Water for Life

Program Outline

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"Everyone has the right to sufficient, continuous, safe, acceptable, physically accessible, and affordable water for personal and domestic use." Stated by United Nations of General Assembly in 2010.

Water is essential to sustain our lives. A supply of clean water is an essential requirement for the establishment and maintenance of diverse human activities. Safe and readily available water is important for public health, whether it is used for drinking, domestic use or recreational purposes. Water resources provide valuable food through aquatic life and irrigation for agriculture production. Improved water supply and sanitation, and better management of water resources, can boost our country economic growth and can contribute greatly to poverty reduction. Almost one tenth of the global disease burden could be prevented by improving water supply, sanitation, hygiene and management of water resources.

Generally, knowledge, personal development and engineering skills are the main drives behind this program's outline and practices. As scientific knowledge is the base for inventing, this program is designed to expose you to different fields of sciences. Knowing that safe, drinking water must meet the standard guidelines published by World Health Organization (WHO). You will need to get closer look at the relation between water and microbiology. Chemical and physical assays of water are essential issues that you should be aware of. You also will need to collect some data and information regarding the epidemics of various diseases transmitted by water. In addition, the program is dedicated to improving your personal skills. As you are approaching the end of phase one, you will collect several data about the previous solutions that tried to address this problem. At the end of the first phase, preparation phase, you will design your solution.

In the second phase, you will determine the problem you are addressing and the design requirements that you must achieve. Now you will use your knowledge you acquire to design your solution. Therefore, the engineering design process (EDP) is an essential part of this phase. You make several studies using the rules you have learnt, and simulate your product using different stimulation programs. Here comes the most interesting part when you transform your innovation into reality and begin to test. Seeing your first prototype is a very proudful moment. However, all errors come here. As a problem-solver is an iterative process, you are expected to re-design, re-implement your product. Don't worry about complexity. Your instructors are here to help you. Be prepared for the challenge to begin!

Program Skills structure

The main goal of this program is to train minds to think; we aim to allow young leaders to move freely in science to come up with a brilliant solution to our grand challenges – we believe they will. Mainly the program concerns about developing skills rather than memorizing and that is the main base for the project-based learning. The journey here involves acquiring knowledge, understanding how nature works as this would be the main target of the program. Then follows teamwork skills. We cannot do significant something alone. Teamwork is a guarantee for maximum efficiency. You will involve with your team members discussing the solution and implementation. As disputes are inevitable at the beginning, by time, you will acquire the skills to discuss efficiently. Then comes the practical application for which the team is constructed for. You and your team begin to describe resources, find a solution for the problem and make and design. However, in your design, you must consider cost and efficiency which is part of designing and practical work skills. It's a wonderful experience.

Scientific and knowledge skills

Science and knowledge are guiding our revolution in the twenty-first century. Their existence is of great importance for efficient design. Without knowledge, we are not expected to apply it, which is what problem-solvers do. Here, students will study the scientific topics from their basics and at the same time will enjoy the beauty of it by making fun experiments.

Engineering and Hands-on skills

Different form experiments, here, you are using knowledge to make a prototype with a specific function that helps humans in somehow. You will work according to the engineering design process where you are considering the problem, find the solution and test your prototype. Nothing is more existing than creating your model from scratch, and watching it works. You will enjoy the taste of your first treated cup of water.

Personal and Teamwork Skills

For large projects, humans are required to work in groups to increase efficiency and productivity. Acquiring such skills is essential and thus, the program is concerned about improving your teamwork skills. You will be experienced opposition from members and hard times, but above all you will learn how to discuss your points and shows your weaknesses and strengths. By time, your communication skills will be developed until you're able to persuade. From this point, it's the way to business and management skills. You're expected to make a business plan for your project in which you market your project.

Program progress phases

Program Structure:

The program is designed to enhance students' personal skills and development, academic skills, and engineering and practical skills. The program consists three phases; each phase will last 4 weeks with 2 sessions per week:

1. Preparation Phase – 4 weeks, 8 sessions.
2. Designing Phase – 4 weeks, 8 sessions.
3. Implementation Phase – weeks, 8 sessions.

Phase 1 – Preparation

In this phase you will be introduced to the principles of water analysis, quality control, organic and inorganic pollutants, fluid mechanics, microbiology and infections, and ecofriendly techniques of analysis and treatments. You will also be introduced to traditional methods of water treatments as well as new alternative environment-friendly approaches. The objective skills set for this phase are:

1.S: Scientific and knowledge content

You will be introduced to qualitative and quantitative techniques of water analysis. Through this phase, microbial, chemical and radiological aspects of drinking-water are studied. Thus, you will be able to check acceptable levels of pollutants and ensure that the water is pathogen free. Also, you will learn the basis upon different filtration techniques is based.
After this journey you will be ready to witness the future and afford your efforts aiming to save your ecosystem from all harms done by contaminated water.

1.E: Engineering Practices

After this phase students should be able to use analytical glassware to accurately measure ions and report the results. Students should accurately use pH meter to determine the acidity of water. Students should be able to cultivate bacteria on agar plate. Case studies for selected topics and techniques along with review articles of antibiotic resistance and microbial contaminations, diseases transmitted by water, quantitative determination of different kinds of ions and chemical compounds in water. You will also inspect real life engineering application of the topics studied in the scientific sections that include titration, bacterial cultivation and calculations of concentrations. Measuring key factors for efficiency and optimization will be assessed. In this part, students will appreciate the role that science plays in their real life.

1.H: Hands on Activities and checkpoint assignment

Here comes the part where we start playing around and building our own small-scale prototypes. Hands-on activities will run in parallel with the scientific content and the engineering practices so that students can apply what they study. Students will quantitatively and qualitatively determine ions in water by titration. They will also check the pH by both pH meter and calculations after titration. They will have a checkpoint assignment in which they determine the chemical, and physical properties of water and check the concentrations of ions by titration.

Phase 2 – Design

In this phase you will be through something exciting, learning whatever it takes to start designing your project. Students will be asked to analyze water and make a report. Also, they will be introduced to real applications of potentiometry. CAD Software, design structure, mechanisms, electronics, microcontrollers, sensors, motors, simulations Apps, etc.

2.S: Scientific and knowledge content

Microbiology, inorganic ions, organic pollutants, chemical analysis, titration. Students will study design mechanisms and principal components of an efficient design.

2.E: Engineering Practices

After this phase students should be able to use analytical glassware to accurately measure ions and report the results. Students should start to apply their hypothesis and solution by reasonable methods. Ion determination by potentiometric electrodes, acid-base titration, CAD (Solid Work), factorial design (Minitab), Simulation and Test parameters (LabView).

2.H: Hands on Activities and checkpoint assignment

Complete water analysis report (qualitative and quantitative). Complete CAD and Simulation test of the chosen solution/project with all features (Titration, Analysis, Control, Sensors, etc.). Specify what exactly your project will achieve and how this can be authentically measured.

Phase 3 – Implementation

In this phase, all your dreams shall come true. It will completely be dedicated to building your project from scratch. Enough about theories and formulas or equations, it's time to put all the designs and simulations into a real thing. you will not succeed from your first attempt. But don't worry we got your back. Together we shall redesign and modify the project: this is the fun part. Debugging and modification is the last step before you see your work doing what it is supposed to do.

3.E: Engineering Practices

Minitab, real time components testing, re-Design and re-Implement and retesting.

3.H: Hands on Activities and checkpoint assignment

Project construction, and testing. This is the part of pride and appreciation. In this part, you will watch your project doing what it is supposed to do. You will witness the effort that you have put into this project turning to success.