



BRONZE AWARD

Workbook



Student/team members' names	Soyun Lee
School/organisation	NLCS Jeju
Project title	Investigating the effect of bleach on bacteria

Introduction

You can use this workbook to plan, record and evaluate your project. Fill in the sections as you complete your project. If you are filling the workbook in electronically, all the boxes should expand so that you can add as much detail as you would like. If you are filling it in by hand, feel free to add extra sheets if you don't have enough room.

- 1 – Planning your project:** Set an aim for your project, and come up with ideas about the best way to achieve that aim.
- 2 – Throughout your project:** Tell us about what you did, how you organised the project and what you found out.
- 3 – Finalising your project:** These questions help you think about what you've done and learned during your project.

Top tips!

Be safe! Always have an adult to supervise you when you are doing practical work. Check your plans for practical work with them before you start.

- Record what you do in each session. This will help you to talk about your project with your teacher and keep track of your progress.
- If you don't understand something or your project isn't going the way you planned, ask your teacher or project lead for help.
- It doesn't matter whether your project idea 'works' or not – but it does matter that you can explain why it did or didn't work.
- Have fun! This is your project, enjoy it!

After your project:

After completing your CREST Bronze Award you can:

- Go on to work towards your CREST Silver Award
- Join the CREST Alumni Network to find out about great opportunities for young people through the British Science Association: www.crestawards.org/alumni

All scientists and engineers are creative. They use scientific and technical knowledge, make decisions, solve problems, evaluate and communicate their work. Throughout your CREST project you'll need to use and show these skills too.



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1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project?

I want to experience to grow bacteria by making plates, and find out what is the most effective way to sterilize bacteria. The project can be divided into 3 steps. First, plan all the experiments and make a hypothesis. In this step, i'll research about making plates from nutrient broth and yogurt. Also, I want to know more about the history of sterilizing so I'll search the history about sterilizing in the books or internet. Second, I'll make bacteria plates. I'll take step by step, knowing the method of making good quality bacteria. In other words, I have to know what environment that bacteria grows well and create that environment. Lastly, I'll try sterilizing bacteria. I'll try different amount of bleach, yogurt, and water.

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know?

In everyday life, we meet bacteria. This might be a good one, or a terribly dangerous. My aim is to sterilize the harmful bacteria that effect people into harmful ways. By improving the environment of the housings, people will get less diseases than before which had many bacteria and this will surely influence people's everyday life by preventing some of the diseases. First, I will start to use this method in my home in summer, which has very good environment for bacteria growing. When the bacteria grow in my house, I'll try to use the method I used in the experiment and see the results, if it work, than it can be used easily in everyday life like me.

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

	Pour bleach in with the bacteria and examine weather it kills it, or not. If it doesn't try another liquid or material that is used to kill bacteria in the history.	Drop several drops of bleach with the bacteria, and find the smallest amount that kills all of the bacteria.
	Find whether the bleach can kill bacteria and the smallest amount for it	Make the dish of bacteria, and drop different amount of bleach inside and find the smallest amount for killing the bacteria.
	Find the material that is sterilized for more accurate answer for growing bacteria.	Pour the yogurt or some kind of liquid that can produce bacteria in short amount of time in the test tubes and drop different amount of bleach inside.

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
<p>1.) How to check if the bacteria is sterilized or not The yogurt bacteria is yellow. If there isn't much yellow on the dish, it is sterilized, and if there's trace of a yellow line, then that means that it is not sterilized.</p> <p>2.) How grow bacteria on an agar plate Collect bacteria from the yogurt and spread it on the agar jelly with very small amount. Wait for on week.</p> <p>3.) How to grow bacteria in the glass tube</p> <ol style="list-style-type: none"> 1. Pour nutrient broth in the glass tube. 2. Put different amount of water in each tube. 3. Put different amount of yogurt in each tube. 4. Cap it with foil and wait for one week. <p>4.) How to prevent the materials to be contaminated</p> <ul style="list-style-type: none"> • Put the cap of the glass tube quickly • Don't open the lid of the agar plate too long. 	<p>1.) https://www.google.co.kr/search?q=grown+bacteria&source=lnms&tbn=isch&sa=X&ved=0ahUKEwjDqtT9yO_gAhWPHKYKHfsnAokQ_AUIDigB&biw=1200&bih=855 The images that show the bacteria grown</p> <p>2.) https://learning-center.homesciencetools.com/article/bacteria-experiment-guide/ The method to grow bacteria</p> <p>3.) https://www.scienceprofonline.com/microbiology/use-of-liquid-nutrient-broth-media-for-growing-bacteria.html Method to grow bacteria</p> <p>4.) Asked to the teacher</p>

1.5 Which of your ideas is the best way to achieve your aim?

I will experiment the bleach and yogurt together. I will try to sterilize the yogurt and broth with bleach and water. Also, I think controlling the amount of all the materials would be better than just experimenting. I will try with two types of plates, one with test tubes and one with dishes. After I finish the experiment, I will compare the results and see if the bleach effectively, and the exact amount of that to use in the real life.

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

I think it is the easiest and the simplest way to achieve my aim, sterilizing bacteria. Other ways are hard to achieve, or cannot do because of the material we needed. Pouring bleach in the bacteria would kill too much of bacteria to compare with others. Also, the best way to grow bacteria is to grow on the agar plate with yogurt which can be grown in one week or so.

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
<i>Example: How the amount of baking soda affects how long a bath bomb fizzes for</i>	<i>Make bath bombs with different amounts of baking soda and put in water</i>	<i>Same size tub for water Same volume of water Same temperature water Same weight of other ingredients</i>
How long it will take to grow yogurt bacteria on a agar plate.	Make a agar plate with yogurt and see how much time does it need.	Make up the best place for bacteria to grow fast as much as it can. - drape the curtain to block the sunlight - Put wet tissues near to make the air full of moisture
How to make the materials all sterilized for the best	Experiment all the possible ways in internet that shows sterilizing simply	<ul style="list-style-type: none"> - Experiment with hot water - Experiment with bleach - Experiment with alcohol

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

The bacteria can be bad for our health. It can harmful for our body so I should wear lab coats and wear gloves. I have to make sure not to spill the hot nutrient agar that can damage our skin. To prevent that, we must wear thick gloves that can protect our hands from getting burned. Lastly, the sterilized materials that we use can burn our skin because I sterilized the materials with hot water or the microwave. To prevent getting burned, we should wear lab coats and wear thick gloves.

2 - Throughout your project

Now you have planned your project, it's a good idea to break the project into tasks that will need doing and organise:

- When each task needs to be completed by
- Who does each task (if working in a team) and if others may need to help you
- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible ?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished?
<i>Example: Decide what practical tests we want to perform on our product so we can set tests up</i>	<i>Sarah</i>	<i>Teacher to show us what equipment is available</i>	<i>Access to the school labs to see equipment</i>	<i>Beginning of February</i>	<i>Feb 5th</i>

1.) Decide what topic will I do	Soyun	Ask teacher for help to find a topic that I'm interested	None	Beginning of September	Sep 6th
2.) Start to think about the method of the experiment what I'll do and consider about the equipments	Soyun	Search internet for the method of growing agar plates and ask to teacher.	Computer for internet	Third week of September	Sep 20th
3.) Do the research of the history of sterilizing.	Soyun	Search internet for the history of sterilizing and the effects of that.	Computer for internet	Second week of October	October 11th
4.) Get the equipments from the school and envision the experiment with it.	Soyun	Teacher to show us what equipment is available	Access to the school equipment room to get the equipments.	2nd week of November	November 8th
5.) Start the 1st experiment	Soyun	Teacher to guide me through the practice experiment	None	Last week in November	November 29th
6.) After the experiment, categorize the results and check if my hypothesis at the start was right	Soyun	None needed	Computer to type the results	Second week of December	December 13th
				-break-	
7.) Think about WWW and EBI and write it down	Soyun	Ask to the teacher what went well, and what didn't	Computer to type the WWW and EBI	Third week of January	January 17th
8.) Analyze the data	Soyun	Non need	Computer for internet	Last week of January	January 31st
9.) Get the apparatuses for the second experiment	Soyun	Help from the teacher to find out what apparatus we need	Access to the laboratory	Fourth week of February	February 14th

10.) After the experiment, categorize the results	Soyun	non need	Access to computer	End of February	February 28th
11.) Think about WWW and EBI and write it down	Soyun	Non Need	Access to computer	Second week of March	March 14th
12.) Start filling in the crest forms	Soyun	Non need	Access to computer	Last week of March	March 28th
13.) Stat making presentations	Soyun	Non need	Access to computer	-break- Last week of April	April 25th
14.) Finalise everything	Soyun	Non need	Access to computer	First week of May	May 2nd
15.) Present the project	Soyun	Non need	Access to computer	2nd week of May	May 9th

2.2 Record what you do as you carry out your project - This might include records of more detailed research, diagrams, descriptions of methods used, photos/videos or even weblinks for blogs. Think about any decisions you had to make, maybe to overcome a problem, and record how you came to your decision.

From the research, I found that the earth is getting polluted by the overuse of chemicals that flows into the river or oceans. These are household wastewater. These affects the organisms that live in the ocean or rivers, and even to humans because the bad chemicals that are used in bleach can be harmful for our body and occur hair loss.

	1st	2nd	3rd	4th	5th	6th
Sterilized Water	1cm ³	1cm ³	1cm ³	1cm ³	1cm ³	1cm ³
Nurtient Broth	9cm ³	9cm ³	9cm ³	9cm ³	9cm ³	9cm ³
Yogurt	6 drops	6 drops	6 drops	6 drops	6 drops	6 drops
Bleech	None	2 drops	4 drops	6 drops	8 drops	10 drops
Seterilized Water	6 drops	6 drops	6 drops	6 drops	6 drops	None

This is the table that I used to measure the ingredients of each glass tubes in the first experiment. To provide a control, in the first glass tube, I didn't put any bleach in it. The method was to drop different amount of bleach and see the results of the least amount of bleach that we must use in sterilizing certain amount of bacteria in our lives. I used yogurt because the bacteria that occurs in yogurt is not that harmful unless we eat it. I tried to make the

experiment safest. Before I succeeded, I had many problems starting an experiment, but I tried until it worked, and it worked finally. I learnt that I had to try more. The first experiment was formed as glass tube experiment, and most of the ingredients were nutrient broth than agar. However, in the second experiment, I tried with agar plate to try variety of materials that I can use. There was a change of my aim in the middle of my experiment. At the first, I aimed "does bleach kill bacteria" but I realized that the topic was not good enough to answer properly. That popped out of google in less than a second. So I tried to change the topic that was related to the environment, because I wanted to help the Earth from boiling in few years. Overuse of chemicals was one of them, and I changed my aim to "What is the least amount of bleach that can kill certain amount of bacteria?".

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

The result was successful that the glass tube that grew most of the bacteria was the first one to the 6th one. However, my result before was terrible. I didn't know what to do, and I even didn't plan anything. I failed that experiment, and tried again and again until I succeed for the result and be confident with it. In the second experiment that I used agar plates were also successful for that the bacteria were grown the most in the plate that there were no bleach in. However, there were some contamination that disturbed the results. Thankfully, that contamination was surely different to other bacteria that grew in the other plates. I had to make decisions weather I needed to consider the contamination as growth of bacteria, or not. I didn't have enough time for one more experiment, so I considered contamination as only contaminations, and carried on to my results, and other things I needed to do. I learnt that I could do things when I try again, and again until it works. After my tests, I felt like the test is a very important task for everybody than at the start of the experiment. At the start of the experiment, I only thought that this would be a little example that people can organize in their ordinary lives. However, after I carried out the results by myself and analyzed the data, the topic became very meaningful for me. The topic itself wasn't a easy topic to predict or expect the result, but my expect was wrong. I thought we needed alot more bleach to sterilize bacteria, but it was not the amount I expected. I think this means that I use alot of bleach in my ordinary life, and by this experiment, I will try to change my thoughts and behaviors.

3 – Finalising your project

An important part of CREST projects is thinking about what you've done. At the end of your project, use these questions to help you reflect on what you did. Remember it's OK to say you didn't get something right.

3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

My project was successful because the results were very accurate in some perspective. I met the aim that was "How much bleach is the least amount for sterilizing bacteria?" and the result was that 8 drops of bleach per 6 drops of yogurt was the least amount of bleach that people can use to sterilize bacteria. My aim changed a bit after some moment, but I successfully met the aim that I setted.

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

It is related to the environmental issues, because using massive amount of bleach can harm the environment by flowing the bleach into the natural water such as ocean or lake. This could harm awfully organisms that live in that environment and moreover, drives to death. To stop this, people should use minimum amount of bleach when they are cleaning, and this can help the environment to be cleaner and the peoples' lives would be better in the clean environment.

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

If I start the project again, I want to organize the plans more accurately, because of the reason that I didn't plan well, I had to spend a lot of time, doing nothing. If I planned well, I would be able to do the experiment in such more shorter period of time. Also, I would like to write the experiment's result more accurately, because I was confused in some moment weather the amount was 7 drops, or 8 drops.

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

I have learnt that I could carry the project on my own. I was surprised when I finished it, and next time I do the experiment, I think I can do the experiment and the whole project better. Also, I know the exact amount of the bleach that can sterilize bacteria such as yogurt bacteria.

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

I think every single person that wants to save the environment would be interested, because this is the method to save the earth in a very easy way. Everyone could make an effort to save the environment by using lack of bleach. I think the best way to share my work is to make an website, or attach my essay on a newspaper, or a magazine about environmental issues.

Space for further notes/ drawings/ reflections (optional)...