



**GLOBE OMAN**



Study titled /

The death of aquatic and plant organisms in the  
laboratory of Umm Thar Al-Ghafari School

**Done by/**

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**February\_2021**

## Table of Contents (Index)

<b>Subject</b>	<b>page number</b>
Abstract	1
Basic terms	2
Research questions	3
Introduction	3
Search methods (search plan)	4
Study site	5
Data collection and analysis	6
Results	13
Discussion of results	17
Conclusion	18
Thanks and appreciation	20
References	21

## Table index

<b>Table number</b>	<b>Table title</b>	<b>page number</b>
1	Results of the experiment of the effect of water source on plants	12
2	Results of the experiment of the effect of water source on aquatic organisms	12
3	GLOBE Protocol results on laboratory water	13
4	Results of microbiological water test for laboratory tank	13
5	Results of the school water source examination (government water)	14
6	The results of an experiment showing the relationship of iron rust to the lack of oxygen in the water	15

<b>The diagram number</b>	<b>The title of the diagram</b>	<b>page number</b>
1	Results of the experiment of the effect of water source on plants	12
2	The difference in the pH and the percentage of oxygen between the main water source and laboratory water	12

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Sultanate of Oman - Buraimi Governorate

**Abstract**

The research aims to study the cause of the death of aquatic organisms that are raised in the school laboratory and the withering and death of plants that are cultivated and taking care of them in the school laboratory of Umm Dhar Al-Ghafari School with the availability of all the appropriate factors for plant growth of water, light, air and warmth. The GLOBE Environmental Program will implement the water protocol to know the characteristics of water and follow it up to ensure its impact on these organisms according to the Omani standards for water, study the vegetation protocol, as well as conduct a microbiological examination in cooperation with the municipality, Department of Water Analysis Laboratories. After applying the water protocol, it was noted that the water's properties are good in terms of salinity and conductivity, and slight differences in the pH of the water, but the problem lies in the great lack of oxygen in a way that is not commensurate with the Omani water quality standards, and during the results of the microbiological examination, the beginning of the emergence of a type of bacteria in the water was discovered. Consequently, cooperation was made with the Health Awareness Department in Al Buraimi Governorate and the STEM team, to search for the causes of oxygen deficiency in the school laboratory water and treat the problem. Hence the importance of research in discovering the cause of death of aquatic organisms in the school laboratory and reaching a lack of oxygen in laboratory water due to rusting of the wiring pipes in the school building, which affected the percentage of oxygen in the water and the appearance of bacteria and some health aspects of students such as allergies (itchy hands - stomach pain) Consequently, cooperation was made with the competent authorities and the community to replace school connections with plastic connections, and schools and old homes in Al-Rabi and Wasit were also visited to make them aware of the impact of steel wire rust on their health and to inspect a number of homes and provide the necessary instructions. Research recommendations: Avoid chemical pollution of water by wiring the water with pipes made of thermal polypropylene, expanding the project to reach old homes, and assisting them in examining and treating water problems.

### **Key terms:**

- 1) Microbiological characteristics of water: Drinking water is completely free of pathogenic microbes, faecal microbes and viruses that harm public health. (Directorate General of Standards and Metrology, 2015)
- 2) Umm Dhar Al-Ghafari School: It is located in the village of Al-Rabi in the Governorate of Al-Buraimi, Sultanate of Oman. It consists of the first grade to the twelfth grade, and depends on government water.
- 3) Iron rust: Iron in its pure form quickly corrodes when exposed to moist air, and appears as red (Taani, 2015).
- 4) Thermoplastic polypropylene: a thermoplastic polymer, which is a commodity plastic PP, which is characterized by mechanical strength and resistance to sudden changes in pressure or temperature and is made of environmentally friendly materials that have high properties against corrosion and the absence of deposits inside the pipes (Al-Alwani, 2013).

### **Research questions:**

- 1- What is the cause of the death of aquatic and plant organisms in the school laboratory of Umm Thar Al-Ghafari Basic Education School?
- 2- What is the reason for changing the properties of the water, the ratio (salinity, conductivity, pH, percentage, oxygen, perceptible characteristics, color, smell, taste, absence of microbes)?
- 3- What are the solutions to treat this phenomenon?

### **Introduction:**

Aquatic organisms need an aquatic environment in which the main factors are present in order to survive, such as oxygen, temperature and food. In the event that any factor is affected by an increase or decrease, an imbalance will occur in the ecosystem of these organisms, which may cause their death. The same is true for plants, as they need factors from the environment in order to grow, such as light, water, air and warmth. Water helps to form strong and healthy stems and leaves of the plant as well as helps transport nutrients to all parts (Fifth Grade Science, 2020). It is natural that plants and living organisms need clean, healthy, unpolluted water according to the water specifications needed by the plants (General Directorate of Standards and Metrology, 2015). Hence the importance of monitoring the environment and the appropriate conditions for these organisms, because any defect in them may lead to the weakness and death of this organism, so the school and science laboratories are a fertile environment for simulating the environment and training the student. As science laboratories help students to investigate and study living organisms, so samples of organisms are brought and some plants are grown to be used in laboratory experiments, but what was observed in the science laboratory at Umm Dhar Al-Ghafari School of the death of aquatic organisms in a short time, and when planting seeds of plants They rot and may grow very weak, so the GLOBE School Program team must investigate this phenomenon by studying the common factors affecting these organisms. One of the

likely factors may be water, but if the source of the water is pure, what makes the water change its properties and its quality affects the life of living organisms, the water may be exposed to various pollutants, including dust, iron rust, waste or chemicals that affect the pH and salinity And the conductivity of the culture (Al-Alwani, 2013), and the water may be affected by a heat source or a chemical reaction that affects the percentage of oxygen in the water (Hassan and Hussein, 2015). Therefore, changing any feature of the water may affect the life of water-dependent organisms. But in homes or schools, what is the factor that causes the death of living things, and if it is the water factor, what made the water change its properties to greatly affect the life of living things? These questions prompted me to study this phenomenon in cooperation with my colleagues in the GLOBE school team and find solutions to that.

#### Search Plan :

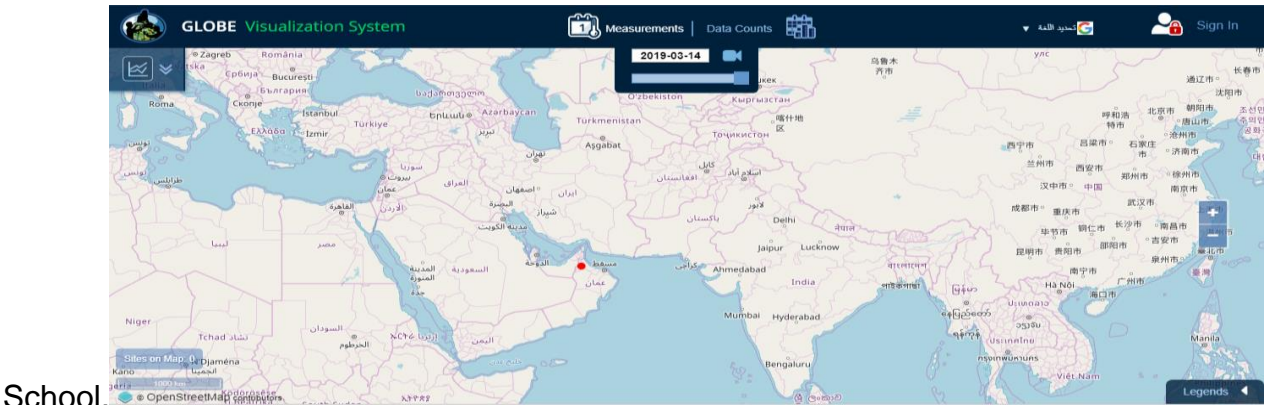
- 1- Sense of the problem: Noticing the death of aquatic organisms (small fish - tadpoles) in the school laboratory, the seeds rot and weakly grow when planted in the school laboratory despite the availability of appropriate conditions, red water coming from the laboratory taps, some students suffer from sensitivity in the hand after Washing with laboratory water.
- 2- Selection of the research problem: It was identified by the researcher and discussed with the school's GLOBE Environmental Program supervisor (Professor Nawal Al Shamsi).
- 3- Defining the study tools: implementing the water protocol, cooperating with the municipality for microbiological examination.
- 4- Official communication: to the General Directorate of Regional Municipalities and Water Resources in Al-Buraimi Governorate (Water Department) and the governorate's STEM team to agree to carry out research in cooperation with them to find solutions.
- 5- The implementation of a meeting: with officials with the Water Department to discuss and analyze the results, a meeting with Al-Buraimi Hospital, the Nutrition Department, to discuss the health effects of water on humans.
- 6- 1- Implementing the GLOBE Environmental Program in cooperation with the Water Affairs Department in the Governorate, specifically the water protocol (conductivity, density, water temperature, PH) and entering data into the GLOBE site.
- 7- Testing the water microbiology in cooperation with the municipality, Department of Water Analysis Laboratories
- 8- Compare results and write recommendations.

**A research plan has also been developed to implement the steps in a timely manner.**

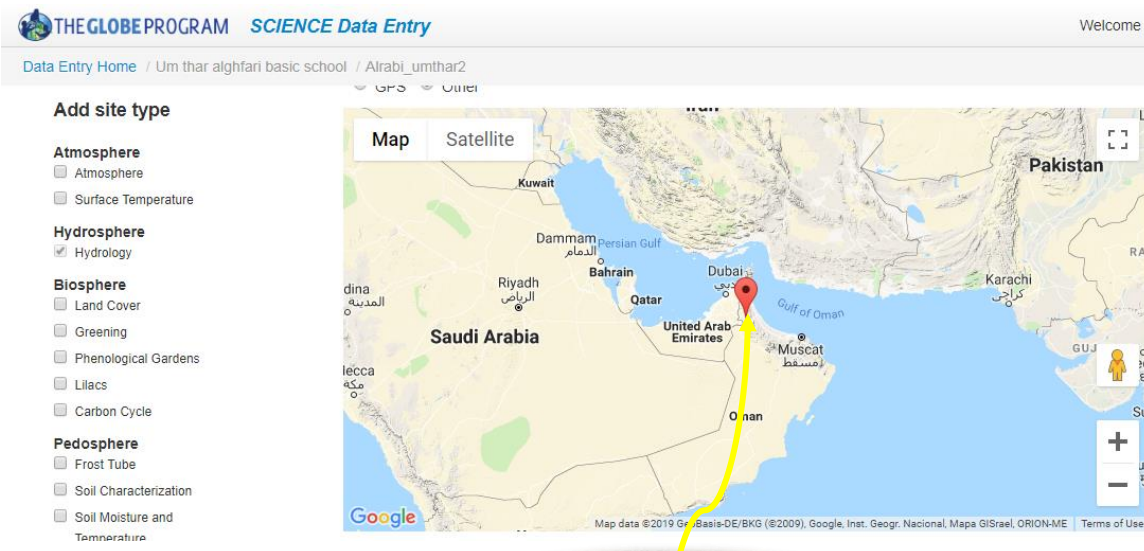
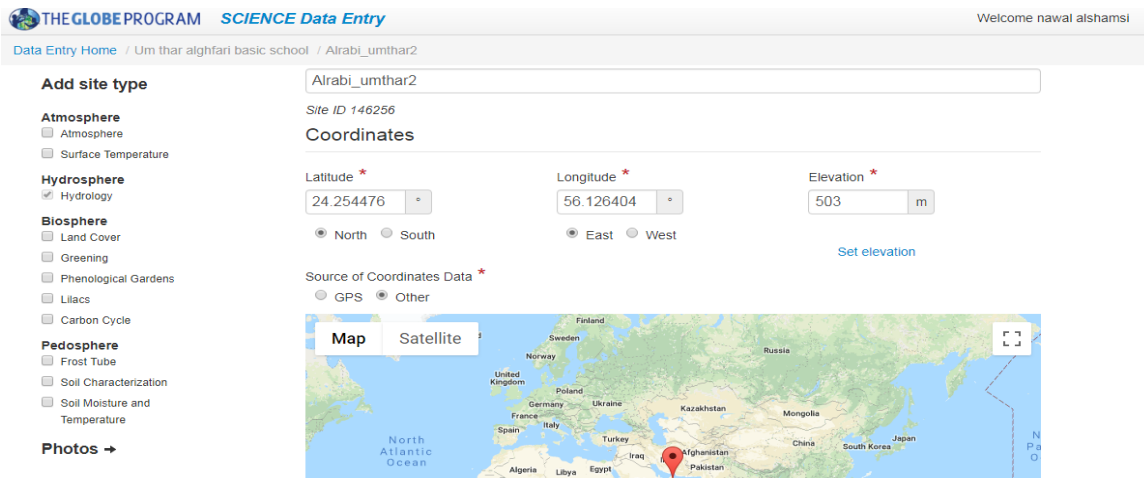
**The time plan for preparing the research is as follows:**

Notes	Implementation Officer	the plan	the month
Addressing the authorities assigned to the school correspondence system	Mayassa Al-Rashidi, in cooperation with the GLOBE team and supervisor	Defining the problem *Correspondence to water resources *Provision of project tools (and provision of water protocol tools, fenugreek seeds and legumes, aquatic organisms (fish and tulip(	Nov
Project tools provided Apply hydration protocol twice a week	Student Noura Al-Rashidi in cooperation with the GLOBE team with the municipality, the hospital and the STEM team	Application of the (water) protocol in the specified locations for the study Microbiological analysis of water in cooperation with the municipality Analyze data and find solutions, in cooperation with the competent authorities, make recommendations, write and review the research.	Dec
The cost of the poster is approximately (15) riyals Conducting seminars and lectures in cooperation with the school specialist	Mayassa Al-Rashidi	Data entry into GLOBE website Business Poster	January
	Maysa Al-Rashidi + Noura Al-Rashidi Supervising GLOBE supervisor	Writing the research and participating in the research in a competition at the governorate, Sultanate and international levels	March

## Second: The location of the study: (Sultanate of Oman, Al Buraimi Governorate), Al Rabi area of Umm Thar Al Ghafari



School.





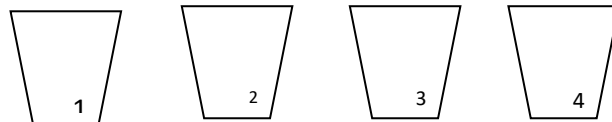
### Third: Collecting and Analyzing Data:

- To determine the cause of the death of aquatic and plant organisms in the school laboratory of Umm Dhar Al-Ghafari Basic Education School and thus answer the main first question, Branch (A), the following steps were taken:
- By searching for common factors between aquatic organisms and plants that caused their death, and conducting some experiments that reach the cause of the problem, it is logical to think about the water factor and study its properties, but in order to be completely sure that the main cause is due to the water, the following experiments were conducted:
- **First experience: Why do plants die when grown in a school laboratory?**

Tools: (Fenugreek Seeds, Bean Seeds, 4 Paper Cups)

The factors I will demonstrate for the test to be fair: number of seeds (five seeds will be placed in each pot), amount of water, quality and quantity of soil, location, type, shape and size of cups.

Factors that will be changed: The water source (water from a laboratory tap, healthy water from a metal bottle)

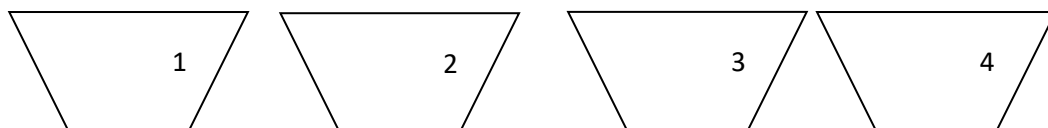


**The second experiment: Why do aquatic organisms die in the school laboratory?**

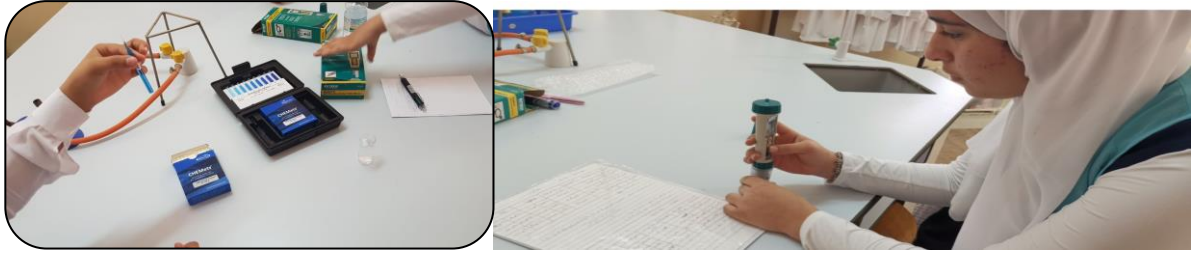
Tools: (small fish, tenneba, 4 ponds)

- The factors that I will prove in order for the test to be fair (the number of aquatic organisms in each basin(2)), the location of the ponds.

The factors that will be changed: (water from a laboratory tap, healthy water from a metal bottle).



### Third: Applying water protocol and studying its concrete and chemical properties for a month



### Fourth: Conducting microbiological analysis of water in cooperation with the municipality, Department of Water Analysis Laboratories



In order to answer the second branch of the reason for changing water properties in the school laboratory, the following has been done:

First: Take a sample from the school water source, the main tank, and study its properties and compare them with the characteristics of tap water in the school laboratory.



**Second: Inspect the cleanliness of the tanks and water connections for the school laboratory and the school building in general**





After discovering the rusting of the school pipes made of metal (iron), and to make more sure about the relationship of iron rust to the lack of oxygen in the water and the change of water properties, the following experiment was conducted:

Tools (iron nails, 4 plastic cups, conductivity meter, salinity, pH, oximeter)

Factors that are proven to be fair (amount of water, quality of cups, location)

Factors changed (number of pins)

Experiment steps: A quantity of 150ml of water was placed in each cup, the first cup contains water only, the second cup (2) contains one nail, the cup (3) contains 2 nails, cup No. (4) contains three nails, the cup The fifth contains (4 nails). Study the properties of water using a globe protocol and record the results.



To answer the last question and find solutions and treatment for the causes of the phenomenon of the death of aquatic and plant organisms in the laboratory, which has been confirmed that the main cause of the problem is the quality of the material from which the water pipes are made in the school, whose interaction with dissolved oxygen in the water led to rusting of these tubes and this chemical reaction caused the change of water properties. And a significant shortage of dissolved oxygen in the water and thus affected the life of living organisms, which may be due to the reason why female students suffer from hand sensitivity after using tap water in the school, so it was required to conduct interviews to find out the effects of rust on living organisms with the Nutrition Department of the Health Hospital in Buraimi Governorate.

Visiting the hospital to collect information and statistics and learn about the impact of polluted water on an individual's health



Visiting the municipality and the specialized engineers to study the problem and develop solutions



Researching learning resources on the topic and searching for solutions to the problem





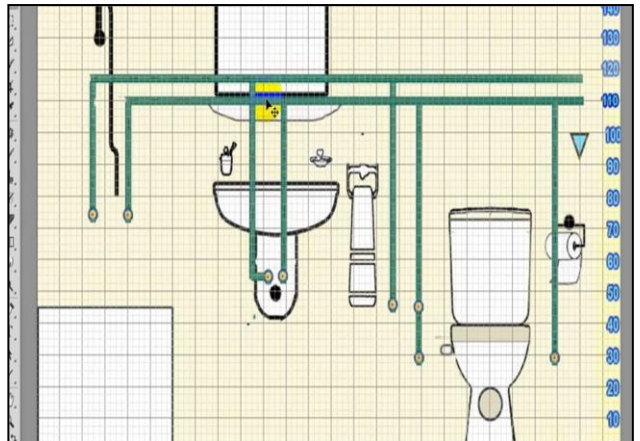
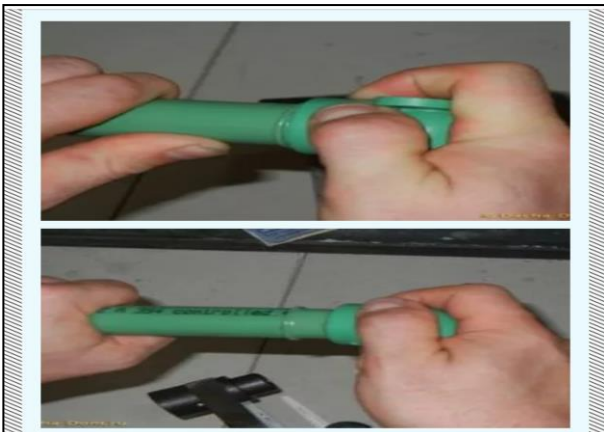
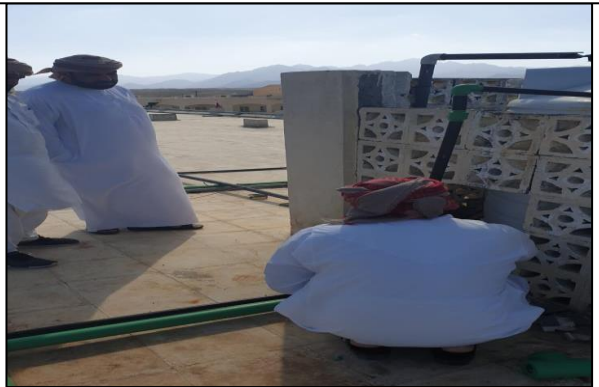
Visit construction hardware stores to notice the best plumbing materials



Starting the project by replacing iron castings with plastic seals

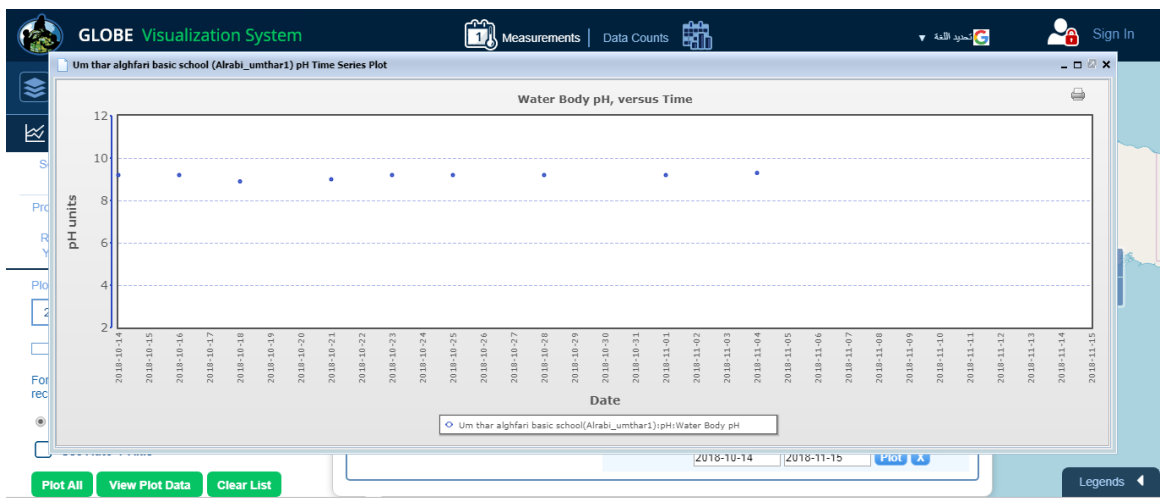
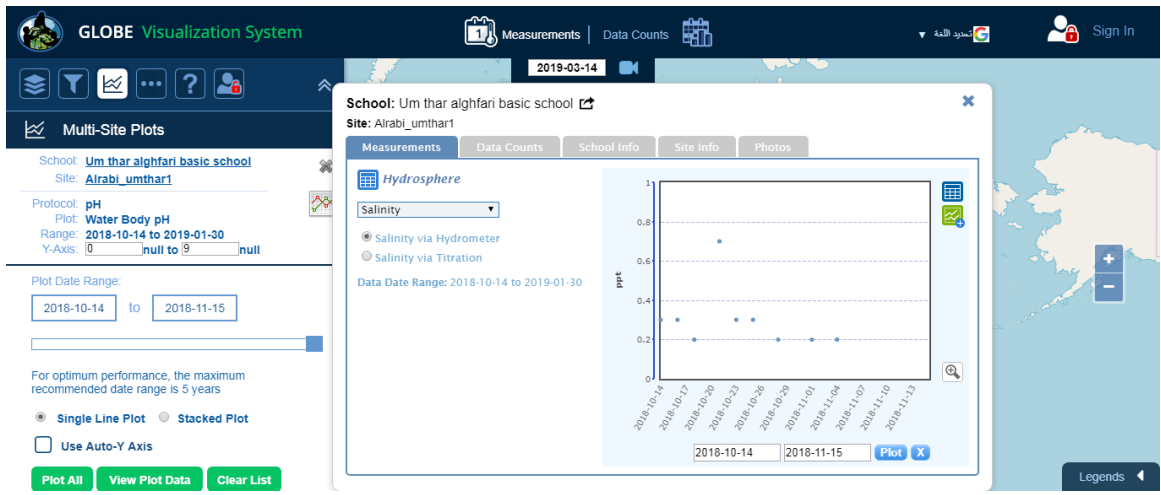


Follow-up STEM in cooperation with engineers from the municipality department and some residents to replace iron pipes with plastic pipes and to ensure the cleanliness and quality of wiring



Enter the data on the GLOBE Eco site, at the site [WWW.GLOBE.GOV](http://WWW.GLOBE.GOV)

By entering the data entry, creating a new site, choosing the water protocol, and entering the weekly data.



**School: Um thar alghfari basic school**  
**Site: Alrabi\_umthar1**

Latitude: 24.206442°  
Longitude: 56.241844°

**All School Sites**

Name	Investigation Area	Date Activated
Almualaga	hydrology	2018-04-23
Almualaga	soil_moisture	2018-04-23
Almualaga	soil_characteristics	2018-04-23
Almualaga_Umthar	hydrology	2018-11-14
Alrabi_umthar1	hydrology	2018-11-14
Alrabi_umthar2	hydrology	2019-02-22
um_Thar_school_behind_laboratory1	atmosphere	2018-10-15

javascript:void(0)

**Results:**

- **First: First experience: Why do plants die when grown in the school laboratory?**

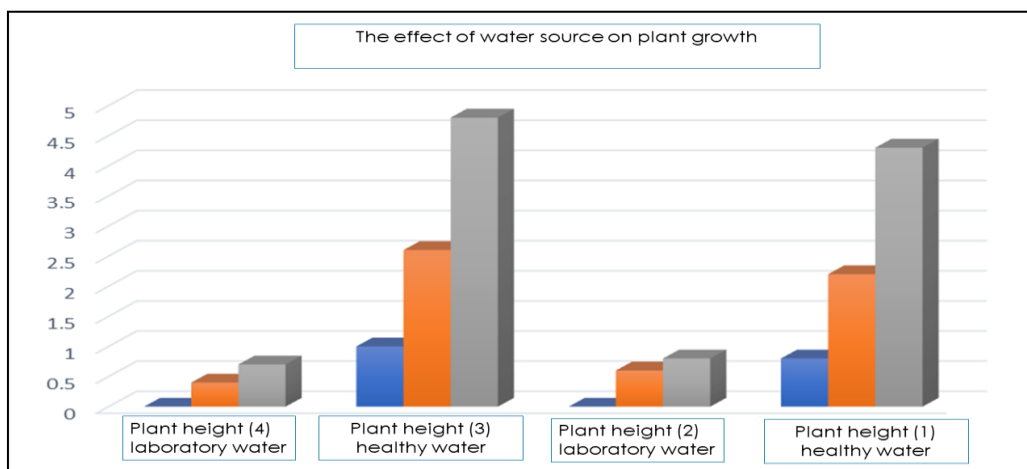
Water from a laboratory faucet						Healthy water						Duration
Pots(4)			Pots(2)			Pots(3)			Pots(1)			
The appearance	The number of seeds that have grown	Plant height (cm)	The appearance	The number of seeds that have grown	Plant height (cm)	The appearance	The number of seeds that have grown	Plant height (cm)	The appearance	The number of seeds that have grown	Plant height (cm)	
Some seeds rot	0	0	-	0	0	Healthy green	5	1	Healthy green	4	0.8	<b>First week</b>
yellowish	1	0.4	yellowish	2	0.6		5	2.6		5	2.2	<b>second week</b>
light green	2	0.7	light green	2	0.8		5	4.8		5	4.3	<b>the third week</b>

Table (1) Results of the experiment of the effect of water source on plants

**The second experiment: why do aquatic organisms die in the school laboratory?**

Water from a laboratory faucet		Healthy water		Duration
Aquarium(4)	Aquarium(2)	Aquarium(3)	Aquarium(1)	
Abu Danaiba died	The fish died	Adenibiah is in good health	Fish are healthy	Passage of 24 hours

Table (2) Results of the experiment of the effect of water source on aquatic organisms



Graph (1) the growth results of plants that were irrigated with the main source of water and laboratory water(



**Third: Applying water protocol and studying its tangible and chemical properties for a month**

	First week Dec	second week Dec	the third week Dec	First week January	second week February
(pH)	9.35	9.37	9.31	9.44	9.58
(E <sub>c</sub> ) conductivity	290	291	295	290	292
PPM Salinity	435	434	435	433	436
( T <sup>0</sup> C) temperature	23.7	23	24	23	22.8
Transparency	100	100	100	100	100
The proportion of dissolved oxygen) mg/l/(	2 - 3				
Color, taste and smell	Red at the start of the water running, then yellow, then becomes transparent with the passage of use				

**Table (3) results of GLOBE protocol on laboratory water**

**Fourth: Conducting a microbiological analysis of water in cooperation with the municipality, Department of Water Analysis Laboratories**

Date of COA :14/11/2020

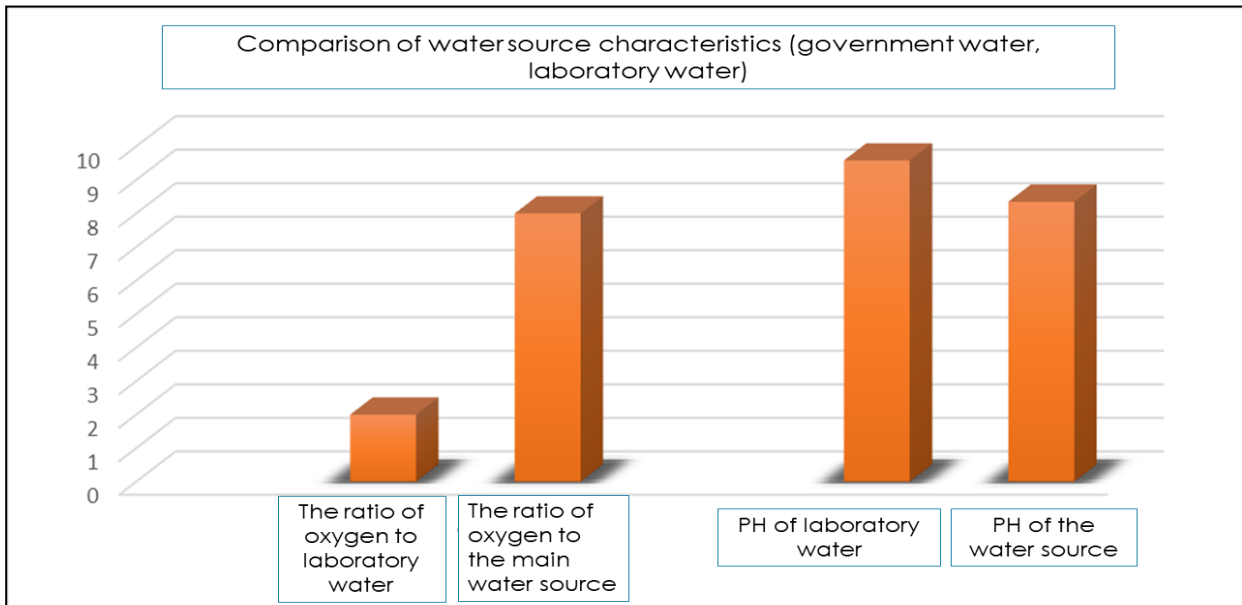
NO	Parameter	Results	Specification
1	Coliform	12.4	0
2	E.Coli	0	0
3	Visual Examination	Normal	Physical
4	Total Dissolved solid	140	100<R(mg/l)<1000

**Table (4) the results of the microbiological water test for the laboratory tank**

تطبيق بروتوكول الماء ودراسة خصائصه الملموسة والكيميائية لمصدر الماء للمدرسة

	First week Dec	second week Dec	the third week Dec	First week January	second week February
(pH)	8.39	8.34	8.31	8.33	8.35
(E <sub>c</sub> ) conductivity	290	291	295	290	292
PPM Salinity	140	138	135	137	139
( T <sup>0</sup> C) temperature	23.7	23	24.1	23	22.7
Transparency	120 <	120 <	120 <	120 <	120 <
The proportion of dissolved oxygen (mg/l)	8 - 10				
Color, taste and smell	There is no				

Table (5) results of examining the source of school water (government water)



Graph (2) the difference in the pH and the percentage of oxygen between the main water source and the laboratory water(

**Experiment No. (3) The relationship of iron rust on the lack of oxygen in the water and the change of water properties**

	First week				second week				the third week				fourth week			
	Dec				Dec				Dec				Dec			
Sample number	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
(pH)	8.45	8.47	8.48	8.58	8.53	8.48	8.53	9	8.57	8.56	8.76	9.40	8.78	8.95	8.98	9.11
conductivity (Ec)	298	307	311	318	306	317	324	353	343	330	332	365	368	346	356	394
PPM Salinity	119	196	211	365	122	200	324	535	136	220	363	720	144	232	394	839
Water color	No color	Light yellow	dark yellow	dark yellow	Light yellow	Light yellow	Red	Red	dark yellow	Light red	Dark red	light brown	Light red	Dark red	brown	Dark brown
Dissolved oxygen ratio (mg / l)	8	8	8	8	6	5	4	3	4	4	4	3	3	3	2	2

**Table (6) the results of an experiment showing the relationship of iron rust to the lack of oxygen in the water**

### **Discuss the outcome:**

Through the measurements and readings that were taken in Table No. (1) and Table No. (2), it is clear that the cause of death of aquatic organisms and plants that are grown in the laboratory is water. It contains a low percentage of oxygen. Table (4) shows the microbiological analysis of laboratory water in cooperation with the municipality, the Water Analysis Department, with the presence of (12.4) of coliform bacteria in the water, and this is the answer to the first question.

By comparing the characteristics of the water from the main source, the governmental water for the school that pours into the school tank shown in Table (5) and the water that comes down from the laboratory faucet, Table (3), it was found that there is a difference in the pH and the percentage of oxygen in the water, and the reason is that the water is silent in the school. It is nothing but rusted and worn iron silks, as the reaction of iron with dissolved oxygen to form iron rust ( $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ ) is the reason for the lack of oxygen in the water and a reason for the stench in the water and the growth of bacteria even though the water that reaches the reservoirs is of high quality, and to be sure. The formation of rust is the cause of the lack of oxygen in the water. An experiment has been made, which is shown in Table No. (6), where it shows the greater the proportion of iron in the water, the greater the percentage of oxygen deficiency in the water. It is noticeable that water that contains four pieces of iron became in the fourth week the percentage of oxygen in it. (2) While the cup that contained one piece had the percentage of oxygen in it (4), this shows the great effect of rust on the percentage of oxygen in the water.

As for the answer to the last question of the study, it was through a meeting with a nutritionist at Al Buraimi Hospital who explained the health effects of iron rust on human health from skin sensitivity (eczema), stomach germs and nausea, and a negative impact on other organisms, and through a meeting of the municipality department and the STEM team in the governorate to study

Ways to treat the problem, so it was agreed to search for a funder from the community members to replace the school pipes, but the problem was that the old wires inside the school walls and it is difficult to replace them because that would require breaking the wall, and after studying the issue with the engineers it was agreed to make external wiring from the tank that goes directly to Drinking fridges, laboratory taps, and school toilets.

After thinking about the problem, it becomes clear that this problem may be prevalent in the community, especially with homes and schools that were built before 1998, because the previously used wires were made of iron. Therefore, the problem should be expanded and the problem should be presented to other schools and cooperation with them to ensure the validity of the water used in addition to establishing Awareness raising and lectures to educate the community about the topic.

### **Conclusion:**

Water is one of the necessities of life, and attention must be given to a chemical, physical and microbiological examination to ensure its suitability for drinking and on living organisms based on water quality standards for each country (Hassan and Hussein, 2015), and it is important to ensure the cleanliness and integrity of the wiring pipes, because rusting iron pipes causes a lot It is a health problem for humans and living organisms, and it is better to use thermoplastic polypropylene seals.

- In this research, the researcher relied on the procedural approach to solve the problem of the cause of death of aquatic and plant organisms in the school laboratory by applying the application of the water protocol and microbiological examination in cooperation with the municipality in the school environment, and the problem was also engineered in cooperation with engineers from the municipality department and the STEM team in the governorate to find a way to solve The problem, as

well as making interviews with a nutrition technician at Al Buraimi Hospital, from which we came out with the Eid recommendations for the community, including:

- Continuous chemical analysis of water used for drinking and watering living organisms, especially in old homes.
- Avoid chemical pollution by wiping water with pipes made of thermoplastic polypropylene.
- Paying attention to the cleanliness of the water tanks, their good coverage of dust, and their continuous external cleaning so that bird waste or organic matter does not enter the water because it helps in the growth of bacteria.
- The use of single filters in kitchens and drinking places to protect from dust, iron rust or chemical contamination, knowing that the filter purifies the water from rust, but does not solve the problem of lack of oxygen.
- Continuous microbiological examination.
- Communicating with the concerned authorities via hotlines in the event that the color, taste, or smell of the water changes.
- Media solidarity between students and the concerned authorities to educate people and make them aware of ways to preserve the safety of water from pollutants.

The strengths of the research. Solving the problem of the death of aquatic and plant organisms in the school laboratory by changing the quality of the tubes to made of thermopropylene. It also contributed to raising my cultural balance on water and its pollutants. I also learned to conduct research in a scientific way as well as learn to conduct microbiological and chemical tests for water from During the implementation of the water protocol, my research is related to the science curriculum, which was the transfer of science information to direct application with the surrounding environment.

### Thanks and appreciation

We are pleased to extend our sincere thanks and appreciation to Professor Nadira Al-Harithiya, National Coordinator of the GLOBE Environmental Program in the Sultanate of Oman, for all the information she provided and to the members of the program's central team for their follow-up and continuous encouragement to prepare and produce the research in an appropriate manner. We also thank Ms. Nawal Al-Shamsi, the program teacher at Umm Dhar Al-Ghafari School for giving us the opportunity to prepare this research and Ms. Rahma Al-Badi, laboratory specialist at Umm Dhar Al-Ghafari School, for providing us with useful information. Health awareness in the directorate, a nutritionist at Al Buraimi Hospital, the STEM program team and the cooperating schools.

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