e-Life@KYC

A school-based STEM curriculum

***e-Life**: raising **enthusiasm** for **life** and value education*

e-Life**: enhancing **environment literacy** for the good of our **Earth

Target: S.1- S.2

Objectives:

1. To nurture students' positive values regarding respect for life and environment
2. To promote students' environmental literacy, i.e., understanding, skills and motivation to make responsible decisions regarding environmental protection and conservation for nature, communities and future generations
3. To promote self-directed learning (SDL) through technology-enhanced STEM activities

Other collaborative parties:

1. Civil Education Committee: "One person, one flower" scheme
2. English Language Department: LAC activity – making presentation on STEM products
3. Home Economics: Tailor-making of a microwavable heat bag

Curriculum framework using "Science" as a leading subject:

Level	**S.2**		***Scope***
Theme	**The Commitment of Green Pioneers 綠色先鋒的承擔**		***Personal commitment***
Unit	**7: Living thing and Air**	**9: Acid and Alkali** **11: Force and motion**	
Topic	Design and make an environmental-friendly drip irrigation device for the growth of a pot of flowering plant (*Viola tricolor* 三色菫)*	Competition of gas powered jetboat using vinegar and eggshell powder as environmental-friendly energy sources	
Subject involved	Science, Mathematics, Computer Literacy, Design and Technology	Science, Mathematics, Design and Technology	
Level	**S.1**		
Theme	**The Second Life of Plants 植物的第二生命**		
Unit	**2: Water**	**5: Energy**	
Topic	Prepare saturated solution for competition, and design and make an effective dehumidifier using chemicals and dried leaves (e.g. *Phyllanthus emblica* 油柑葉)	Design and tailor-make a good microwavable heat bag by using beans (e.g. *Vigna angularis* 紅豆) for the elderly	
Subject involved	Science, Mathematics, Computer Literacy, Design and Technology	Science, Home Economics, Mathematics, English	***Environmental and social awareness***

*Species of the flowering plant is subject to the "One person, one flower" scheme

Subject: Science **Level:** S.1

Topic: Prepare saturated solution for competition, and design and make an effective dehumidifier using chemicals and dried leaves

Prerequisite knowledge:
S.1 Science Unit 2 Water: Factors affecting the rate of dissolving, saturated solution

Intended learning outcomes / products:

Scientific investigation	**Design and making**	**Problem solving with mathematical skills**	**Non-disciplinary knowledge/skills/ value**
Scientific investigation on: • Factors of kinds of solute, mass of solute and volume of solvent on the rate of dissolving • Prepare a saturated solution with limited solute and solvent given by the teacher (competition) • Way to measure and compare the efficacy of dehumidifiers using chemicals and dried leaves to absorb water vapour from the environment	• A dehumidifier using calcium chloride (solute used in scientific investigation) / dried leaves (*Phyllanthus emblica* 油柑葉)	• Understand the meaning of relative humidity in percentage • Estimate the mass of solute required for preparing a most saturated solution; and estimate the volume of the container (plastic bottle) needed for collecting the water absorbed (volume of solvent) in making the dehumidifier through mathematical calculations	• Be aware of the disposal problems of commercial dehumidifier using chemical (e.g. calcium chloride) • Nurture students' positive values regarding respect for life (dried leaves) and environment

Curriculum mapping:

Cycle	**Science**	**Mathematics**	**Computer Literacy**	**Design and Technology**
9 (2nd Term)		Understanding the concept of percentage and solve problems involving percentage change		
13-14 (2nd Term)				Construction of a 3D printed rack for assembling a fan on the dehumidifier
17-19 (3rd Term)			Application of micro:bit and sensors	

			Programming using Microsoft MakeCode for micro:bit (Fan system)	
19 (3rd Term)	**Scientific investigation:** Investigation on dissolving different kinds / mass of solute in different volume of solvent (water) **Engineering design:** Designing and making an effective dehumidifier using the solute (calcium chloride) / dried leaves (with the installation of fans) **Scientific investigation:** Investigation of the effectiveness of different dehumidifiers using calcium chloride and dried leaves by prolong measurement of relative humidity in the surrounding air (with the use of Arduino mobile datalogger and relative humidity sensor)			

Subject: Science **Level:** S.1

Topic: Design and tailor-make a good microwavable heat bag by using red beans for the elderly

Prerequisite knowledge:
S.1 Science Unit 5 Energy: Forms of energy, energy conversion, heat transfer

Intended learning outcomes / products:

Scientific investigation	**Design and making**	**Problem solving with mathematical skills**	**Non-disciplinary knowledge/skills/ value**
Scientific investigation on: Factors of sizes (small / medium/ large) and materials (thin cotton, thick cotton, thick cotton with coating) of the microwavable heat bag on heat loss from the surface of the microwavable heat bags	• A microwavable heat bag using red beans for the elderly • A user manual for the elderly • A presentation video of the introduction of the microwavable heat bags	• Calculate the percentage change of temperature of the heat bag surface for 20 minutes during scientific investigation	• Be aware of the disposal problems of commercial heat bag using chemicals • Improve students' tailoring skills • Nurture students' positive values regarding respect for life (red beans) and environment, and caring for the elderly in the society • Enhance students' presentation and communication skills using English

Curriculum mapping:

Cycle	**Science**	**Home Economics**	**Mathematics**	**English**
4-8 (1st Term)		**Engineering design:** Designing and making a microwavable heat bag for the elderly (individual work)		
9 (2nd Term)				Making Presentation of a STEM product: facial mask

9 (2nd Term)			Understanding the concept of percentage and solve problems involving percentage change	
10 (2nd Term)	**Scientific investigation:** Investigation on the factors of sizes / materials of heat bags on the heat loss from the surface of the microwavable heat bags **Engineering design:** Revision of the heat bag by adjusting other variables, e.g. time of microwaving, mass of red beans, etc. Making a user manual for the microwavable heat bag			

Subject: Science **Level:** S.2

Topic: Design and make an environmental-friendly drip irrigation device for the growth of a pot of flowering plant

Prerequisite knowledge:
S.2 Science Unit 7 Living things and air: Photosynthesis

Intended learning outcomes / products:

Scientific investigation	**Design and making**	**Problem solving with mathematical skills**	**Non-disciplinary knowledge/skills/ value**
Scientific investigation on: • Factors of the diameter of rubber tubing, height of the water bottle, number of holes in the rubber tubing etc. on the amount of water dripped from the irrigation device for a fixed period	• An environmental-friendly drip irrigation device using disposable wastes such as wooden chopstick and plastic bottle for the growth of a pot of flowering plant	• Calculate the volume of water collected from the drip irrigation device for 24 hours, and for 7 days (ratios and proportions) • Calculate the percentage change of sizes of the leaves / height of plants during students' observation (if needed by the students)	• Be aware of water shortage, water pollution in developing countries, and problems of disposable wastes during the pandemic • Recognise the advantages of drip irrigation to conserve water • Nurture students' positive values regarding respect for life and environment

Curriculum mapping:

Cycle	**Science**	**Mathematics**	**Computer Literacy**	**Design and Technology**
(S.1)		Understanding the concept of percentage and solve problems involving percentage change		
(S.1) Revision on cycle 11 (2nd Term)			Application of micro:bit and sensors Programming using Microsoft MakeCode for micro:bit (servo system)	
10		Understanding ratios and proportions and		

(2nd Term)		solve daily life problems using ratios and proportions		
11 (2nd Term)				Construction of a 3D printed rack for assembling a servo on the drip irrigation device
12 (2nd Term)	**Engineering design:** Designing and making a device using disposable materials such as plastic bottle and wooden chopsticks that can (a) stand and (b) release water drop by drop into the soil for irrigation and water conservation purpose **Scientific investigation:** Investigation on the factors such as the position (height) of the plastic bottles, the volume of plastic bottles fully filled with water, the diameter of the rubber tubing, the number of holes in the rubber tubing (to be determined by the students) that affect amount of water dripped from the device for 15 minutes **Engineering design:** Revise the drip irrigation device with Micro:bit and sensors as well as Microsoft MakeCode programming so that it can have higher efficacy on water conservation for watering the plant			

Subject: Science **Level:** S.2

Topic: Competition of gas powered jetboat using vinegar and eggshell powder as environmental-friendly energy sources

Prerequisite knowledge:
S.2 Science Unit 9: Acid and alkali: Corrosive nature of acid, reaction of calcium carbonate and vinegar to produce carbon dioxide, Unit 11: Force and motion: relationship between average speed, distance and time, distance-time graph, uniform and non-uniform motion, force, and friction

Intended learning outcomes / products:

Scientific investigation	**Design and making**	**Problem solving with mathematical skills**	**Non-disciplinary knowledge/skills/ value**
Scientific investigation on: • Effect of different mass of eggshell powder (calcium carbonate) and volume of vinegar on the amount of gas released as pushing force	• A plastic bottle jetboat that uses gas released from the reaction between eggshell powder (calcium carbonate) and vinegar as pushing force to drive the jetboat	• Understand the concept of a rate and calculate the average speed of a moving object	• Be aware of the air pollution problem from the burning of fossil fuels in vehicles • Nurture students' positive values regarding respect for environment

Curriculum mapping:

Cycle	**Science**	**Mathematics**	**Design and Technology**
10 (2nd Term)		Understanding rate solve daily life problems using rate	
11-12 (2nd Term)			Construction of 3D printed parts for the gas jetboat
21 (3rd Term)	**Scientific investigation:** Investigation on the factors of mass of eggshell powder, volume of vinegar, and the diameter/length/angle of the straw on the release of carbon dioxide gas (with solution) **Engineering design:** Designing and making a gas jetboat with plastic bottle Measurement of the motion of jetboat with the use of water track, datalogger and motion sensor		