we put out. This time we hope to get to the kids without over-explaining anything.

Problem:

Find a way to make younger children use flush handles properly. Every day, a big portion of the problem is that our younger audience does not know the importance of saving water to help our schools because of how fast water flows.

Question:

If our younger audience doesn't know how to properly flush for the right reasons, how will we get them to do so? How will we get them to take a little bit of time to stop and think about a small but important decision?

Hypothesis:

If the school's younger female audience can get used to flushing properly, **then** they will do it unconsciously **because** of feeling like someone watching as their minds trick them, helping our school out.

Material List:

Paper	**Teacher supervision**	**Rulers**
Scissors	**Chromebooks**	**Notebook**
Tape	**Student participation**	**Phones for pictures**
Printer	**Google softwares** **(docs, sheets, slides)**	**Lab package**
Printer ink and paper	**Stationary**	**Pen and pencils**

Variables:

Dependant variables - if theory about eyes making younger children works, and if it'll help save water when using flush handles

Independent variables - put sign and eyes in every other stall

Controlled variables - bathroom schedule, grades/age of students going to the bathroom, estimated amount of students using bathroom daily, maintenance and school hours

Procedure:

1. Grab all needed materials (stationary, chromebooks, paper etc)
2. Make sure you have teacher supervision
3. Open up chromebook and start a blank template online on google docs
4. Browse for different eye pictures (cartoon) to find one that's not too scary but intimidating enough to intrigue children
5. Select your preferred picture and with the help of your teacher, print out the sheet with as many copies as you need
6. Once printed, use stationary to decorate, write or colour the picture
7. Get all survey sheets and tables printed as well
8. Go to the bathrooms of your choice (depending on how many there are)
9. Hang up all posters and pictures of your choice, make sure there are enough to repeat tests and days
10. Keep posters and survey sheets up for as long as you want, (going in and asking the questions is also allowed)
11. After the amount of time you have chosen to run the texting part, collect all survey sheets back as well as the posters and eye pictures
12. Sit down with a partner and teacher to copy data onto another blank doc for space
13. Take time to analyze data and do the MCT (measures of central tendency)
14. Create charts with said data and make a written analysis
15. Compare data with hypothesis and state a conclusion

Observation Charts:

Wednesday Jan 15 2020 stall's without eyes & signs

How many people know about the different functions for the flush handle? (up and down) 5	How many didn't know about the different functions for the flush handle? (up and down) 10
How many people that know about it use it on a daily basis? 1	Did you flush up? 3
Did you flush down for the wrong purpose? 8	Did you flush down for the right purpose? 4

Wednesday Jan 15 2020 stall's with eyes & signs

How many people know about the different functions for the flush handle? (up and down) 3	How many didn't know about the different functions for the flush handle? (up and down) 12
How many people that know about it use it on a daily basis? 2	Did you flush up? 7
Did you flush down for the wrong purpose? 4	Did you flush down for the right purpose? 4

Thursday Jan 16 2020 stall's without eyes & signs

How many people know about the different functions for the flush handle? (up and down) 2	How many didn't know about the different functions for the flush handle? (up and down) 13
How many people that know about it use it on a daily basis? 0	Did you flush up? 2
Did you flush down for the wrong purpose? 8	Did you flush down for the right purpose? 5

Thursday Jan 16 2020 stall's with eyes & signs

How many people know about the different functions for the flush handle? (up and down) 6	How many didn't know about the different functions for the flush handle? (up and down) 14
How many people that know about it use it on a daily basis? 5	Did you flush up? 10
Did you flush down for the wrong purpose? 3	Did you flush down for the right purpose? 20

Analysis:

Measures of Central Tendency (stalls without eyes and signs): Mean Only

How many people know about the different functions for the flush handle? (up and down):
5, 2
Mean: 5 + 2 = 7
= 7 ÷ 2 = **3.5**

How many didn't know about the different functions for the flush handle? (up and down):
10, 13
Mean: 10 + 13 = 23
= 23 ÷ 2 = **11.5**

How many people that know use it on a daily basis?
1, 0
Mean: 1 + 0 = 1
= 1 ÷ 2 = **0.5**

How many people flushed up?
3, 2
Mean: 3 + 2 = 5
= 5 ÷ 2 = **2.5**

How many people flushed down for the wrong purpose?
8, 8
Mean: 8 + 8 = 16
= 16 ÷ 2 = **8**

How many people flushed down for the right purpose?
4, 5
Mean: 4 + 5 = 9
= 9 ÷ 2 = **4.5**

Measures of Central Tendency (stalls with eyes and signs): Mean Only

How many people know about the different functions for the flush handle? (up and down):
3, 6

Mean: 3 + 6 = 9
= 9 ÷ 2 = **4.5**

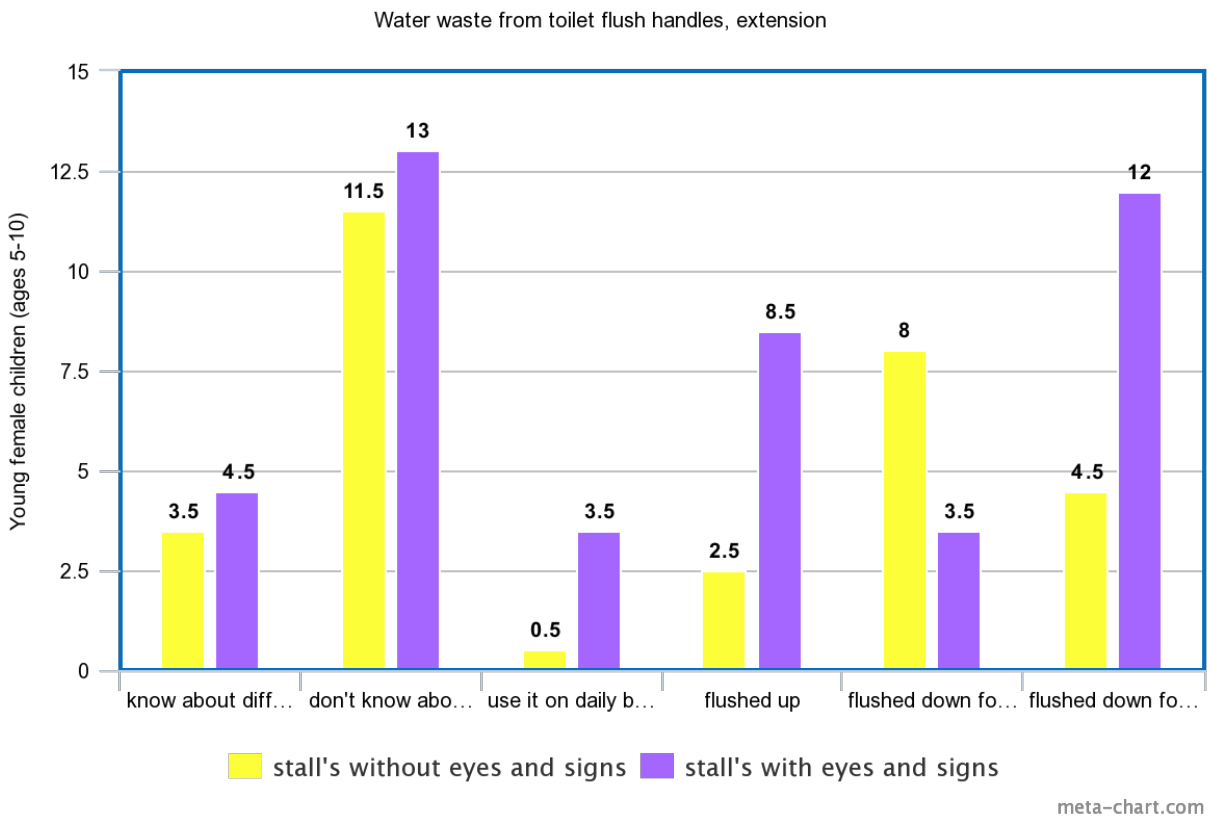
How many didn't know about the different functions for the flush handle? (up and down):
12, 14
Mean: 12 + 14 = 26
= 26 ÷ 2 = **13**

How many people that know use it on a daily basis?
2, 5
Mean: 2 + 5 = 7
= 7 ÷ 2 = **3.5**

How many people flushed up?
7, 10
Mean: 7 + 10 = 17
= 17 ÷ 2 = **8.5**

How many people flushed down for the wrong purpose?
4, 3
Mean: 4 + 3 = 7
= 7 ÷ 2 = **3.5**

How many people flushed down for the right purpose?
4, 20
Mean: 4 + 20 = 24
= 24 ÷ 2 = **12**



Conclusion:

As we worked and collected data from this lab, we were w=very happy that we were able to make a very tiny difference, if we were even able to make one. We did this extension piece because we thought it was important for younger kids to grow a habit of using the right flush handles when they have access to them because, they'll be saving the environment, using less energy and they'll continue to do this as they grow up. Hopefully they'll teach their friends about ways to save the environment, even if it was a little different like our experiment. As mentioned in the abstract, we used a pair of cartoon eyes to test if the physiological theory about eyes making kids feel intimidated works, and according to our data it worked. We didn't have enough time to collect a lot of data or at least a week's worth of data, however the data we currently have, shows a little piece of proof as to why this psychological theory works.

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