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High School Department
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Senior High School Main Campus

A MICROCONTROLLER-BASED WATER LEVEL INDICATOR USING ARDUINO WITH PH SENSOR

A **Research Proposal**

Presented to the Faculty of the Senior High School - Main Campus

Liceo de Cagayan University

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In Partial Fulfillment

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Science, Technology, Engineering and Mathematics

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Chapter III

RESEARCH METHODOLOGY

This chapter represents the strategy and procedures on how the researchers will conduct this study. It includes the methods employed by the researchers as well as the tools and procedures utilized to collect the essential data for the study.

3.1 Research Design

To evaluate the functionality and performance of a microcontroller-based water level indicator integrated with a pH sensor in monitoring water quality in a specific environment. The researchers will conduct quasi-experimental research to determine the water level using an ultrasonic sensor HC- SR04 with a pH sensor. This quasi-experimental research methodology will assist the researchers in determining the efficiency of the microcontroller-based water level indicator with a pH sensor in water quality monitoring by considering into factor of practical limits in real-world environmental conditions.

3.2 Research Procedure

a. Gather all components: Arduino, Breadboard, LED (Green, Orange, Red), Buzzer, Ultrasonic HC- SR04, Jumper Wires, Resistor (220 ohms), pH Sensor, PCB Board Amplifier, LCD.

b. **Assemble LED on breadboard**

Use LED of 3 different colors: Green (indicating Low Water Level), Orange (indicating

Moderate Water Level), and Red (indicating High Water Level)

Each LED's cathode should be connected to the breadboard's power line. Connect the LED's anode to various nodes. Then, wire connects each LED in series with resistors (220 ohms).

c. Make connections with Arduino and LED

Make connections for LED with digital pins on arduino as follows:

RED LED wired to Digital Pin 13

ORANGE LED wired to Digital Pin 12

GREEN LED wired to Digital Pin 11

d. Connect Water Sensor with Arduino

With the Water Sensor pins connected to the Arduino Pins. Connect the negative (-) pin to the GND on the Arduino with a wire. Connect the positive (+) pin to the VCC on the Arduino. Connect the (S) pin to A0 on the Arduino with wires provided

e. Connect the buzzer

Attach the buzzer positive to Arduino's Digital Pin 8 and negative to ground

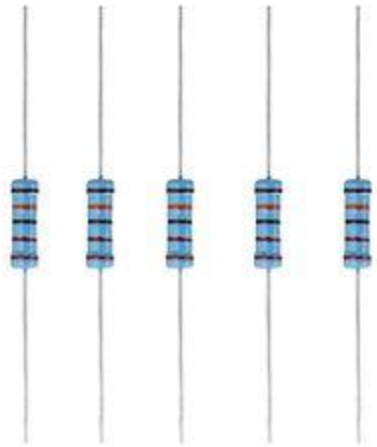
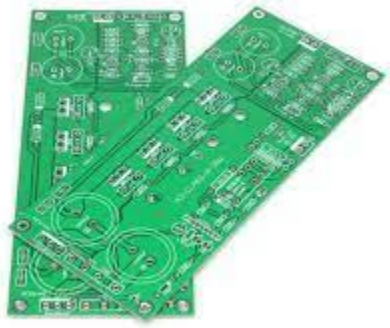
Make connections of pH Signal Conversion Board with Arduino: Connect V+ to Arduino's 5V and Connect G to Arduino's GND, then Connect Po to Arduino's A0

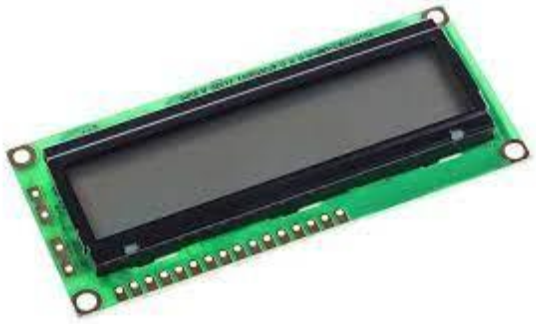
3.3 Research Materials and Methods

The materials that the researchers will use are listed below:

	**Arduino** - serves as the microcontroller in this project. It is the brain of the system, responsible for processing data from various sensors and controlling the output devices.
	**Breadboard -** is a platform for developing and constructing electronic circuits without the use of solder. It enables simple and temporary component connections, promoting experimentation and testing.
	**LEDs** - are employed as visual indicators. varying colors can indicate varying volumes of water, making it simple for consumers to grasp the data.

	**Buzzer** - is probably employed to provide an auditory alert or alarm. It can be activated when the water level reaches a certain level or when particular conditions are recognized, such as abnormal pH values.
	**Ultrasonic HC - SR04 -** is a flexible component that measures distance using ultrasonic waves. It can be critical in estimating the distance between the sensor and the water surface in the context of a water level indicator.
	**Jumper Wires** - are used to link the different components on the breadboard. They give a simple and flexible technique of connecting things.

	**Resistor** - is probably employed to limit the current flowing through the LEDs in order to keep them from burning out. To ensure appropriate operation, resistors are typically connected in series with LEDs.
	**pH Sensor** - is used to determine if the water is acidic or alkaline. This information can be useful in monitoring water quality. A high pH level may suggest pollution or other problems.
	**PCB (Printed Circuit Board)** - amplifier can be used to amplify signals from sensors or other components. This can improve sensor reading accuracy and dependability.

	**LCD (Liquid Crystal Display) -** is most commonly used to show water levels and pH readings in numeric or graphical form. It acts as a user interface, making information more accessible and usable.

METHODS:

Planning: The research strategy is developed during this phase, which specifies the objectives, system design, and expected outcomes. Setting the parameters for the research, such as the range of water level measurements and pH values to be examined, is part of the planning process.

Material Gathering: This step entails acquiring the essential hardware components and electronic materials, such as the Arduino microcontroller, pH sensor, liquid level sensor, and display unit, as well as other system-building components.

Building: The physical assembly of the system, incorporation of the specified hardware components, and configuration of the electronic connections to form the working water level indication system are all part of the building process.

Testing: immediately after this, the system is rigorously tested. Testing entails assessing the system's ability to reliably measure water levels and pH readings. It also entails recognizing any potential problems or constraints.

3.4 Data Gathering

In gathering the data, the researchers will utilize table sheets and will list the gathered data in every trial and error, the data collected in table sheets will help the researchers determine how

accurate the measurement and alkalinity of the sensor.

3.5 Statistical Analysis

In order to further enhance the study by evaluating the alkalinity present in water, the researchers will employ regression analysis to ascertain whether the variables are related to one another. Additionally, they will investigate whether the ultrasonic HC-SR04 is compatible with the pH sensor installed.

3.6 Coding of Data