LOGBOOK: SCIENCE FAIR 2023-24

Deep Dive: Aleeza Gondal and Ayah Hassan

NOV 12: Started Project, Researched, (At the time our project was about the Chestermere lake) Looking at News Reports:

When we started our project we originally did it on the Chestermere Lake and how much bacteria was in it. So at the time we were actually researching bacteria found in lakes, rivers and pools just to get an understanding of the project before we started it. **(NOTED FROM DEC.28)**

NOV 15: Started writing down information we wanted to include in our project, Coloured the slides, Made the name Deep Dive:

We did this step early on in our project to be able to create a foundation before we actually started writing down all the information.

TOOK A BIG BREAK:

DEC 21: Started the introduction and Big Question:

Introduction: Imagine going to Chestermere Lake with friends and family, you sit in the cool shade but later you decide to hop in for a swim. You come home, wash up and sit on your couch but suddenly you feel extremely sick. You feel as if you got the flu, but you couldn't, you never ate anything and you made sure to wash your hands, so why do you feel this way? In our science fair project we thrive to grasp an understanding of why you would feel this way, what could have

caused it and possible solutions.

Big Question: Are we able to identify bacteria in Chestermere Lake and possibly find a solution to get rid of it? We want to be able to spread awareness to the community of Chestermere about how much bacteria is in the lake and how they could possibly get rid of it. **(THIS WAS OUR OLD BIG QUESTION AND INTRODUCTION GO TO DEC. 28 TO KNOW ABOUT WHY WE CHANGED IT!)**

DEC 22: Did our background research slides:

First of all, every project has to start with background research. Background research helps you get information on your topic before doing it. This gives you an understanding on your topic. Every project has to have background research. Without background research it would be hard to know what your project is about. This is why it is one of the most important parts of the scientific method.

We of course had to do background research on our project before we started it. The first thing we wanted to know was what bacterias can be found in lakes. The particular reason that we want to know this is so that we are able to identify the bacterias and get an understanding of them. If we are able to do this, we can know what bacterias we're looking for and what impact they have on the human body and ecosystem. The next slides will be showcasing which bacterias are commonly found in lakes.

DEC 23: Started researching bacterias found in lakes and bodies of water, Made a slide about the bacteria's shape/colour **(BRIEF INFORMATION):**

CYANOBACTERIA: Cyanobacteria is in the shape of a pill, and the colour varies from green, orange and pink.

CRYPTOSPORIDIUM: Cryptosporidium has a spherical or ovoid shape and its colours differ between light pink to bright red.

SHIGELLA: Shigella is a rod shaped bacteria and its colours range from slightly pink to translucent.

NOROVIRUS: Norovirus shares the similar spherical shape with the popular virus Covid-19. It's typically the colours

E.COLI: E. Coli is a rod shape and under a microscope the colour is an off white beige.

DEC. 24: Went more into depth on the bacterias found in bodies of water, Cyanobacteria:

One of the bacterias that are harmful to humans are called cyanobacteria (sometimes called green-blue algae) and they are able to produce toxins called cyanotoxins which are harmful to humans. Cyanobacteria are aquatic, this means that an object's habitat is underwater such as fish, seaweed and coral. Since cyanobacteria is an aquatic bacteria this means that there is a chance that it could be in the pool water that I am testing. They are barely visible to the naked eye but when in clusters cyanobacteria can be seen. Cyanobacteria is one of the most important bacterias but can also be a harmful one. It causes nausea and stomach pain but it is also vital because it is responsible for the oxygenation of the atmosphere and body's of water. During researching this I saw that there were a lot of resources that said cyanobacteria can cause nausea and diarrhea. Unlike most viruses, cyanobacteria have multiple ways to get rid of it. You could do it manually, increase the flow and/or filtration rate, adjust the photoperiod because cyanobacteria is like plants and it uses photosynthesis to turn light into energy and lastly you could use chemical treatment to get rid of it.

DEC. 25: Went more into depth with Shigella:

Shigella is a family of bacteria that causes intestinal infection. Some signs that you have shigella are diarrhea (often bloody), abdominal pain, fever and stomach cramps. Shigella is very contagious but you shouldn't just stay away from people with the symptoms. People can have and spread shigella even if they don't have any of the symptoms. Symptoms usually start 1-3 days after being exposed to shigella. Like cryptosporidium, shigella is formed from the feces of infected people, but it can also come from the foods and water of infected people. Shigella can last 5-7 days but some symptoms can last a few days to 4 or more weeks. If shigella gets serious it can cause a disease

called shigellosis which occasionally causes seizures, bloodstream infection or arthritis. And it can rarely result in death. Like I said before, Shigella runs its course for about 5-7 days. After that you could start replacing fluids that were lost because of diarrhea.

DEC. 25: Went more in depth with Norovirus:

Norovirus is an excessively contagious disease that can cause diarrhea and vomiting. It is also referred to as "winter vomiting disease" or the "stomach bug". You can get norovirus by: eating food or drinking liquids contaminated by an infected person, eating raw shellfish that has been harvested from contaminated waters or touching contaminated surfaces and then touching your mouth or eating something without washing your hands. Some symptoms of norovirus are: vomiting, watery diarrhea and stomach cramping. You may also get a fever or headaches. In the US sometimes certain seafoods like shellfish and oysters are naturally contaminated with norovirus. Pools usually develop norovirus commonly which is dangerous because norovirus can cause severe illnesses. There is no treatment for norovirus, so you have to let it run its course.

DEC. 26: Went more in depth with E. Coli:

E. coli stands for Escherichia coli. It is a type of bacteria that is usually found in the lower intestine of warm-blooded organisms. You usually get E. coli infections by: eating contaminated foods, drinking unpasteurized beverages, drinking contaminated water or getting it in your mouth, touching stool or contaminated surfaces, not wiping properly after going to the bathroom. E. coli is considered to be highly contagious. Though most E. Coli are harmless some can cause severe symptoms like: diarrhea (often bloody), severe stomach cramps and vomiting. E. coli is usually found in raw or undercooked ground meat products, raw milk or cheese products, and contaminated vegetables or sprouts. We don't think that E. coli can be in the pools because chlorine actually kills this bacteria but pools have been known to get contaminated. E. coli usually goes away on its own and you don't need any antibiotics.

DEC. 27: Went more in depth with cryptosporidium;

Cryptosporidium also known as “Crypto” are parasites which are organisms that come from the feces of infected animals and people. Crypto is very dangerous and highly contagious. It produces a disease called cryptosporidiosis. This disease can cause itchiness, dehydration, vomiting, nausea, fever, stomach cramps or pain, weight loss and more. It has an outer shell to protect itself and live longer outside the body. Crypto can spread in several ways like mainly through drinking water and recreational water (like pools). Cryptosporidium is leading to waterborne diseases in the United States but it can also spread easily in pool water. Cryptosporidium is an extremely chlorine-tolerant parasite. Which means it doesn’t die in chlorine and can spread rapidly and dangerously in a swimming pool. It can spread even when the chlorine concentration is well-maintained in the water. This means cryptosporidium is more prone to be found in pools, so when we go to test the water we are going to make sure to look out for this type of bacteria. It can spread even when the chlorine concentration is well-maintained in the water. It’s been known to go away on its own without any treatment.

DEC. 28: We Changed our Project from finding bacteria in the Chestermere Lake to Comparing and Contrasting amounts of bacteria, total hardness, total chlorine, free available chlorine, total alkaline and stability in 4 different pools (Calgary)

We actually had to change our project from finding bacteria in the chestermere lake to Comparing and contrasting amounts of bacteria, pH, alkalinity, free chlorine, total chlorine, total bromine, calcium hardness and cyanuric acid in 2 different pools (Calgary). The reason for this change is because the chestermere lake had frozen and it would be extremely difficult to conduct the experiment without it being unfrozen. In our eyes, this change was crucial considering that we needed to do our project to the best of our ability and make sure we felt ok with it.

DEC. 29: We changed anything in our project that talked about the Chestermere Lake and made sure our project was up to date, we also made slides about chlorine tolerant bacterias;

Since we had changed our project we needed to fix our slides. This was a tedious part of the project because we had to alter our slides to fit our new project.

Chlorine Tolerant Bacteria Slides: Cryptosporidium is a parasite that causes a diarrheal disease called cryptosporidiosis. The particular reason why we wanted to do background research on this bacteria is because it is actually chlorine tolerant. This means it could easily spread sickening infections throughout a common swimming pool. Being chlorine tolerant means it doesn't get killed by the effective chemical and is more likely to be lurking in your local swimming pool. Cryptosporidium is actually one of the only bacterias that are chlorine tolerant.

Giardia, like cryptosporidium, is a parasite that causes a diarrheal disease called giardiasis. Giardia comes from soil, food or water that's been contaminated from the feces of infected people and animals. Our research says that most people get giardiasis by accidentally swallowing contaminated water, mainly drinking water and recreational water (pools, rivers, lakes). Since giardia has a well-protected outer-shell, it can last up to 45 minutes in well chlorinated pools without getting killed. Which is distressing because within that time it can infect many people.

Hepatitis A is an inflammation of the liver that can cause mild illnesses to severe. You can get hepatitis a comes from contaminated food or water or if you come in direct contact with a person who's already been infected with hepatitis a. Though most people have been known to recover from this virus, there have been cases where it has become deadly to some people. There is a vaccine for hepatitis A and now it is not a very big deal.

DEC 30: We made 2 slides on what we are testing for and a background research slide giving a brief description of what they are;

Were not only going to test for bacteria though, we are also going to be testing for pH, alkalinity, calcium hardness, free chlorine, total chlorine, total bromine and cyanuric acid levels in the pools. We are going to be testing the pool water for these chemicals because of the fact it's actually what makes a pool non-toxic and not harmful to humans. In the following slides it will talk about what are these chemicals and their role in pools;

A pH level is a measure of how acidic or basic a substance is. Ph applies to our project because of the fact that in pools pH levels are actually what determines how acid or alkaline the pool water is. The pH in pools should be around 7.3-7.6. We are checking the pools we are going to for their pH levels because if it's over the permissible range that could affect the human body and be extremely dangerous to swim in.

Calcium Hardness measures if your pool has a high level of minerals, including calcium, or a low level of minerals. Total hardness has to be between 200-400 ppm in a pool. A high level of minerals can lead to deposits and build up which can cause damage to your pool. A low level of minerals can reduce the effectiveness of sanitizers, such as chlorine and can corrode your pool. In this case you want just in the middle because both are the best for your pool, or even you!

Alkalinity is a buffer that keeps pH where it's supposed to be and it helps prevent sudden changes in pH. A good alkalinity for a pool is around 80-120 ppm. When the alkalinity in a pool is too high, or too low it can affect the effectiveness of the chlorine in a pool or make the water more acidic, which can lead to irritation and dry skin. Alkaline is actually a huge factor of pH. Alkaline is actually on the pH scale; you often see it on the far right side (over 7).

Free Chlorine is the amount of chlorine measured in parts per million (ppm). Free chlorine is what gets rid of bacterias and eliminates harmful microbes. Free chlorine is basically what chlorine is. The advised amount of free chlorine in a pool is 1-3 ppm. At around 5-15 ppm free chlorine can actually cause throat irritation.

Total Chlorine is combined chlorine plus free chlorine. So basically the sum of free chlorine and combined chlorine makes total chlorine. Total chlorine is made from combined chlorine, which is from the sweat, oil, skin and urine and is not allowed in pools. And free chlorine which is the amount of chlorine present in water as dissolved gas.

Total Bromine is the amount of bromine in 1 oxidation state, which is the oxidized form. Bromine is a dangerous fuming liquid and it has a reddish brown color. It dissolves quickly when exposed to air. Bromine has a powerful odor that may be irritating to the eyes, skin, and lungs.

Cyanuric Acid Levels are a pool balancing product that is used to help chlorine last longer. It forms a weak bond with free chlorine in the pool water which protects it from the sun's ultraviolet rays. Too much cyanuric acid can actually cause damage to humans, such as damage to the kidney tissue. This is why the permissible amount of cyanuric acid in a pool is 30-50 ppm.

DEC. 30: We made slides on what pools we are interested in going to;

Our project consists of going to 2 different pools and comparing and contrasting the amount of bacteria, pH, alkalinity, free chlorine, total chlorine, total bromine, calcium hardness and cyanuric acid levels. We had to research these pools before we went to them and find the 4 pools we would be interested in interviewing and testing at. The following slides will showcase the research we did on pools and why we chose them.

One of the pools we decided to interview/test water quality at is Bob Bahan Swimming pool. This

pool is used by many, even though it is pretty small. When more people are cramped in a small area, the bacteria on one another can pass through each person, which can lead to diseases. The way bacteria spreads is kind of how covid spreads (using this as an example not as a statement) it goes from one another by touch, air and even just being around someone with it. In other words, bacteria is extremely contagious. Bob Bahan offers many swimming lessons for everyone everyday, plus on top of that, the public pool is open almost every day.

Brookfield Residential Ymca is another highly populated pool. It's actually the largest Ymca in the world! That's an amazing achievement for Calgary but bigger pools are more prone to have contamination. We know that if more people attend such places there is more of a chance for people to come in contact with each other and that is one of the most common ways for bacteria to spread. There is more of a chance for bacteria to spread in a bigger and more populated pool than one with less people.

We decided to choose Village Square Leisure Center as one of the pools we will be testing. We chose this because they are more populated and are relatively bigger than most pools in Calgary. If more people come, then there is more room for bacteria to sneak into these pools. If that many people are in a pool at the same time, the germs from one another can create bacteria and diseases, which can make you extremely ill.

DEC 31: We did our variables, materials and 2 slides on our procedure, we also did some information on what our DIP & GO Pool Test Strips will be testing;

Variables;

Independent Variable: Pools which we are testing at.

Dependent Variable: The bacteria, pH, alkalinity, free chlorine, total chlorine, total bromine, calcium hardness and cyanuric acid levels

Controlled Variable: DIP & GO Pool test strips, How long we dip the strips in the water for (2

seconds), how long we wait to get the results from the strips (15 seconds), how much water we take from the pools to test (3ml), how many tests we conduct with the strips (5), how many water samples we take from each pool (5).

Materials;

-DIP & GO Pool Test Strips (20)

-Tiny Sample Containers (20)

-Microscope

-Microscope Slides (?)

-Eyepiece Lense (10x and 20x)

-Gloves (2 pairs)

-Syringe (10ml)

Procedure 1;

1. Go to a local pool and ask to test their water
2. Interview the aquatics team/people who test water
3. Go to the pool
4. Put on gloves
5. Take a strip out of DIP & GO Pool Test Strip container
6. Dip the strip into the pool water for 2 seconds
7. Take the strip out and wait for result for 15 seconds
8. See result and record into notebook
9. Repeat steps 5,6,7 and 8 five more times with 5 different strips
10. Observe the differences between the five strips (if any)

Procedure 2;

1. Use Tiny Sample Containers to take water samples from the pool
2. Go home and bring out your microscope
3. Set the setting of the microscope to the lowest scanning objective lens (4x)
4. Slide the 10x eyepiece lens into the eyepiece tube
5. Put on gloves
6. Take out a slide
7. Carefully slide the slide under the stage clips
8. Take out syringe
9. Dip syringe into water and extract 1ml
10. Take syringe and pour the pool water on to the slide
11. Place eye over the microscope lens
12. Make the frame come into focus by rotating the coarse adjustment knob
13. To make the image more clear rotate the fine adjustment knob
14. Observe and record what you notice
15. When you see bacteria take a photo
16. Switch objective lens to 10x
17. Adjust until the picture is in focus
18. Observe and record
19. If bacteria spotted take a photo
20. Repeat all steps again for each sample you have from each pool

JAN 1: Made the interview question, called the pools we would want to test at so that we know which ones allowed us to come and interview them and test their water;**The questions stayed the same on every single interview we did;**

QUESTION 1: What specific challenges do you face with maintaining the pool?

QUESTION 2: Are there any specific cleaning methods or chemicals used to clean your pools and how frequently do you use them?

QUESTION 3: Have you encountered any issues with bacterial contamination, and if so, how did you address it?

QUESTION 4: How do you monitor and test the water quality in your facility?

QUESTION 5: What are some of your common challenges faced while keeping the pool clean?

QUESTION 6: How effective are your current cleaning methods when coming into contact with bacteria?

JAN 2: Took a break and did other school projects;

We really needed this break because we were working on our project non-stop since December. 21. This break let us relax and have a day where we didn't need to stress about the project. A break was well deserved and we thought we needed it.

JAN 3: Our materials came so we got to working on our plan for the next few days and who is going where;

Since our materials came, we knew we had to get started as quickly as possible. We decided what days we will be going to the pools and who will be going. This is a crucial step in our science fair and if we had not done this there would be no order.

JAN 4: We called the pools we were interested in interviewing and testing and made sure that we were allowed to test;

We called the pools because we needed to have confirmation on if they were ok with us coming because scheduling is always better.

JAN 5: Waited for confirmation from at least one of the pools, also fixed some slides;

Today we just had to wait for confirmation that we were allowed to test the pools before we went. We did fix some mistakes on the slides though (grammar and punctuation).

JAN 6: I (Ayah) went to Brookfield YMCA at Seton to do an interview with the aquatics supervisor Aryan;

QUESTION 1: What specific challenges do you face with maintaining the pool?

We don't really face it, but one of the biggest barriers of maintaining the pool is how much it costs. You have to buy chemicals, you have to pay for a heating bill, you have to pay for a water bill. As we're talking, there's actually multiple pumps working to keep the water circulating. So I think maintenance cost is a big one, and again you have to pay people that are trained and they have to monitor the pool. The equipment to run this pool is another challenge because most of our parts are pretty rare and expensive so we have to get a specialized contractor to fix them. But the maintenance is probably the biggest challenge we go through.

QUESTION 2: Are there any specific cleaning methods or chemicals used to clean your pools and how frequently do you use them?

So, the water is always treated with chlorine, we always have chlorine in the water. Now they way you get chlorine into the water, well some pools use different systems, but how you get it into the water is by using salt some use other things but I don't know too much about it so i'm not the right person to speak on it. But the important thing is that chlorine is always in the water, therefore theoretically speaking, any organic cell or organic matter that touches that chlorine is like apoptosis, like it instantly breaks apart. An example is if you have a nose bleed or if you somehow cut your hand and there's blood, if you place that wound over a pool and let your blood drip into the pool it would instantly vanish, like disintegrate because of the chlorine in the water. The chlorine instantly breaks it up and makes all the blood vanish. That's why if someone gets hurt in the pool you don't see any blood in it. So that's one, we also have something called pool foulings, pool foulings are basically vomit, blood clot, solid stool, those have their certain criterias. If we have any dippers leak or people vomit in the pool, in that case what we would do is get rid of any solid

contaminants out of the water then depending on how much chlorine is in that water and the water volume we have to use a special formula so that the water can get treated. After that we have to make sure that the water is fully treated so sometimes we will add more chlorine to the water or there's enough chlorine that we could just let it sit for a number of hours and wait for that water to kind of sit, so it all depends. Or if the contaminated water isn't responding to the chlorine, we would drain out the pool and then scrub the walls with 1-10 dilution of bleach, then the pool is rinsed multiple times. After that we make sure the levels are back to normal. If in any case we have diarrhea or liquid stool, the pool has to be closed for 18 hours minimum, but this number can be massaged a bit depending on how much chlorine is in the pool. But again at a certain time it gets really expensive. One thing that you need to know is that if you want to bring up the chlorine in the pool, even by 1 ppm you need to put a lot of chlorine in it. Again everything comes down to resources and cost and how much time you have to keep the pool closed, there are various factors. Yeah, so again diarrhea, the pool gets hyperchlorinated and actually when the pool is getting hyperchlorinated the water starts to feel slimy. I have actually touched the water on accident once, and for the next few days my hand was super dry and I definitely felt the effects of chlorine. And after all this, water samples get sent to AHS before and after the pool fouling and when we get indicated that the pool is good we open right back up.

QUESTION 3: Have you encountered any issues with bacterial contamination, and if so, how did you address it?

No, I haven't really ever encountered issues with bacterial contamination because that's more of an AHS thing, but if we ever do we will always shut down the pool. And again if we do AHS will let us know because of the samples we always send to them.

QUESTION 4: How do you monitor and test the water quality in your facility?

Water quality has multiple different criterias for it. One of the criterias is free available chlorine, or FAC and it basically measures how much chlorine is in your water. The water gets treated by chlorine so FAC is very important for monitoring and testing water quality. We also have to monitor the pH of the water, and what pH does is measure how acidic or basic the water in the pool is. If the pH in a pool is too high, we have to make it more acidic but if it is too low we have to make it more basic. In our facility we are actually fortunate enough to have a really nice system which I believe uses carbon dioxide and acid to control the pH in our pool. On top of that, we do water tests

which test for free active chlorine and combined chlorine. Combined active chlorine or CAC determines how hard chlorine works to keep the pool clean. For combined chlorine you would want to keep it close to zero because that means that your pool doesn't have as much bacteria and your chlorine does not have to work that hard. When the combined chlorine is above zero, that means you need to add more chlorine into your pool and that's why at some pools you go to, you smell a strong sting of chlorine. That means that the chlorine in that pool is working really hard to get rid of the bacteria in the pool. The reason why you smell it is because the chlorine in the pool is reacting with all of the contaminants in the water and it is releasing in the form of gas. How to make your CAC lower is by taking out the pool water in the pool, and then add fresh water. The other major things we monitor are the water temperature and the water clarity, maximum and minimums and all that stuff. We test for all these things every 3 hours at our pool but other pools might not. Here, there are water samples and we send them to AHS once a week. They pretty much do a detailed look at the bacteria in our pool and make sure our pool is clean. If the results aren't ok for people to swim in, we have to shut down the pool for 18 hours, but the hours vary if you have more chlorine in your pool, or less chlorine in it. Most of the time, at seton we just let it sit for that time but if you really want to shorten down the 18 hours, you could add more chlorine into it, but that can cause more irritation for people coming to the pool in following days.

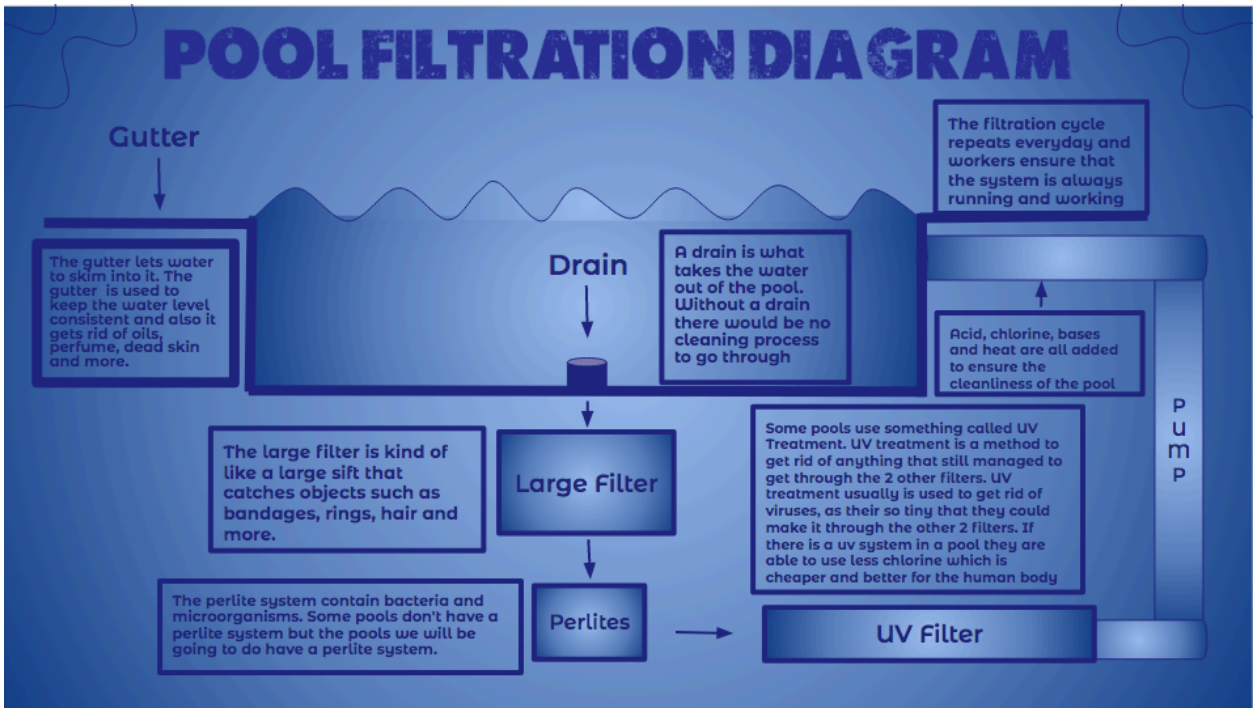
QUESTION 5: What are some of your common challenges faced while keeping the pool clean?

Yeah again, like cost is one of them, maintenance is one of the challenges and just like dealing with foulings. Yeah that's pretty much it, I would say maintenance is probably one of the biggest challenges though.

QUESTION 6: How effective are your current cleaning methods when coming into contact with bacteria?

Here at this pool, I can speak on behalf of them, I would say, majority of the time we don't really come in contact with bacteria as you can see the pool is running, its very very rare that AHS comes back to us saying hey, we found this bacteria and you have to shut down our pool for a period of time. If anything I would say this happens once or twice a year maybe. But again that's why these measures are in place so that doesn't happen. I think for most pools it's very rare that these happen because there has to be a fail safe for viruses to come into the pools.

JAN 7: We made a diagram on the pool filtration system and how it works;



JAN 8: We edited our slides while we waited for confirmation from the pools;

Today we made sure to read through and practice our slides. We needed to do this because we could have made multiple spelling mistakes or errors (which we did) which could lead to an unprofessional presentation. We wanted to make sure that our slides were up to date, worded correctly and did not have any spelling errors so we went and read over our slides together to ensure that our project could reach full potential.

JAN 9, JAN 10, JAN 11, JAN 12, JAN 13: We were supposed to do our experiments during these days but due to extreme cold weather, we were unable to conduct our experiment;

So far these days have been the hardest for us in our project. The deadline for our science fair project was Jan.14, but we are not able to conduct our experiment yet. We had an interview scheduled for Jan. 11 but it got cancelled. This is due to the fact that the weather conditions are highly dangerous and it is sitting at a chilling -40 to -50℃ with the windshield. Most pools in Calgary were actually closed so we couldn't simply change our pools and go to other ones. At this moment, there are many reliable sources advising not to go outside unless you really need to, and yes our science fair is important, but not as important as our lives.

JAN 15: We got back in contact with Village Square Leisure Center;

Village Square Leisure Center got back to us today. They said they are willing to show us around the pool, show us how they test the pool and do an interview. This helped us a lot and we got right back on track.

JAN 16: I (Ayah) went to Village Square Leisure Center for a tour, a demonstration and a interview;

Interview:

QUESTION 1: What specific challenges do you face with maintaining the pool?

Challenges we face when maintaining the pool are maybe when we have a really busy day. Like what I mean is basically is when a lot of people are in the pool at the same time, usually the system will use more chemicals, so the chlorine has to feed longer, the carbon dioxide has to feed longer and the pH of the pool has to be maintained. Often on busy days we have to monitor the system much more closely, sometimes we have to do more frequent water tests especially when we have a contamination. With contamination in our pool we always have to make sure that our chemicals levels are sitting where they need to be seated.

QUESTION 2: Are there any specific cleaning methods or chemicals used to clean your pools and how frequently do you use them?

Within the pool our system usually adds the chlorine and other chemicals that make a pool non-harmful. The carbon dioxide and pH are very important to monitor too. We also add a stain preventative chemical once a week, we also use some other chemicals once a week to get rid of other things but those are the ones we mainly use once a week. In something like a hot tub, we dump it and then scrub it and refill the water every week to make sure that our pool is clean.

QUESTION 3: Have you encountered any issues with bacterial contamination, and if so, how did you address it?

Yeah so we have experienced that before, a big thing would be if we have a contamination when we are on shift. We will have to basically get everyone out of the pool, and then follow that by getting the solid debris out of the pool and then we would have to make sure that the chlorine level is high enough, to get rid of any bacterial infection that can be in there. And then sometimes we would have to add a stabilizer to the water, so in that spot we would sometimes have to add bleach to help treat or shock that impacted spot.

QUESTION 4: How do you monitor and test the water quality in your facility?

So we do water tests, morning evening and half way through the day, we also send water tests to Alberta Health Services also known as AHS once a week. That's for the Hot Tub, the Wavepool and the Dive Tank. We do that to make sure that ahs knows that our water is safe and on top of that we do the 3 tests everyday, which actually sometimes varies depending on the capacity of our pool. And if say if the chlorine is way too high or the pH is way too low or too high, we might have to close off which pool has that defect, then we have to deem that the pool is safe for reopening too.

QUESTION 5: What are some of your common challenges faced while keeping the pool clean?

Our common challenges would be, sometimes we get people walking on deck with dirty footwear, so we would have to remind them that they can't have that on there. We also sometimes have people coming in without taking a shower, and we have to also remind them because we need to keep the pool water clean. Another thing is that when people don't throw away their garbage into

the provided garbage kinds, let's say like bandaids, people just let it fall off and don't throw them out. Yeah so there's a lot of education that goes out to tell the public to keep the water clean.

QUESTION 6: How effective are your current cleaning methods when coming into contact with bacteria?

I think our cleaning methods are very effective because the chemicals we use to clean our pool deck and our facility are proven to kill most if not all bacteria on the surfaces. And that is well as the pool, like the chlorine kills off most of the waterborne bacteria in our pool. So I think overall in the public area, the change rooms and the pool I think our cleaning methods are pretty effective.

JAN 17: We looked at the water samples under a microscope, we recorded the information on a piece of paper;

How we counted the bacteria was we would look at each sample under the microscope, then proceed to count each bacteria. Then we would group what bacteria form they are in so it is easier to determine the exact bacteria it is.

JAN 18: We worked on any slides we thought were not finished enough and needed editing;

JAN 19: We made slides on our observations, and what we think could be in the pool water;

VS 1: This sample is actually one of the cleanest samples taken at Village Square. The observations made at this pool were thin bacteria, long coils, moving clumps, greenish, black and grey. When we referenced this bacteria to the bacterial chart we think that the bacterial forms that we saw were coccus, diplococcus and spirillum bacterias in this sample. These types of shapes can correspond with many types of bacterias but most of those bacterias are supposed to be exterminated by chlorine. So why are those bacterias still present? Well we think that maybe since the calcium

hardness in this pool is pretty low, there could be a chance some of the pool got eroded and maybe some of these bacterias slipped under the system, but this is just an educated guess.

VS 2: This particular sample that we took is the second cleanest sample. Our observations on this bacteria was circular black spots, coils, clumps, dots with rings around it, one long black thin strip. These bacterias that we saw could be a part of the coccus, the tetrads, the staphylococcus or the filamentous group. Most of these groups A red flag that popped up is that most tetrads actually die in chlorine, and cyanobacteria is actually one of the most common tetrads found in wastewater or swimming pools. Cyanobacteria actually get killed by chlorine so we can not know for sure if this bacteria is cyanobacteria.

VS 3: Village square sample number 3, is the third cleanest sample we took. The observations stated were, chunks of blackish gray bacteria, mini blackish circular bacteria, (a lot) no long black strips. Unlike the other tests that we have taken, we could spot any bacterias from the filamentous (described as black strips). We did manage to find many coccus bacterias and three diplobacillus bacterias.

VS 4: Village square number 4 and number five have pretty similar results (which will be shown in the next slide) . Our observations stated for this sample was, a long curly strand of hair like material, lots of black circular dots, some dots that were forming in tiny groups. Based on the bacterial chart we can make an educated guess that some of these bacteria fall under the groups of; filamentous, coccus, staphylococcus.

VS 5: This sample (to us) was the dirtiest sample taken from village square. When we put our eye through the optical lens on the microscope we noticed long thin bacteria, dots with rings around it, metallic colour, clumps of dots, black, tiny circles. Due to the shapes and sizes of the bacterias that we saw, we think these bacterias are: filamentous, cocci and staphylococcus.

JAN 20: I (Ayah) Went to Bob Bahan Aquatics and Fitness Center and did an Interview with them, they said that I could email them my questions and they would answer them;

QUESTION 1: How do you monitor and test the water quality in your facility?

Monitoring of our water follows the Alberta Health Pool Standards, see here: Alberta Health Pool Standards, July 2014, Amended 2018

Our internal City standards are more stringent; most of the time, our standards meet and/or exceed minimum legislated requirements.

Water testing is done with a Taylor Technologies Professional Water Testing Kit. See here for details:Professional (uses Slide comparators), Alkalinity/Chlorine, DPD/Hardness/pH (taylortechnologies.com)

Professional (uses Slide comparators), Alkalinity/Chlorine, DPD/Hardness/pH (taylortechnologies.com)

For our site at Bob Bahan, we complete testing for the following items:

Free Chlorine (ppm or mg/L)

Total Chlorine (ppm or mg/L)

Combined Chlorine (ppm or mg/L)

pH

Salt (ppm or mg/L)

ORP (Oxidation-Reduction Potential)

There's a lot going on with how all our tests work together to keep an optimal pool chemistry.

QUESTION 2: Are there any specific cleaning methods or chemicals used to clean your pools and how frequently do you use them?

EP50: EP50 Cleaner Disinfectant | Diversey Global - for cleaning changerooms and any high-touch points

EP77: EP77 Heavy Duty Washroom Cleaner | Diversey Global - much more heavy duty cleaner, for dirtier areas

Industrial-strength vinegar (for removing calcium buildup e.g. water stains)

Diluted versions of Hydrochloric acid (cleaning pool testing equipment)

Sodium Bicarbonate (baking soda) - cleaning the pool deck, removing any grime/grease points in the pool area e.g. edge of the pool gets dirty, scrub with bicarb.

There are many other chemicals, but due to our environmental standards (ISO 14001), we want to make sure that the chemicals we use (in terms of usage and concentrations) fall within regulatory compliance.

QUESTION 3: Have you encountered any issues with bacterial contamination, and if so, how did you address it?

When we have any type of contamination, we follow a contamination report. Specifically, we consider “contaminated” water when we have vomit, formed fecal, or diarrhea present in the water. In each of these cases, we have internal reporting guidelines and protocols we follow to bring the pool water back to standard for customer use and satisfaction.

QUESTION 4: What specific challenges do you face with maintaining the pool?

Ongoing upkeep of cleanliness. It’s easier to clean when there’s not much dirt, hard to clean when

there's a bigger mess. Clean early and often! Makes everyone's jobs easier.

QUESTION 5: What are some of your common challenges faced while keeping the pool clean?

Outdoor shoes on deck (outside dirt)

Strollers/wheelchairs (outside dirt on wheels)

Proper swimwear and taking a shower before entering the pool

Making sure we limit how much water spitting spouting is happening in the pool area

QUESTION 6: How effective are your current cleaning methods when coming into contact with bacteria?

On a weekly basis, we are required to submit water samples to Alberta Environmental Health. These tests are important, as we want to make sure that our equipment and chemical usage controls these bugs, while not harming people that use our facility. We have to keep a fine balance between limiting sickness and infection while keeping our site safe for all participants.

JAN 23: We did slides on what we were provided with by each pool;