Comparison between bottled water and zamzam water

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Abstract:

Drinking water is one of the basic needs of life and essential for survival. Still, more than one billion people all over the world do not have ready access to an adequate and safe water supply and more than 800 million of those unsaved lives in rural areas [18]. Water is important because no organism can live without water. This research will study the differences between bottled water & Zamzam water at a steady temperature in Jeddah KSA 2020. The following parameters were measured, which are: conductivity, temperature, dissolved O2, nitrate, PH, density, and salinity. Bottled water was analyzed against Zamzam water for various water quality parameters. All the figures from (1) to (5) show the differences in different parameters. Zamzam has higher values than the bottled water except dissolved O2 was lower, and the temperature was steady in both categories. This research supports the alternative hypotheses which say's "there will be differences between bottled water, and Zamzam water". In fact, all the graphs illustrate that there are differences between bottled & Zamzam water.

Key words: Zamzam water, bottled water, conductivity, temperature, dissolved O2, nitrate, PH, density, and salinity.

Introduction:

Water is one of the most important substances on earth. All plants and animals must have water to survive. If there was no water, there would be no life on earth [7]. It is needless to say that the drinking water quality is the most important issues to human health all over the world. About 70% of an adult's total body weight is water; without it in a consistent range, the body's survival time is restricted (Al-Omran et al., 2013) [4]. Zamzam water is slightly alkaline and elements found in zamzam water like Ca2+ and K+ can have healing. The high amount of calcium in zamzam water can be useful in quenching thirst and hunger [9].and chemical parameters. Bottled waters were also compared with the city municipal water supply and Zamzam water from TDS), Ca, Mg, Na, K, NO_3, Cl, and SO_4(Sulaiman Mohammed Alfadul,Mujahid A Khan)[2].Zamzam water is different from natural water in terms of minerals and radiological features. The miracle of Zamzam is its continuous flow since 2000 BC. Zamzam water quenches the thirst and shows potential to cure numerous diseases. Different studies have been conducted to explore the mythical qualities of this water; still there is a need to conduct widespread research and to explore its healthcare

benefits, mineral profile, and technological perspectives. (Asif Ahmad, Sumera Khalid, Anwaar Ahmed & Muhammad Irfan 08 Nov 2013)[3].

Zamzam water: well of Zamzam is located within Wadi Ibrahim in Makkah. The well is about 30.5 meters deep [9].

Temperature: the measured amount of heat in a place or the body[10].
Conductivity: the property of allowing heat or electricity to go through something [10]

dissolved O2: a measure of how much oxygen is dissolved in the water - the amount of oxygen available to living aquatic organisms [11].

Nitrate: in inorganic chemistry, a nitrate is a salt of nitric acid. In organic chemistry, the esters of nitric acid and various alcohols are called nitrates [12].

Density: Mass/Volume, Density often has units of grams per cubic centimeter (g/cm3). Remember, grams are a mass and cubic centimeter is a volume (the same volume as 1 milliliter) [13].

PH: a pH is a unit of measure which describes the degree of acidity or alkalinity of a solution. It is measured on a scale of 0 to 14[14].

Salinity table: Salinity refers to the concentration of soluble salts in soil or water [15].

Researcher: Elaf Al-Ahdal

Research perimeter:
This experiment was conducted in Saudi Arabia-Jeddah to prove the differences in parameters between bottled water and Zamzam water.

Research problem:
Study the differences of parameters between bottled water & Zamzam water.

Research aim & objectives:
The research aim is to explore the differentiation between bottled water and Zamzam water parameter.

Research Questions:
Are there differences between bottled water, and Zamzam water? And what are the differences in the parameters between bottled water, and Zamzam water?

Hypothesis:
The expectations are:

Null hypothesis: There will be no differences between bottled water & Zamzam water at a steady temperature.
Alternative hypothesis: There will be differences between bottled water & Zamzam water at a steady temperature.

Experiment design:

To measure the difference between bottled water and Zamzam water. The following was performed.

1-Tools and devices were borrowed (measurements) from school.

2-the two samples were in the same room for a day (to reach the same temperature).

3-All the measurements were taken at the same temperature.

4-The experiment was conducted on the same day (2/26/2020).

5- Data are analyzed to find any possible trends that may help in concluding.

6-Having the above data enabled the researcher to validate or negate the hypothesis.

Experiment tools:

1-Digital Thermometer (by using acidity device)

2- Manual temperature

3-Dissolved O2 measurement device

4-Nitrate measurement device

5-PH Water acidity measuring device

6-Density measurement device (hydrometer)

7-Conductivity measurement device

8- salinity table [1]

9- a pen and a paper

10- computer for data analysis

11- glass tube

Experiment steps:

1-Bring Zamzam water from Makkah.

2-Bring bottled water from the desalination plant

2-Put both samples at the same temperature (same room).

3-Measure the following parameter:

Measure Conductivity

Measure water temperature by using alcohol thermometer, and digitally by using the acid device

Measuring water specific gravity (Density) using a hydrometer (260ml bottled & Zamzam water).

Analytical Dissolved O2

Analytical Nitrate

4-The data was reflected in graphs to find trends.

5-Data was compared between bottled water and Zamzam water.

Results:

Table (1): shows the data that was collected during the experiment.

Water type	Bottled water					Zamzam water				
Measurements/repeating times	1	2	3	4	SMA (simple moving average)	1	2	3	4	SMA (simple moving average)
Manual temperature (C°)	26	26	26	26	26	26	26	26	26	26
Digital temperature (C°)	27	27	27	27	27	27	27	27	27	27
Conductivity (µS/cm)[3]	179	185	192	178	184	673	685	672	669	675
Dissolved O_2 ppm (mg/L) [5]	10	10	-	-	10	8	8	-	-	8
Nitrate ppm (mg/L) [5]	0	0	-	-	0	6	8	10	-	8
acidity or alkalinity (PH)	8.3	8.4	8.2	-	8.3	8.6	8.7	8.6	-	8.6
Density ppm (g/cm^3) [1][13]	1000	1000	1000	1000	1000 (1)	1010	1010	1010	1010	1010 (1.01)
Salinity [1]	4					17.4				

Graphs and photos:

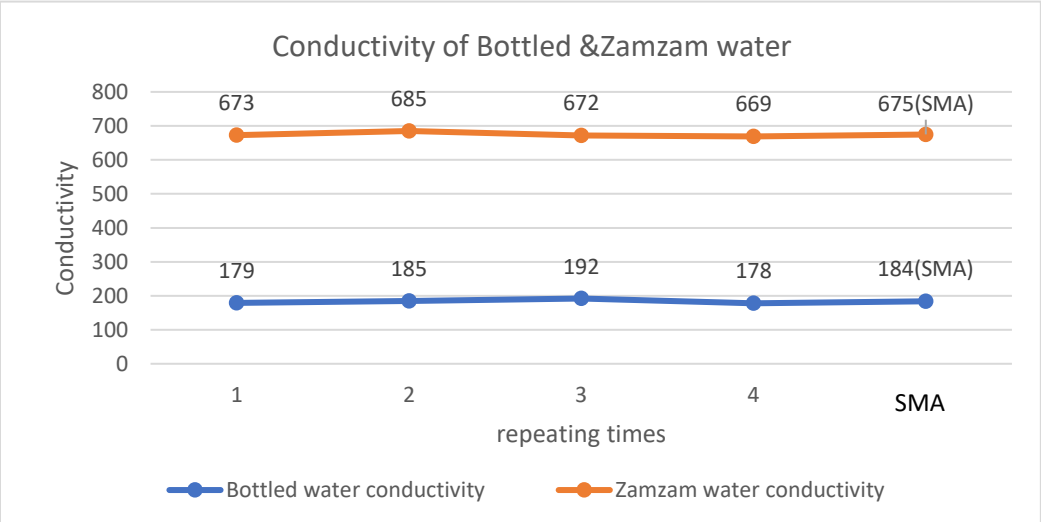
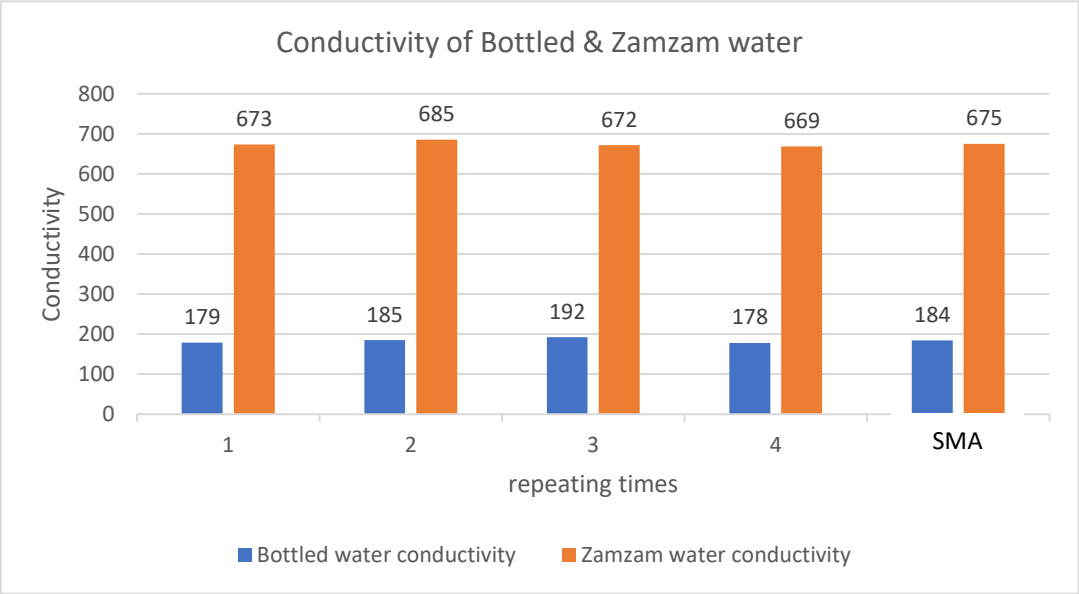


Figure (1): the graph shows the conductivity for Bottled & Zamzam water. It is evident from the graph that the arithmetic average of zamzam water is higher than bottled water.



Figure(2): The bar chart shows the conductivity for Bottled & Zamzam water. It is evident from the graph that Zamzam water has higher conductivity than bottled water.

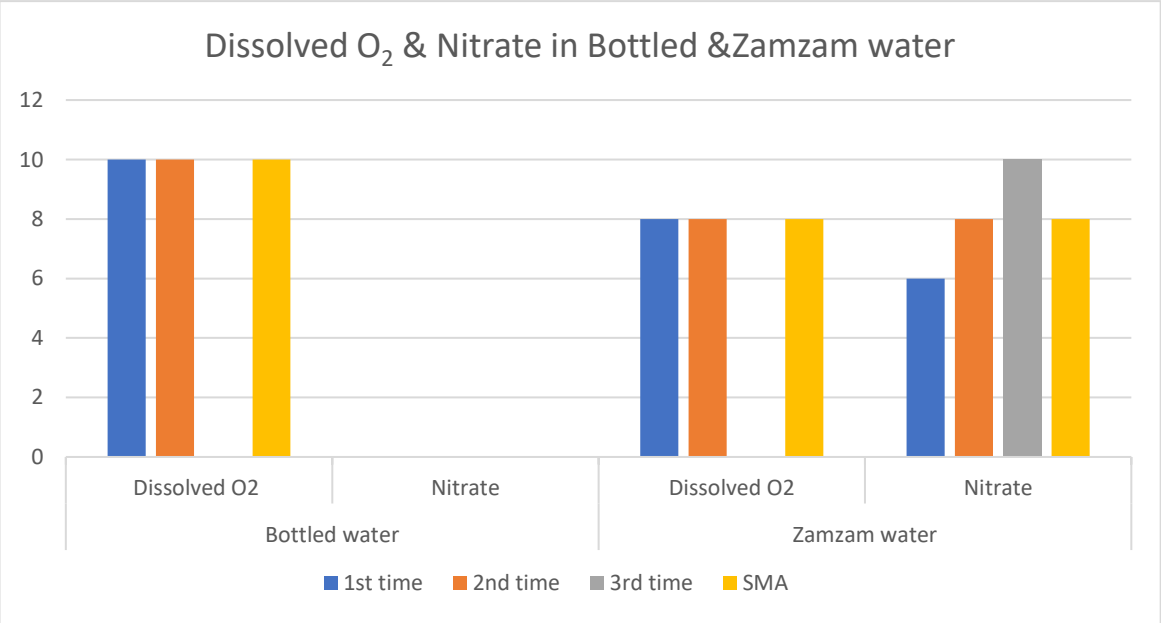


Figure (3): shows the Dissolved O_2 & Nitrate in Bottled & Zamzam water. It is evident that Dissolved O_2 is higher in Bottled water than Zamzam water. Also, Nitrate in Zamzam water was 8 whereas in bottled water Zero.

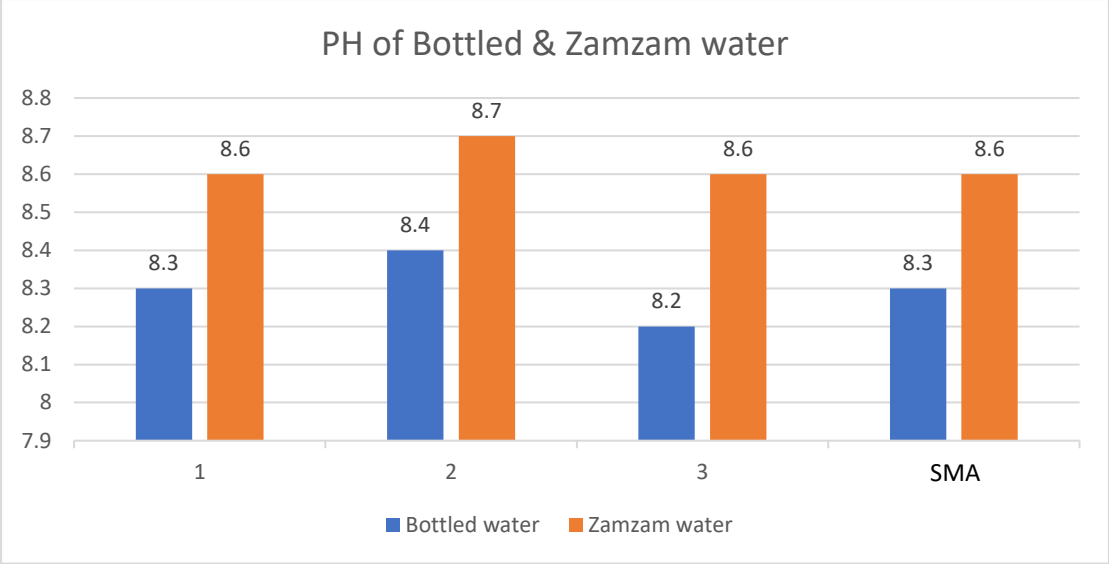


Figure (4): shows the PH in bottled & Zamzam water. Zamzam water slightly has a higher PH than bottled water.

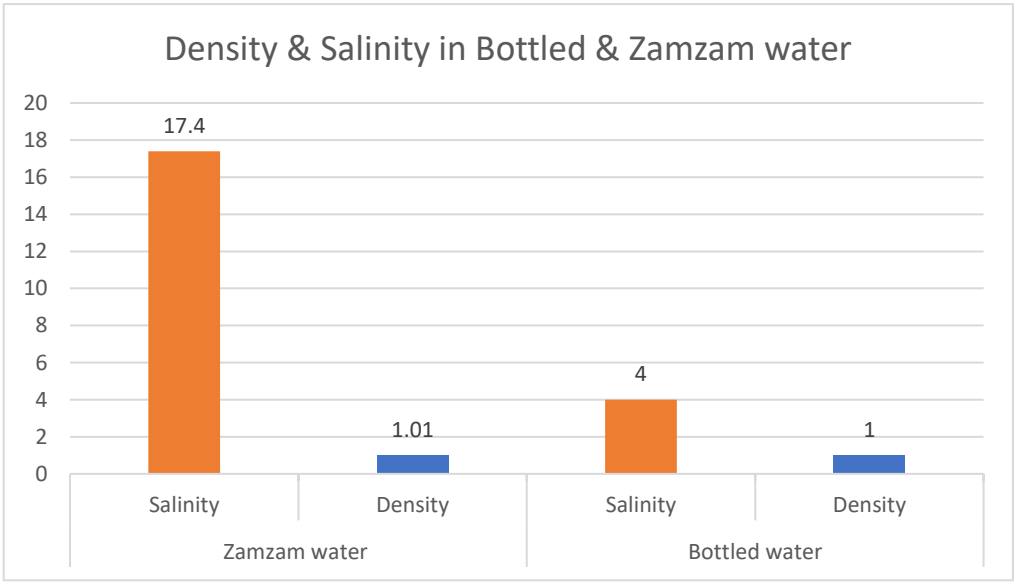


Figure (5): Display the density and Salinity in Bottled & Zamzam water. It is clear that Zamzam water has a high density, in turn, the salinity is high too.

Figure (6): Analytical Dissolved O_2.

Figure (7): Measuring PH & temperature digitally by using acid device.

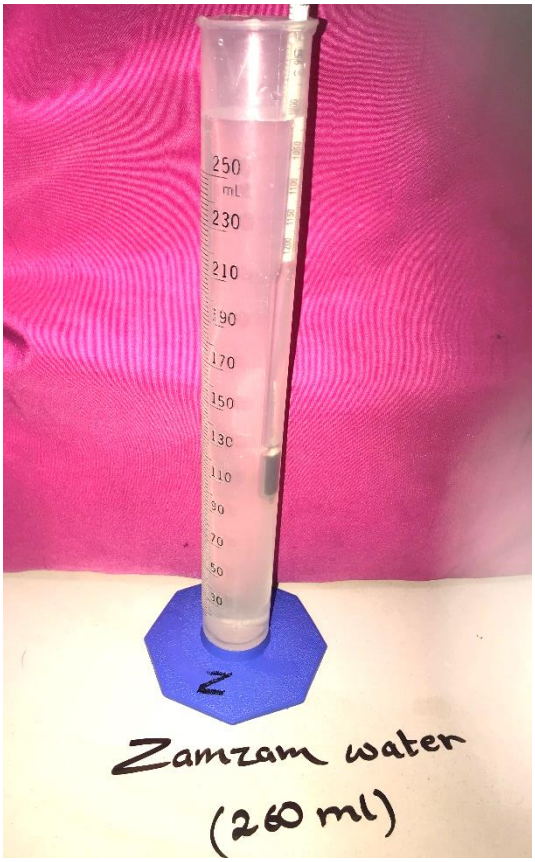


Figure (8): Measuring water specific gravity (Density) using a hydrometer (260ml bottled & Zamzam water).

Figure (9): Analytical Nitrate.

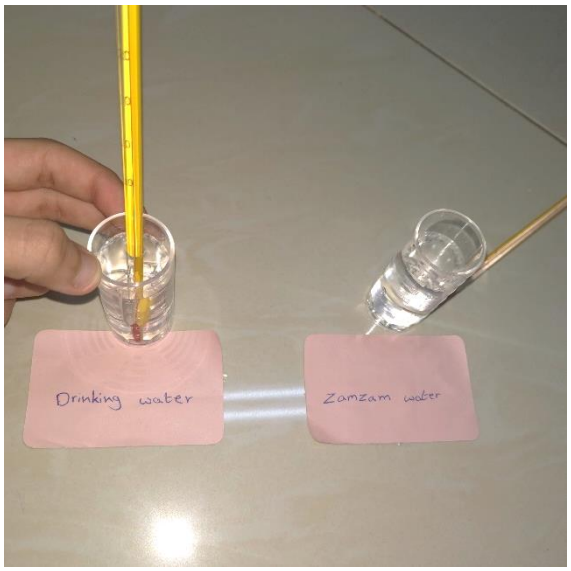


Figure (10): Measuring water temperature by using alcohol thermometer.

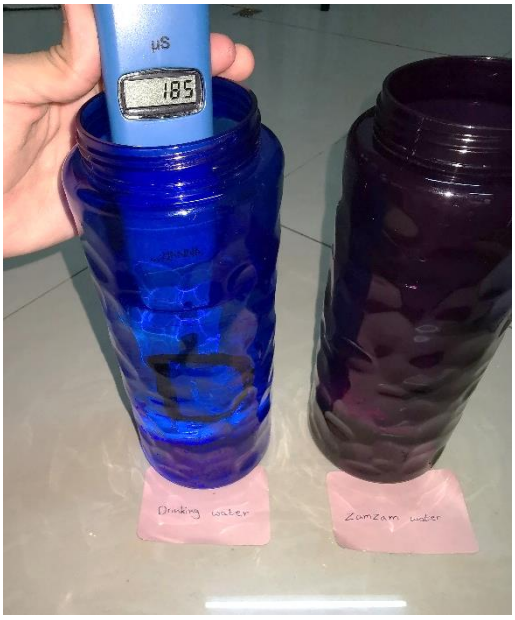


Figure (11): Measuring Conductivity.

Analysis:

Graphs and data show the following:

Figure (1) and (2) show Conductivity for bottled & Zamzam water. Zamzam water presented higher conductivity than bottled water. The simple moving average conductivity of Zamzam water is 675 whereas bottled water is184. Figure (3) illustrates Dissolved O2 & Nitrate in Bottled & Zamzam water. It is apparent that Zamzam water dissolved oxygen is lower than bottled water dissolved oxygen by 2 ppm mg/L. The Nitrate in Zamzam water is totally different where it is about 8 ppm mg/L while bottled water is Zero.

Figure (4) manifests the PH in bottled & Zamzam water. Hydrogen ion concentration in Zamzam water was slightly higher than in bottled water, but both are alkalinity because they are above 7. The simple moving average PH of Zamzam water is 8.6 whereas bottled water is 8.3. Figure (5) Display the density and Salinity in Bottled & Zamzam water. It is clear that Zamzam water has high density, which is 1.01 in turn, its salinity is high to it is about 17.4. While bottled water density is 1, and its salinity is about 4.

Discussion:

Several studies proved that the relationship between conductivity & density is positive, which means whenever conductivity increases the density increase too. Also, the relation between density & salinity is positive. Moreover, whenever the temperature decreases the dissolved O2 increases [16]. nitrates (or nitrites) are natural chemicals that are found in the soil, air, and water. Nitrates are also used as a food additive to stop the growth of bacteria [17]. Some of these facts were proven in this research.

Conclusion:

Water is one of the most important substances on earth. All plants and animals must have water to survive. If there was no water, there would be no life on earth [7]. The table, graph, and bar charts show that there are differences between bottled water & Zamzam water. Zamzam water shows differences in PH, conductivity, dissolved O2, nitrate, density, and salinity at a steady temperature. This experiment(research) supports the alternative hypotheses which say's "there will be differences between

bottled water, and Zamzam water". Indeed, all the graphs testified that there is a vast difference between the 2 categories (bottled & Zamzam water).

Recommendations and Future research:

- Sterilize contaminated water by new applications and compare them with the standard criteria of the healthy water.
- Use more parameters to compare bottled water & Zamzam water.
- Comparison between bottled & Zamzam water in different temperatures.

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Several studies proved that the relationship between conductivity & density is positive, which means whenever conductivity increases the density increase too. Also, the relation between density & salinity is positive. Moreover, whenever the temperature decreases the dissolved O2 increases =. nitrates (or nitrites) are natural chemicals that are found in the soil, air, and water. Nitrates are also used as a food additive to stop the growth of bacteria	**S**cience has been used to measure temperature, conductivity, dissolved O2, nitrate, PH, density, and salinity. The **t**echnology has been used in many things, such as measuring by Globe measurement, Tables and graphs are used in mathematics, search for background literature, and some facts. **E**ngineering has been used in tables and graphs. **M**ath has been used in calculation such as the measurements density, salinity etc…	An Electrical Engineer helped me Sr. Project Engineer Esam Al-Ahdal to complete my research, and offer me the right guidance. Ms. Manal Al-Nami guided me , she is STEM trainer.	-I needed a help from a computer teacher in some technical things. -I was helped by teacher Manal Al -Nami to complete my research. -My father helped me in taking some measurements, and writing research. -My mother Souad Sindi helped me to find the right statisthics (Background literature). -Participating school students through constructive criticism of the research and inform them of the Globe program.

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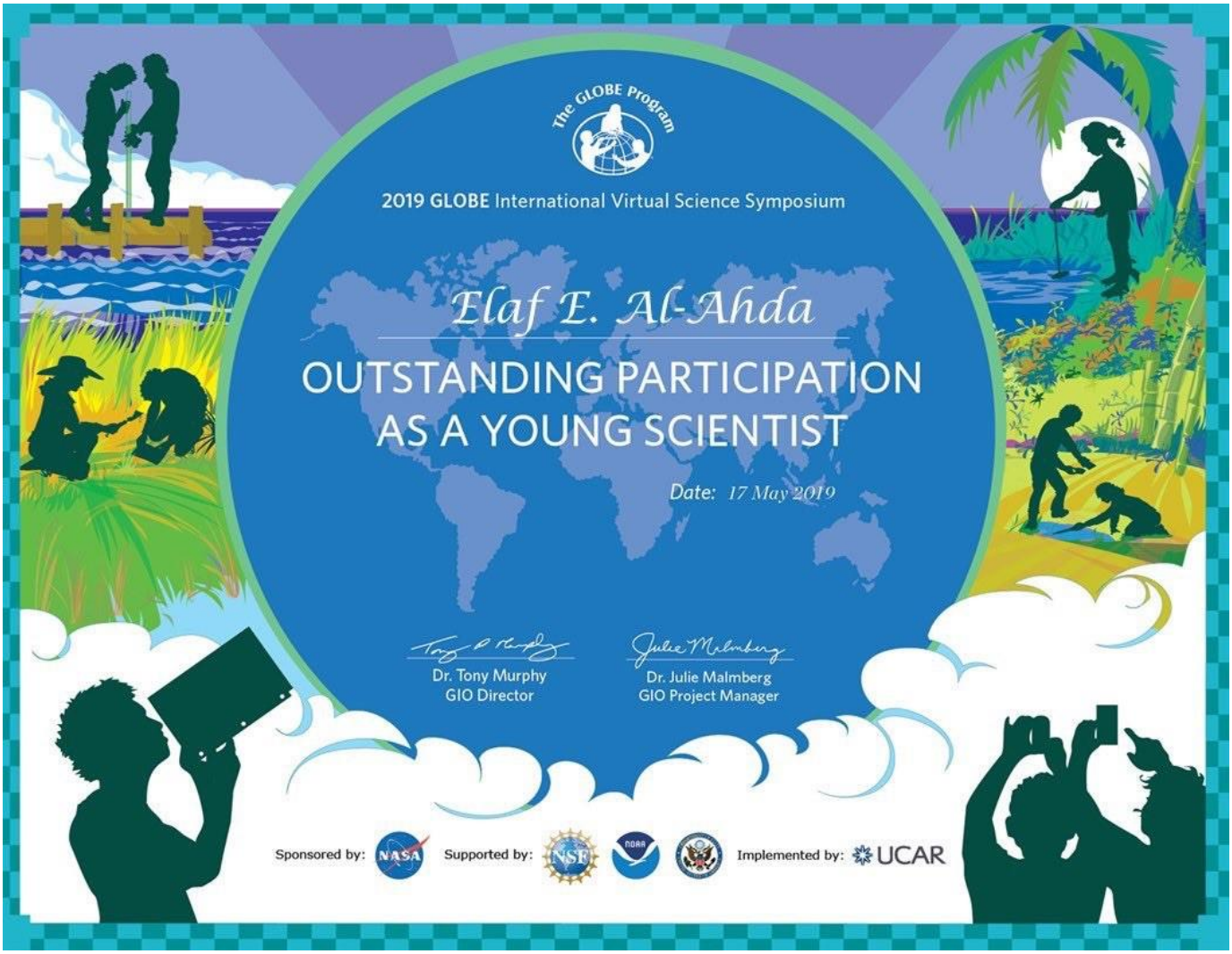
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