Diocesan Boys' School
Primary Division

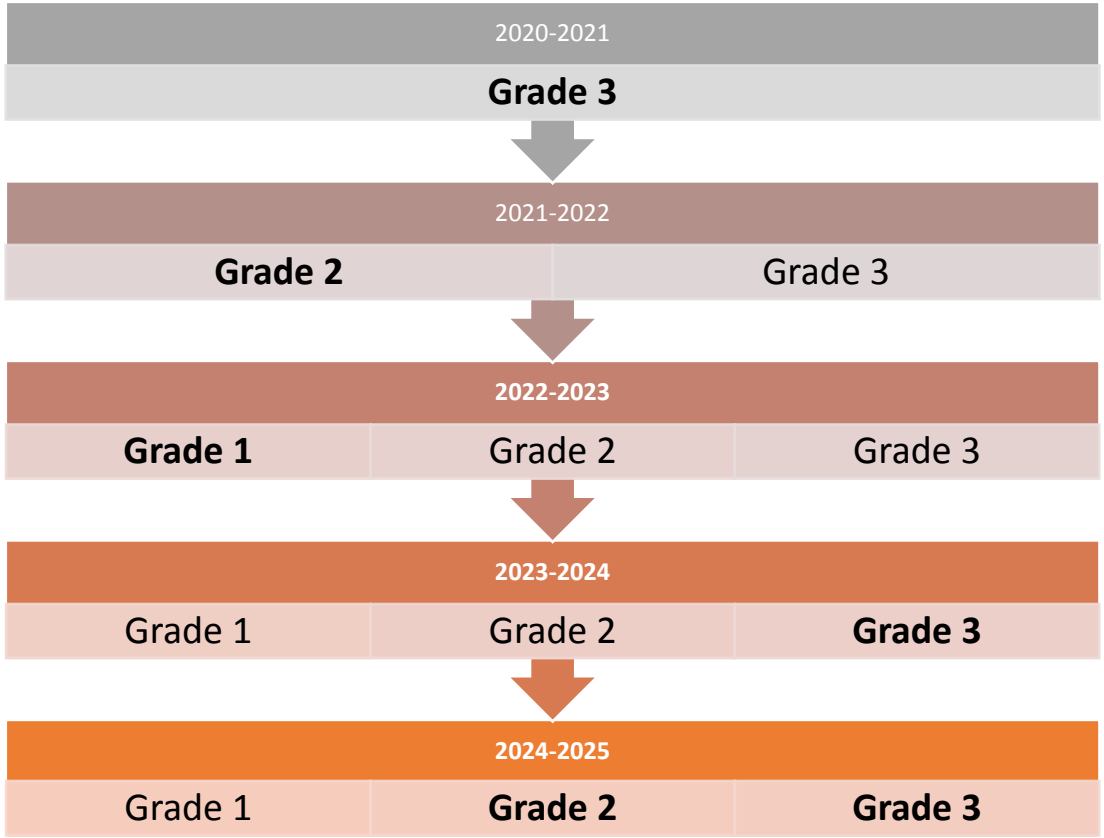
Quality Education Fund – Thematic Network (QTN)

Coordinated by Man Kwan Pak Kau College

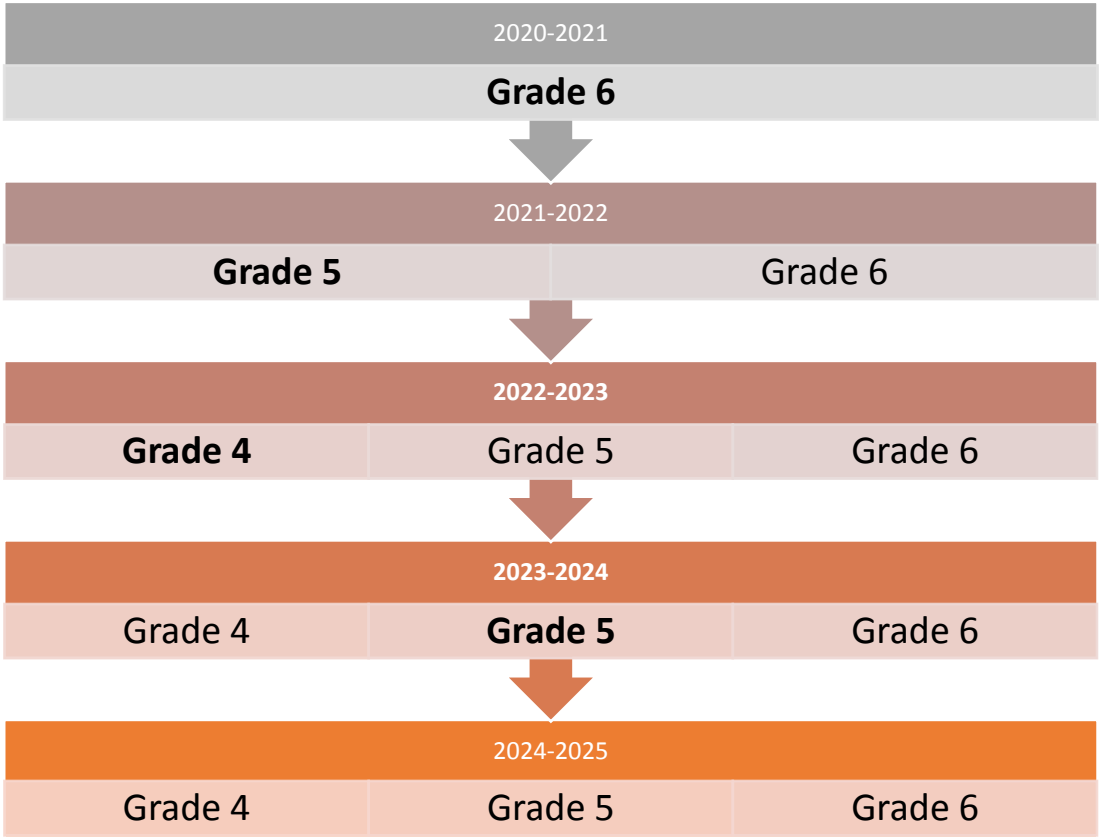
優質教育基金
總結及再發展工作
「透過活的科學:促進中小學創意STEAM」主題網絡計劃
校本STEAM教案的設計與實踐

Quality Education Fund (QEF) Thematic Network project in DBSPD 2024-2025

Key Stage 1



Key Stage 2



QTN project in DBSPD 2024-2025

General Studies Department:

- Grade level project in Grades 1-6

STEAM Education:

- Cross-curricular Activities in various grades under different themes

Annual School Plan:

- To further integrate STEAM education in the school curriculum

QTN project in DBSPD 2024-2025

Key Stage 1	Remote Laboratory Living Things Around Us (Grade 1)	Making a Toy Car (Grade 2)	SMART Observatory - New Science IoT Kit (Grade 3)
Key Stage 2	Husky Lens Identification Key of Animals (Grade 4)	Automatic Spray System (New) (Grade 5)	Maglev Train (Grade 6)

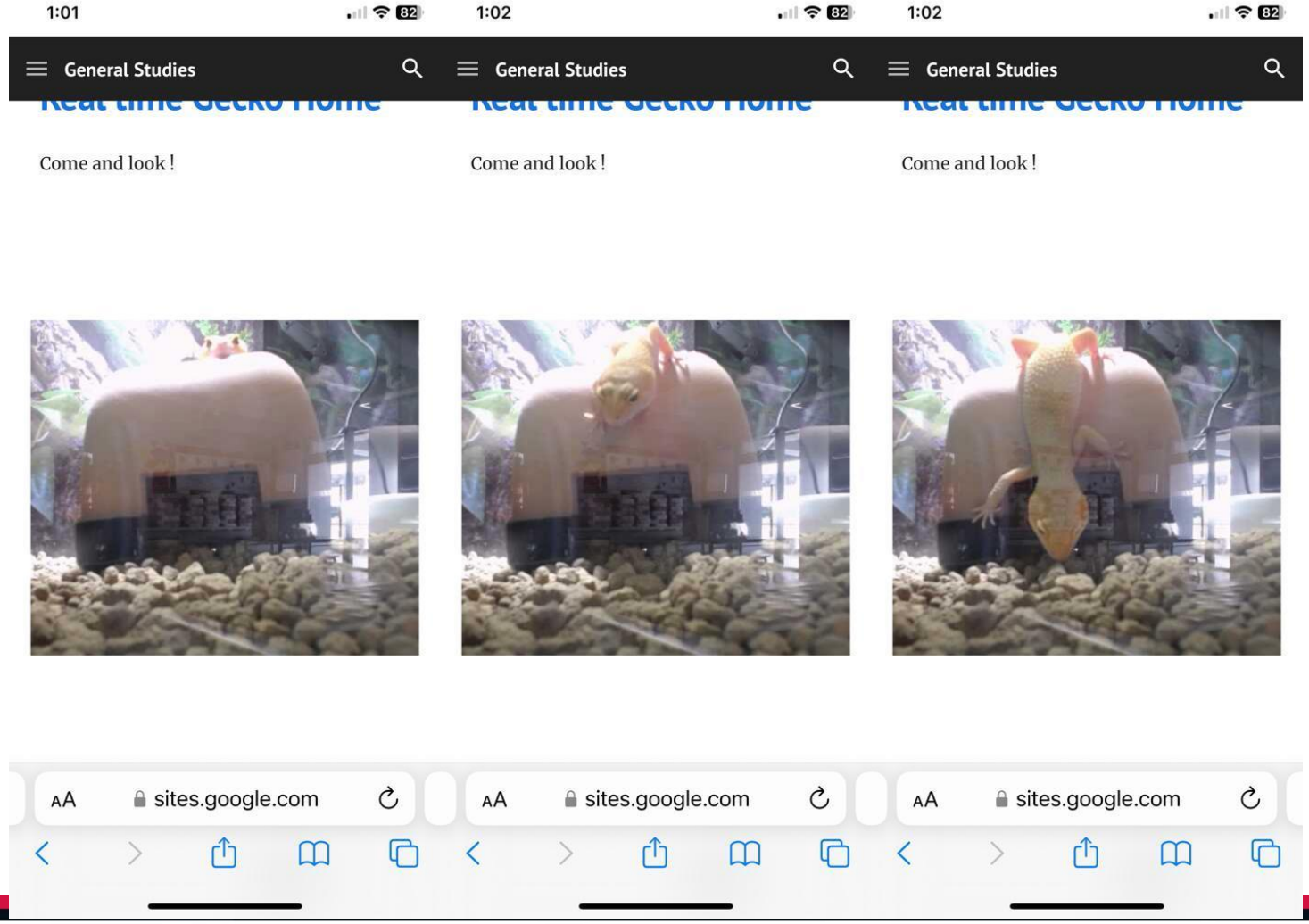
Remote Laboratory (Grade 1)
Schedule

December 2024
Students started on project on Living Things Around Us.

Christmas Holidays 2024
Set-up of the Remote Laboratory.

January 2025	
Students observed the animals on Remote Laboratory.	Present their findings in their project.

Remote Laboratory (Grade 1)
Photos



Remote Laboratory (Grade 1)
Students' work

Identification: Animals Around Us

Study the two animals carefully. Capture their moments and watch their every move. What do you notice?

Animal A: Gecko

Date: 4th January 2023
Time: 4:26 p.m.
Note: It is crawling.

Date: 4th January 2023
Time: 4:26 p.m.
Note: It has a tail with black rings.

Date: 4th January 2023
Time: 4:27 p.m.
Note: It is very close to the camera.

Date: 4th January 2023
Time: 4:27 p.m.
Note: It want to eat the glass.

P.3

Identification: Animals Around Us

Animal B: Tortoise

Date: 7th January 2023
Time: 11:05 a.m.
Note: It is finding a way out

Date: 6th January 2023
Time: 8:00 p.m.
Note: It is swimming

Date: 8th January 2023
Time: 7:58 p.m.
Note: It is hiding.

Date: 6th January 2023
Time: 2:20 p.m.
Note: It is climbing.

P.4

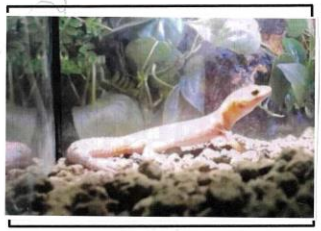
Remote Laboratory (Grade 1)
Students' work

Identification: Animals Around Us

Study the two animals carefully. Capture their moments and watch their every move. What do you notice?

Animal A: Gecko ✓

Date: 3-1-2023
Time: 4:45pm
Note: walking in circle



Date: 3-1-2023
Time: 4:45pm
Note: walking in circles

Date: 3-1-2023
Time: 4:46pm
Note: trying to get out

Date: 3-1-2023
Time: 4:46pm
Note: trying to get out

P.3

Identification: Animals Around Us

Animal B: Tortoise ✓

Date: 7-1-2023
Time: 5pm
Note: swimming

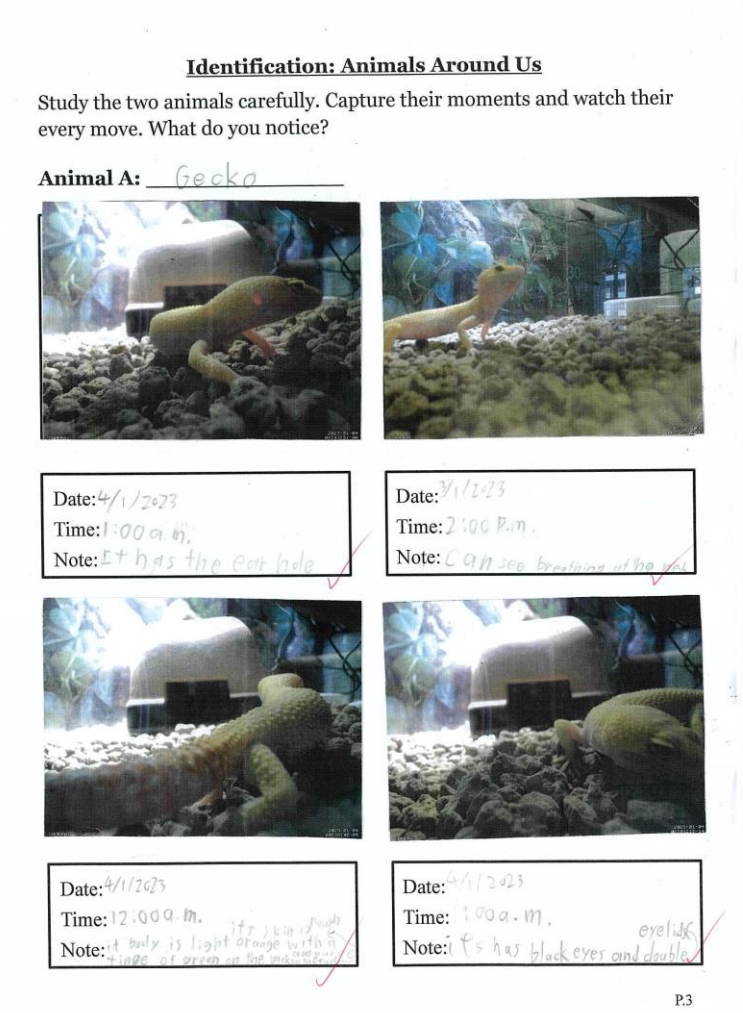
Date: 7-1-2023
Time: 5:05pm
Note: swimming

Date: 8-1-2023
Time: 9am
Note: resting

Date: 8-1-2023
Time: 9am
Note: resting

P.4

Remote Laboratory (Grade 1)
Students' work



Identification: Animals Around Us

Study the two animals carefully. Capture their moments and watch their every move. What do you notice?

Animal A: Gecko

Date: 4/1/2023
Time: 1:00 a.m.
Note: It has the ear hole

Date: 4/1/2023
Time: 2:00 P.m.
Note: Can see breathing at the ya

Date: 4/1/2023
Time: 12.000 m.
Note: its skin is rough it body is light orange with a tinge of green on the

Date: 4/1/2023
Time: 1:00 a.m.
Note: It has black eyes and double eyelids

P.3

Remote Laboratory (Grade 1)
NEW MEMBER

Making a Toy Car (Grade 2)
Schedule

December 2024	
Research on the basic of wheels, forces and what affects speed.	
January 2025	
Making toy car from drink carton	Conduct simple tests at school.
January 2025	
Making an electric toy car.	Conduct simple tests at school.

Making a Toy Car (Grade 2)
Project booklet

Research: Factors that affect the speed of a car

1. Based on your life experience, do light objects or heavy objects move faster?

_____

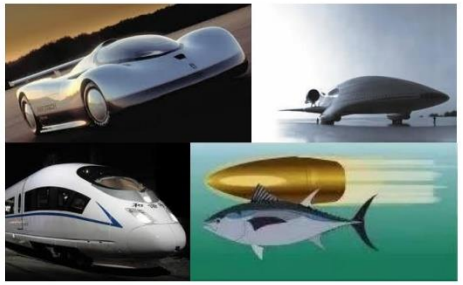
2. Suggest **TWO** ways to make your toy car lighter.

_____

_____

3. Observe the pictures of fast-moving objects below. How are these objects similar in terms of the shape of their front parts?

_____



4. Find **TWO** pictures of fast-moving objects with a streamlined body.

Research: Forces

Read and complete TB M4 Unit 4 p.24-25 and p.28 to learn about the relationship between forces and the shapes of objects. Then answer the questions below.

1. What is the relationship between forces and the shapes of some objects?

_____

2. Based on your daily observations, complete the table below to find out more about the relationship between forces and the shapes of objects.

	Does it **break** easily when pinched? (✓/×)	Does it **change** its shape easily when pinched? (✓/×)	Does it **return** to its original shape when released? (✓/×)
Potato chips		N/A	N/A
Play dough			
Rubber band			

From the above results, forces can _____ some objects while they can _____ the shape of some other objects. Some of these objects can _____ to their original shape when the force is removed.

3. Name the **TWO** types of forces that can move an object:

_____

4. Find a picture of an object being moved by a push and a pull. **Draw an arrow** to show the direction of the push and the pull in the picture.

Picture showing a **push**	Picture showing a **pull**

Research: Functions and features of wheels

Please visit the following website by scanning the QR code with your parents to complete the questions on wheels below:
https://www.dkfindout.com/us/science/amazing-inventions/wheel/

1. What is thought to be the original wheels?

_____

2. What is needed to work with wheels? It starts with the letter "a".

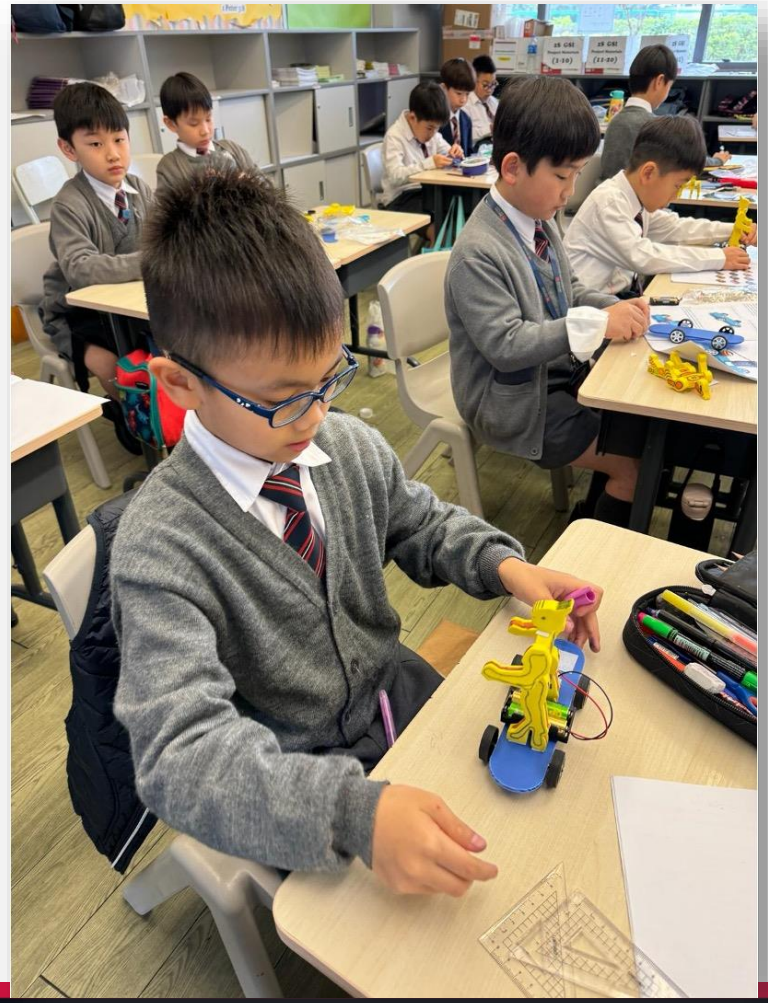
_____

3. Draw a labeled diagram of the wheel and axle in the box below.

4. Find **TWO** pictures of objects with wheels. Describe how the wheels help the object work by filling in the blanks below.

The wheels on the _____ help moving _____ more easily.	The wheels on the _____ help moving _____ more easily.

Making a Toy Car (Grade 2)
Lessons



SMART Observatory (Grade 3)
Schedule

October to November 2024

Students learned coding on Micro:bit and use of Thingspeak during Computer Studies lessons.

December 2025

Students learned about weather information and certain plant growing conditions during General Studies I lessons.

January to February 2025

Students use the new IoT Kit and Thingspeak to collect data.	Identify best location to grow different plants.

SMART Observatory (Grade 3)
New Science IoT Kit

SMART Observatory (Grade 3)
Students' work

Phase 3: Collect data at campus using the smart observatory

Record the date, time, temperature, humidity, sunlight and carbon dioxide level for five days around the **SAME** period of time **for 5-minute**. You will be collecting data in groups at the assigned location in campus.

3D Eugene Bok (1)
Morris Chan (2)

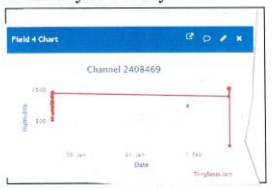
Location: Rooftop Garden

Day	Date	Time	Temperature (°C)	Humidity (%)	Sunlight (lux)	CO2 (%)
1	2/1/24	1:00p.m.	32.8°C	53%	10051	513%
2	2/1/24	2:38p.m.	24.0°C	71%	10041	443%
3	2/2/24	11:20p.m.	31.6°C	46.0%	10111	749%
4						
5						

Select one day of above. Screen capture the charts that you obtained from Thingspeak that day. Print them out at home and stick them in the box below.

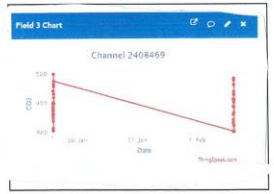
Temperature of the day:

Humidity of the day:



Sunlight of the day:

CO2 of the day:



13

Phase 3: Collect data at campus using the smart observatory

Record the date, time, temperature, humidity, sunlight and carbon dioxide level for five days around the **SAME** period of time **for 5-minute**. You will be collecting data in groups at the assigned location in campus.

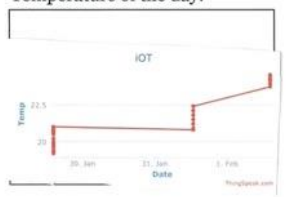
3D Jasper Tan (25)
Michael Tong (26)

Location: Basketball Court

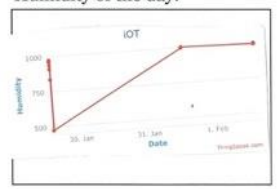
Day	Date	Time	Temperature (°C)	Humidity (%)	Sunlight (lux)	CO2 (%)
1	31-1-24	1:01	21.5°C	80.0%	998 lux	440%
2	1-2-2024	2:38	24.2°C	75.0%	987 lux	621%
3	2-2-2024	11:17	25.2°C	70.0%	994 lux	515%
4						
5						

Select one day of above. Screen capture the charts that you obtained from Thingspeak that day. Print them out at home and stick them in the box below.

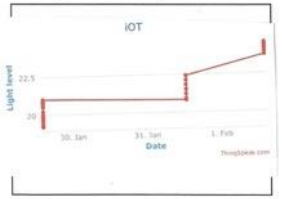
Temperature of the day:



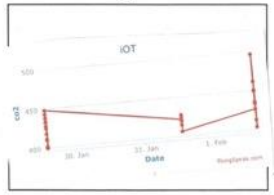
Humidity of the day:



Sunlight of the day:



CO2 of the day:



13

Husky Lens- Identification Key of animals (Grade 4)

Schedule

December 2024

- Research on the animals and compose an identification key in Science lessons.
- Prepare an interactive key using Google slides.

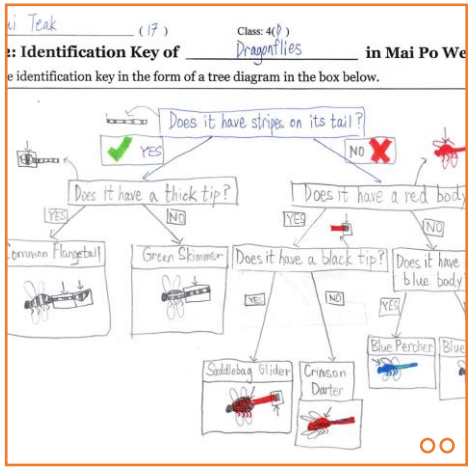
January 2025

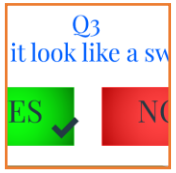
- Started assembling the hardware.
- Learned coding in Computer Studies lessons

January 2025

- Apply AI technique (Husky Lens) on the identification key.

Husky Lens- Identification Key of animals (Grade 4)
Lesson Observation






National Geographic Kids
Monarch Butterfly


Wikipedia
Butterfly - Wikipedia


Extension Entomology - Texas A&M U...
Monarch Butterfly


NPR
Butterflies evolved from moths ...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Scientists find where butterflies first ...


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Monarch Butterfly: Animals We Protect ...


Dimensions.com
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Butterfly genomes hav...


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How to draw a butterfly real easy ...


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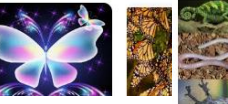

Wikipedia
Lizard - Wikipedia

Pensoft blog - Pensoft Publishers
lizard discovered in the Tropical Andes ...

Britannica
Lizard | Definition, Types ...

Live Science
tiny geckos to giant Komodo dragons ...

Natural Habitat Adventures
Seven Lizards to Love (Plus Where to ...

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Mygate
Top 8 methods to get ...

The Quint
World Lizard Day 2023: History ...

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Australian Geographic
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Frilled Dragons: The King Lizard

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Monitor Lizards: Unsung Dragons of the ...

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Arid Lizard Care Sheet: Food, Habitat ...

Healthline
Can You Eat Lizards?

Missouri Department of Conservation
Prairie Lizard | Missouri Department ...

Reader's Digest
How Long Do Lizards Live? | Reader's Di...

Petco
Tropical Lizard Care Sheet: Food ...

News18
Scared Of House Lizards? Know What T...

National Institutes of Health (N...
Lizard tails give clues to carti...

Wikipedia
Agamidae - Wikipedia

Science News
A nose-horned dragon lizard lost to ...

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The Atlantic
Monitor Lizards in Australia Dig ...

BBC Wildlife
Sand lizard guide: how to identify ...

Kaieteur News
Frilled Lizard - Kaieteur News

Technology Networks
New Species in Smaug Lizard Group ...

Automatic Alcohol Spray (Grade 5)
Schedule

December 2023

Learned coding in Computer Studies lessons.

January 2024

Assembling the hardware using the new kit.

Automatic Alcohol Spray (Grade 5)
Project Booklet

Diocesan Boys' School Primary Division
G.5 Science and Computer Studies Cross-curricular Activity
Automatic Spray Dispenser
Project Guidelines (2023 – 2024)

Name: _____ (__) G.5 (__) **Submission of Final Product: 2 Feb 2024**

Topic: Automatic Spray Dispenser

Objectives:
1) To understand the function and operation of an IR sensor.
2) To work in pairs to build a simple automatic spray dispenser using Micro:bit, Infrared sensor and simple materials, and to understand its mechanisms.
3) To test how to adjust the position of the infrared sensor so as to improve the performance of the automatic spray dispenser.
4) To find the limitation of the design and give suggestion for improvement.
5) To appreciate the technology of infrared sensor and explore its further usages of the spray dispenser.

Timeline of Events:

Week 19	2 – 5 Jan	- Introduction of the project (Section A)
Week 20	8 – 12 Jan	- Micro:bit coding and assembling of the spray dispenser (Section B)
Week 21	15 – 19 Jan	- Conduct testing, record data and refine the spray dispenser (Section C) - Upload videos of Section C to Padlet
Week 22	22 – 26 Jan	- Further exploration of the use of IR sensor (Section D) - Upload videos of Section D to Padlet
Week 23	29 Jan – 2 Feb	- Upload videos of Section D to Padlet - Complete self-evaluation (Section D)

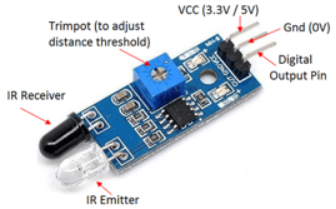
Your project will be assessed on the following criteria:
- Understanding of the scientific knowledge and mechanisms of infrared sensor applied on an automatic spray dispenser. (Section C)
- Ability to refine a product, conduct testing, collect and analyze data. (Sections B & C)
- Ability to conclude and share the findings through Padlet. (Section C)
- Evaluation of findings, peer evaluation and self-evaluation. (Section D)

Section A. Mechanisms of IR sensor

1. Go to Google Classroom and watch the video "What is an IR sensor" and fill in the blank as follow.

What is an infrared sensor?

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation. Infrared radiation is a type of __light__ that falls outside the __visible spectrum__ but can be felt as heat.



How an IR sensor detects objects in front of it?

The transmitter emits __IR light__ and the receiver keeps checking for __reflected light__. If an object is present in front of the sensor, the light gets reflected back after hitting the object and the receiver detects it.

Search in the internet and find out how IR sensor be used in our daily life. List THREE usages.

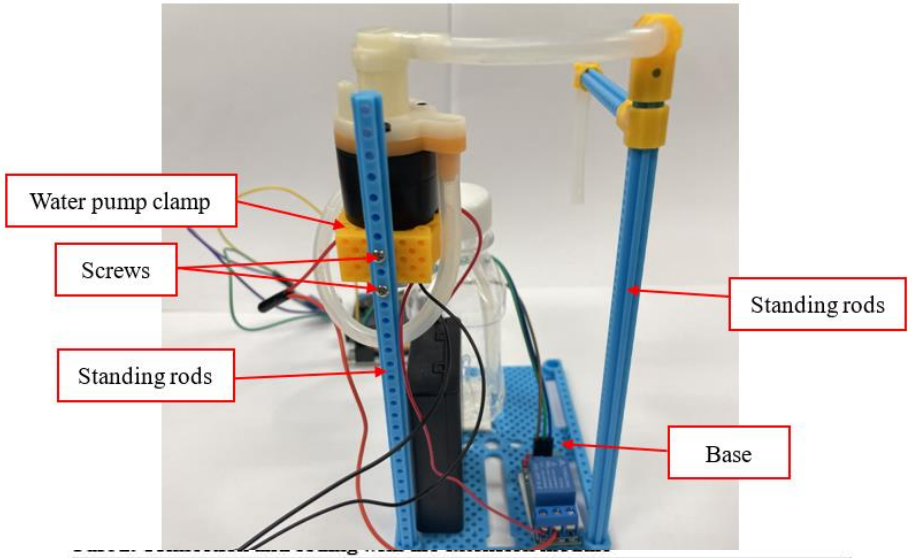
1. TV remotes
2. Motion detectors
3. Burglar Alarm (Accept any reasonable answer)

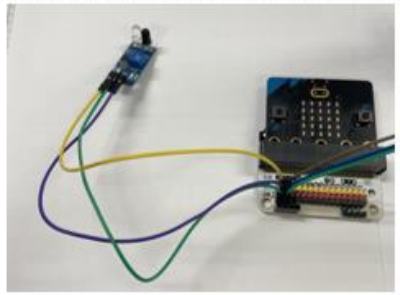
In this project, IR sensor will be used to activate the automatic spray dispenser. You will be setting a sensing distance range by coding on your Micro:bit and testing how the reaction time and the position of the IR sensor affect its performance.

Section B. Building a prototype of the automatic spray dispenser

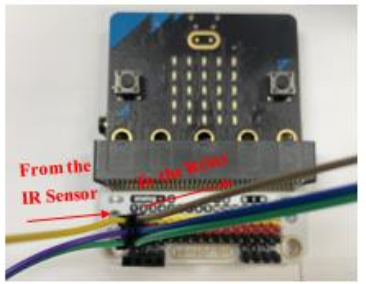
Safety precautions:

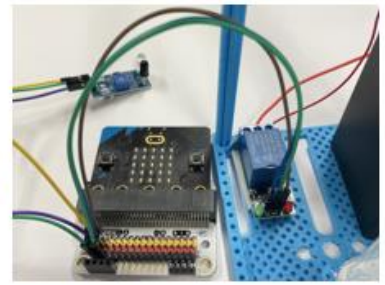
1. Ends of wires are sharp and should be handled with care.
2. Connection pins on the extension module may break easily and should be handled with care.
3. Holding the heads of the connection cable/wire and the connection port when connecting or disconnecting cables/wires. Pulling only the cables/wires may damage both the cables/wires and the connection port.





1. Connect the IR Sensor to the Micro:bit extension for testing:
   OUT→PIN 1
   VCC → V
   GND → G





2. Connect the extension board and IR sensor to the Relay:

Automatic Alcohol Spray (Grade 5)
Students' product

Table 2. Findings on the best position to fix the SONAR

	Did the fingers trigger the servo motor to pull the spray bottle handle?		
Positions	Position A (✓ / ×)	Position B (✓ / ×)	Position C (✓ / ×)
Height P			
Height Q			
Height R			

8. At which height should we set the SONAR?

9. Is it possible for the SONAR to be triggered mistakenly? If yes, suggest a scenario.

10. Suggest a solution that solves the problem you described in Q.9.

p.9

Automatic Alcohol Spray (Grade 5)

Students' product

Maglev Train (Grade 6)
Schedule

Term 1

Learned about speed and rate in Math lessons.

January 2024

Learned to input formula in MS excel / Google Sheet

May - June 2024

Start with research on Maglev Train.	Assembly the model using the kit.

Maglev Train (Grade 6)
Cross-subject collaboration

Sample Grade 6 (Class Class number) Science Project Analysis

	A	B	C	D	E	F	G	H
1		Distance travelled (cm)	Time taken (seconds)	Speed (cm/s)	Rank	Speed (km/hr)		
2	Attempt 1			#DIV/0!	#DIV/0!	#DIV/0!		
3	Attempt 2			#DIV/0!	#DIV/0!	#DIV/0!		
4	Attempt 3			#DIV/0!	#DIV/0!	#DIV/0!		
5	Average speed			#DIV/0!				
6								
7								
8								

Maglev Train (Grade 6)
Project booklet

Diocesan Boys' School Primary Division
G.6 Science Project Guidelines (2023 – 2024)

Name: _____ ( ) **G.6 ( )** **Submission of Final Product: 31 May 2024**

Topic: Energy and Force – Maglev Train

Objectives:
1) To understand the history and mechanics of Maglev trains.
2) To build a simple Maglev train model using simple materials and investigate the factors that affect the speed of the train model through testing.
3) To appreciate the creation of Maglev trains and explore their limitations.

Timeline of Events:

Week 38	- Complete Pre-lesson (Section A)
Week 39	- Build a simple Maglev train model (Section B)
Week 40	- Conduct testing, record data and refine product (Section C) - Upload photos or videos of Sections B and C to Padlet
Week 41	- Complete booklet and peer evaluation on Padlet (Section D)

Your project will be assessed on the following criteria:

- Understanding of the scientific knowledge and mechanics of Maglev trains. (Section A)
- Ability to refine product, conduct testing, collect and analyze data. (Sections B & C)
- Ability to conclude and share findings product through Padlet. (Section C)
- Evaluation of findings, peer evaluation and self-evaluation. (Section D)

Introduction:

History of Maglev Trains

The idea of a **magnetically levitated (Maglev) train** was first raised by Robert H. Goddard, a physics graduate student in 1909. The first ever working model was then developed by a British electrical engineer named Eric Laithwaite in the late 1940s. Despite over a century of research and development, maglev transport systems are only operational in three countries: Japan, South Korea and China. Figures 1 & 2 below show the Shanghai Maglev Train and the Chuo Shinkansen respectively. The Shanghai Maglev Train is the world's first commercial high-speed maglev train that has a maximum cruising speed of 300km/h.

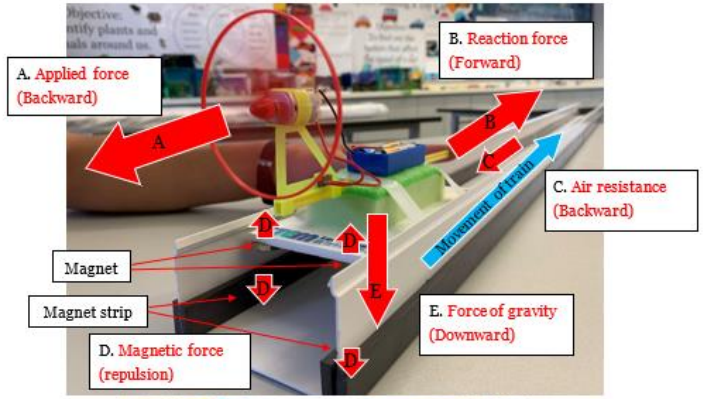
Figure 1. The Shanghai Maglev Train (CPT, 2021)

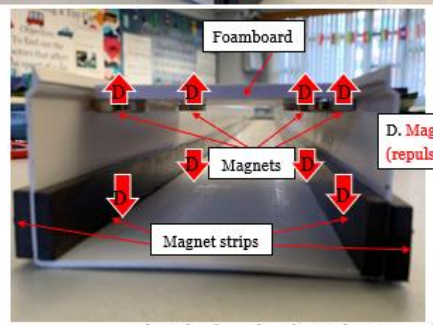
Figure 2. The Chuo Shinkansen (The Japan Times, 2021)

Section A. Mechanics of Maglev trains

1. Watch the Edpuzzle video "How does a Maglev train work" and answer the questions embedded on Google Classroom.
2. Below shows an end product of the Maglev train model which you will build in this project. Label the force in the boxes using the phrases provided.

Applied force (Backward)	Force of gravity (Downward)	Air resistance (Backward)
Reaction force (Forward)	Magnetic force (repulsion)	





3. Describe the energy conversions that take place when the Maglev train model moves.

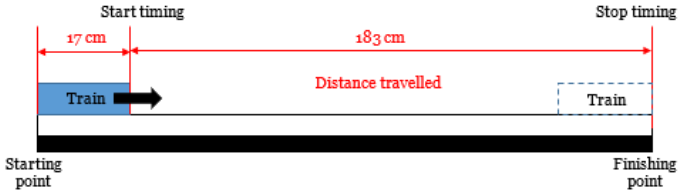
Chemical energy (Batteries) → Electrical energy (Circuit) → Kinetic energy (Movement of the fan and train) + Sound energy (Waste) + Heat energy (Waste)

Section C: Investigation

C1. Test the speed of your Maglev train model

The diagram below illustrates the setting of the test. A 2-metre rail will be used.

1. Work in pairs and test the speed of your Maglev train model. **2 trials** per person.
   One student should use an iPad to record the time using the stopwatch function while the other student should be responsible for placing the train model into the 2-metre rail. Record your results in Table 1.
2. Take photos or videos for Padlet while you perform the test.



Checklist for the trials:

a. Did you place your Maglev train model in the correct position? ☐
b. Is your Maglev train model able to move after you turn on the power? ☐
c. Is your Maglev train model able to move without any additional force? ☐

Table 1. Results of the first 2 trials of testing for the Maglev train model

	Distance travelled	Time taken	Speed (Correct to 2 decimal places) (Distance ÷ Time taken)
Example	183 cm	8.45 s	21.66 cm/s
Trial 1	cm	s	cm/s
Trial 2	cm	(Free answer) s	cm/s
Average	cm	s	cm/s

3. What was the average speed of your Maglev train model? _____ cm/s (Free answer)
4. What are the factors that affect the performance of your train model? Why do they affect the performance of your train model? (Hint: Read the procedure again in Section B)
   The position of the components because they affect the balance of the train model/ increase air friction.
5. Based on the factors you suggested in Q.2, refine your train model. Then, proceed to Section C2 for another 2 trials of testing.

Maglev Train (Grade 6)
Testing

Summary

Learning outcomes

- Students applied their knowledge through engaging into hands-on STEAM projects.
- Students' generic skills were sharpened.
- Students gain satisfaction through the projects and develops positive attitude towards technology.

Staff Development

- The training sessions are very informative and helpful to get teachers familiar with the projects and Micro:bit.
- Lesson observations and discussion afterwards greatly facilitates professional interflow.

School-based Curriculum Development

- General Studies Grade Level Projects.
- Collaboration in certain Cross-curricular Activities in various grades under different themes.
- Annual School Plan to further integrate STEAM education in the school curriculum

Furthermore…

Other STEAM projects:

- STEAM x Service Learning
- Diamond Lamp (VA)
- A.I. / Blockchain / Chip Design (Gifted)

To design a **curriculum framework** that outlines the learning and **assessment** objectives of STEAM education

Question & Answer