A Comparative Study of Water Quality in Natural Ponds and Concrete Ponds at Wichienmatu School, Trang, Thailand

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Abstract

Research name: A Comparative Study of Water Quality in Natural Ponds and Concrete Ponds at Wichienmatu School, Trang, Thailand

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The research on comparing the water quality in natural ponds and concrete ponds at Wichienmatu School, Trang Province, aims to study the water quality in these two types of ponds within the school. The water quality was assessed by measuring pH levels, water temperature, water transparency, and dissolved oxygen content. The experiment found that The study found that the water quality in the natural pond and the concrete pond differs significantly. The pH level in the natural pond was 7.6, indicating a slightly alkaline condition, while the pH level in the concrete pond was 7.0, which is neutral. However, both values remain within a suitable range for aquatic life. Regarding water temperature, the concrete pond had a higher average temperature of 32.33°C, compared to 28.33°C in the natural pond. This difference may be due to the concrete pond's ability to absorb and retain heat more effectively than the natural pond. Additionally, the dissolved oxygen (DO) concentration was higher in the concrete pond, averaging 3.67 mg/L, while the natural pond had a lower average of 2.0 mg/L. This difference could result from variations in water circulation and biological composition between the two ponds. Meanwhile, water transparency was greater in the natural pond, suggesting a lower presence of suspended solids and microorganisms compared to the concrete pond.

Based on the findings, it can be concluded that the natural pond provides a more balanced biological environment as it supports the survival of aquatic organisms under natural conditions. However, the natural pond tends to contain more suspended solids and organic matter, which may impact water quality and cleanliness. If the water is to be used for consumption, additional treatment may be required to ensure its suitability for use.

Keywords: Concrete pond, Natural pond, Water quality, Wichienmatu School

Introduction

Background and Significance

Water is an essential natural resource for the survival of humans, plants, and animals. It exists in various forms, including surface water sources such as rivers, canals, and lakes, as well as groundwater stored in aquifers. Water plays a crucial role in ecosystems and is a fundamental factor in human activities, including consumption, agriculture, industry, and energy production.

In terms of human health, water is a primary component of the body and contributes to metabolic processes, waste excretion, and temperature regulation. In daily use, water is required for drinking, bathing, and cooking, directly impacting public hygiene. In agriculture, water is vital for crop cultivation and livestock farming, ensuring sufficient food production. In industry and energy sectors, water is used in manufacturing processes and hydropower generation. Additionally, water helps maintain environmental balance by being a part of the ecosystem and contributing to natural waste treatment.

Research Question

Are there significant differences in water quality between natural ponds and concrete ponds?

Research Hypothesis

The water quality in the concrete pond at Wichienmatu School differs from that of the natural pond.

Related Variables

Hypothesis:

The water quality in the concrete pond at Wichienmatu School differs from that of the natural pond.

Independent Variable:

The type of water source natural pond and concrete pond at Wichienmatu School.

Dependent Variable:

The measured water quality parameters in both ponds.

Controlled Variables :

Time of water sampling, Type of containers used for water collection, Specific locations where water quality measurements were taken.

Materials and Equipment

-Universal indicator paper (pH paper)

-Thermometer

-Dissolved oxygen test kit

-Secchi disk

-Sample containers for water collection

Research Procedure

Study Site Selection

The study was conducted at designated locations within the natural pond and the concrete pond at Wichienmatu School.

Part 1: Measuring pH Using pH Paper

1. Rinse the sample container with the pond water twice.
2. Collect a sufficient amount of water in the container.
3. Dip a strip of pH paper into the water sample.
4. Compare the color change on the pH paper to the reference chart provided with the pH paper.

Part 2: Measuring Water Temperature Using a Thermometer

1. Submerge the thermometer approximately 10 cm below the water surface for 3–5 minutes.
2. Read the temperature at eye level while keeping the thermometer submerged.
3. Repeat the measurement twice more, allowing a different researcher to read the thermometer each time.
4. Record the temperature in degrees Celsius (°C) and calculate the average.

Part 3: Measuring Water Transparency Using a Secchi Disk

1. Lower the Secchi disk into the water vertically until the markings on the disk are no longer visible. Mark the depth on the rope.
2. Lower the disk slightly deeper, then slowly raise it until the markings reappear. Mark this second depth.
3. Calculate the average of the two recorded depths to determine the water transparency level.
4. If the Secchi disk reaches the pond bottom while still visible, record the transparency as being greater than the depth at which the disk settled.

Part 4: Measuring Dissolved Oxygen Levels

1. Rinse the sample collection cylinder underwater 2–3 times, then fill it completely and seal it underwater to prevent air bubbles.

2. Carefully open the cylinder and add 2 drops of reagent #1, followed by 2 drops of reagent #2. Seal the container and mix gently. A yellow-brown precipitate will form if oxygen is present.

3. Allow the precipitate to settle halfway in the cylinder.

4. Add 5 drops of reagent #3, seal the cylinder, and shake gently until the precipitate dissolves completely. The sample should turn yellow.

5. Transfer 5 mL of the treated sample into a new test tube.

6. Add reagent #4 drop by drop, shaking gently after each drop, and count the number of drops added. When the sample turns light yellow, add 2 drops of reagent #5, turning the sample blue.

7. Continue adding reagent #4 drop by drop until the sample becomes colorless.

8. The number of drops added corresponds to the dissolved oxygen concentration in milligrams per liter (mg/L).

Research Results

Table 1: pH Values of Water from Natural Ponds and Concrete Ponds at Wichienmatu School, Trang Province

Measurement	pH value	
	Water in Natural Ponds	Water in Concrete Ponds
1st time	7	7
2nd time	8	7
3rd time	7	7
Average	7.67	7

Research Results Part 1

The pH measurement results indicate that the average pH of the natural pond water is 7.6, which falls within the slightly alkaline range. In contrast, the average pH of the concrete pond water is 7.0, which is neutral. The comparison of pH values between the two water sources shows that the natural pond water is slightly more alkaline than the concrete pond water. However, both values remain within a range suitable for the survival of aquatic organisms.

Table 2: Water Temperature Measurements from Natural Ponds and Concrete Ponds at Wichienmatu School, Trang Province

Measurement	Temperature (˚C)	
	Water in Natural Ponds	Water in Concrete Ponds
1st time	28	33
2nd time	29	32
3rd time	28	32
Average	28.33	32.33

Research Results Part 2

The water temperature measurements show that the natural pond water has an average temperature of 28.33°C, while the concrete pond water has an average temperature of 32.33°C, which is significantly higher. This temperature difference may be attributed to the structure of the concrete pond, which absorbs and retains heat from sunlight more effectively than the natural pond.

Table 3: Water Transparency Measurements from Natural Ponds and Concrete Ponds at Wichienmatu School, Trang Province

Measurement	Transparency (m)	
	Water in Natural Ponds	Water in Concrete Ponds
1st time	> pond depth	0.47
2nd time	> pond depth	0.43
3rd time	> pond depth	0.45
Average	> pond depth	0.45

Research Results Part 3

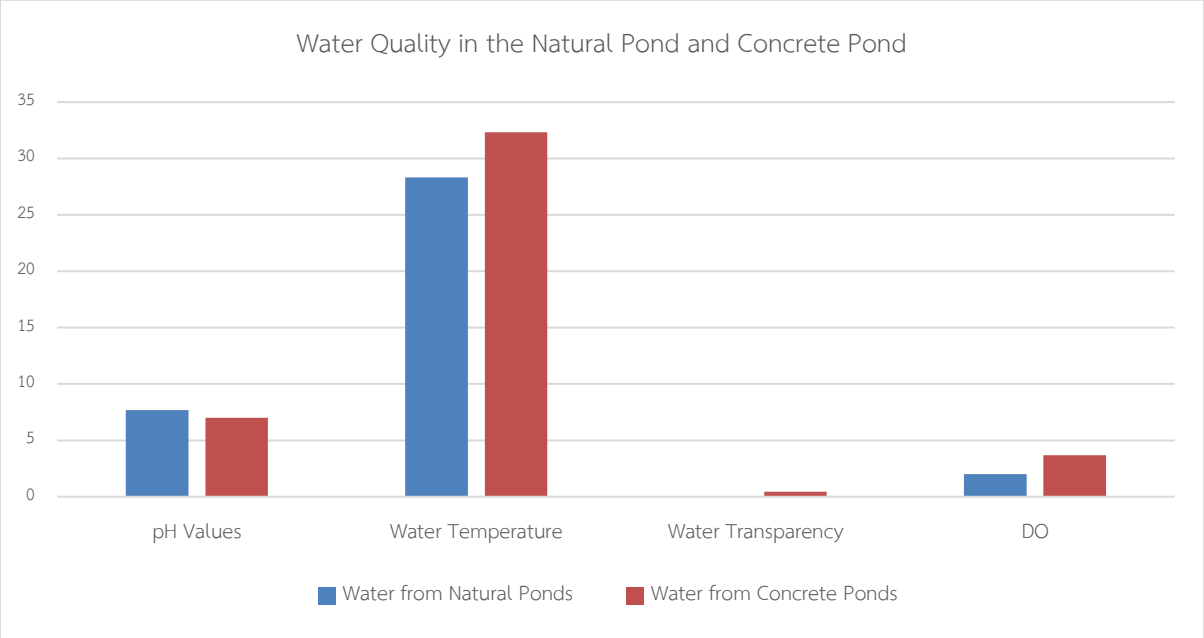
The water transparency measurements reveal that the natural pond water is less transparent than the concrete pond water due to the accumulation of sediments and biological activities occurring naturally. The average transparency of the natural pond water is 0.45 meters, indicating a higher presence of suspended solids and microorganisms compared to the concrete pond water.

Table 4: Dissolved Oxygen Concentration from Natural Ponds and Concrete Ponds at Wichienmatu School, Trang Province

Measurement	Dissolved oxygen (mg Oxygen/L)	
	Water in Natural Ponds	Water in Concrete Ponds
1st time	2.0	4.5
2nd time	2.0	3.5
3rd time	2.0	3.0
Average	2.0	3.67

Research Results Part 4

The dissolved oxygen measurements indicate that the natural pond water has an average dissolved oxygen level of 2.0 mg/L, which is lower than that of the concrete pond water, which has an average dissolved oxygen level of 3.67 mg/L. This difference in dissolved oxygen levels may result from variations in water movement, the presence of aquatic organisms, and biological processes occurring in each water source.



Bar Chart Showing the Average Water Quality Measurements from the Natural Pond and Concrete Pond

From the bar chart displaying the average values of pH, temperature, dissolved oxygen (DO), and water transparency, it was found that the pH level in the natural pond is slightly higher than that in the concrete pond, but both remain within a suitable range for aquatic life. Meanwhile, the water temperature in the concrete pond is significantly higher than in the natural pond, likely due to the concrete structure's ability to absorb and retain heat. Additionally, the dissolved oxygen (DO) concentration in the concrete pond is higher than in the natural pond, which may affect the ability of aquatic organisms to survive. At the same time, the water transparency in the natural pond is greater than in the concrete pond, indicating a lower presence of suspended particles. Based on the analysis, it can be concluded that the environmental conditions of water in the natural and concrete ponds differ significantly, which may impact the aquatic ecosystem and overall water quality in each pond.

Conclusion and Discussion

The study found that the water quality in the natural pond and the concrete pond differs significantly. The pH level in the natural pond was 7.6, indicating a slightly alkaline condition, while the pH level in the concrete pond was 7.0, which is neutral. However, both values remain within a suitable range for aquatic life. Regarding water temperature, the concrete pond had a higher average temperature of 32.33°C, compared to 28.33°C in the natural pond. This difference may be due to the concrete pond's ability to absorb and retain heat more effectively than the natural pond. Additionally, the dissolved oxygen (DO) concentration was higher in the concrete pond, averaging 3.67 mg/L, while the natural pond had a lower average of 2.0 mg/L. This difference could result from variations in water circulation and biological composition between the two ponds. Meanwhile, water transparency was greater in the natural pond, suggesting a lower presence of suspended solids and microorganisms compared to the concrete pond.

Based on the findings, it can be concluded that the natural pond provides a more balanced biological environment as it supports the survival of aquatic organisms under natural conditions. However, the natural pond tends to contain more suspended solids and organic matter, which may impact water quality and cleanliness.

Recommendations If the water is to be used for consumption, additional water treatment may be necessary to ensure its suitability for use.

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