

聖公會曾肇添中學
S.K.H. Tsang Shiu Tim
Secondary School

LEARNING STEM AERONAUTICAL KNOWLEDGE THROUGH IMMERSIVE EXPERIENCE



Mr. Cheung Tin Yau
STEM Education Committee
SKH Tsang Shiu Tim Secondary School

OVERVIEW

- School Introduction
- STEAM Education in Hong Kong
- Immersive Experience
- Background, Rationales & Objectives
- Implementation of Flight Simulation Workshop
- Curriculum mapping
- Future Development
- Q&A



OUR SCHOOL

- **School Information**

- **Established in 1978**
- **Sha Tin District**
- **EMI, Co-educational**
- **Enable students to attain all-round development**
- **Prepare students to become future leaders with a global perspective**
- **Students have excellent learning attitudes and brilliant academic achievements**



聖公會曾肇添中學

S.K.H. Tsang Shiu Tim
Secondary School

S. K. H. Tsang Shiu Tim Secondary School

OUR SCHOOL



聖公會曾肇添中學

S.K.H. Tsang Shiu Tim
Secondary School

- **Major Concerns**

- 1. Unleash students' potential in Innovation - STEM education
- 2. Help students build a flourishing life
- 3. Enable students to gain a variety of experiences beyond the classroom

S. K. H. Tsang Shiu Tim Secondary School

OUR SCHOOL



聖公會曾肇添中學

S.K.H. Tsang Shiu Tim
Secondary School

- **STEM & Innovation Centre**
 - Officially launched on 14 Oct, 2022
 - Unleash students' potential in innovation
 - Nurturing students' self-directed learning capabilities

STEM AND
INNOVATION



STEAM EDUCATION IN HONG KONG



- Promotion of **STEM** education was first proposed in the 2015 Policy Address
- Strengthen students' ability to integrate and apply knowledge and skills across different STEM disciplines
- Nurture students' creativity, collaboration and problem-solving skills
- Foster students' innovation and entrepreneurial spirit as required in the 21st century

Source:

“Report on promotion of STEM Education - unleashing potential in Innovation” 2015. [Online]. Available: https://www.edb.gov.hk/attachment/en/curriculum-development/renewal/STEM%20Education%20Report_Executive%20Summary_Eng.pdf.

STEAM EDUCATION IN HONG KONG

- Creating a **STEAM** learning atmosphere through diversified learning activities
- Scouting and developing talent with potential in I&T
- Creating opportunities for students with I&T-related talent to realize their potential
- Promoting STEAM education **"for all", "for fun" and "for diversity"** in primary and secondary schools

Source:

Steam education fair 2022 equips students with abilities to meet Innovation Challenges. [Online].

Available: <https://www.info.gov.hk/gia/general/202211/26/P2022112500305.htm>.

"Policy address," Policy Address | The Chief Executive's 2022 Policy Address. [Online].

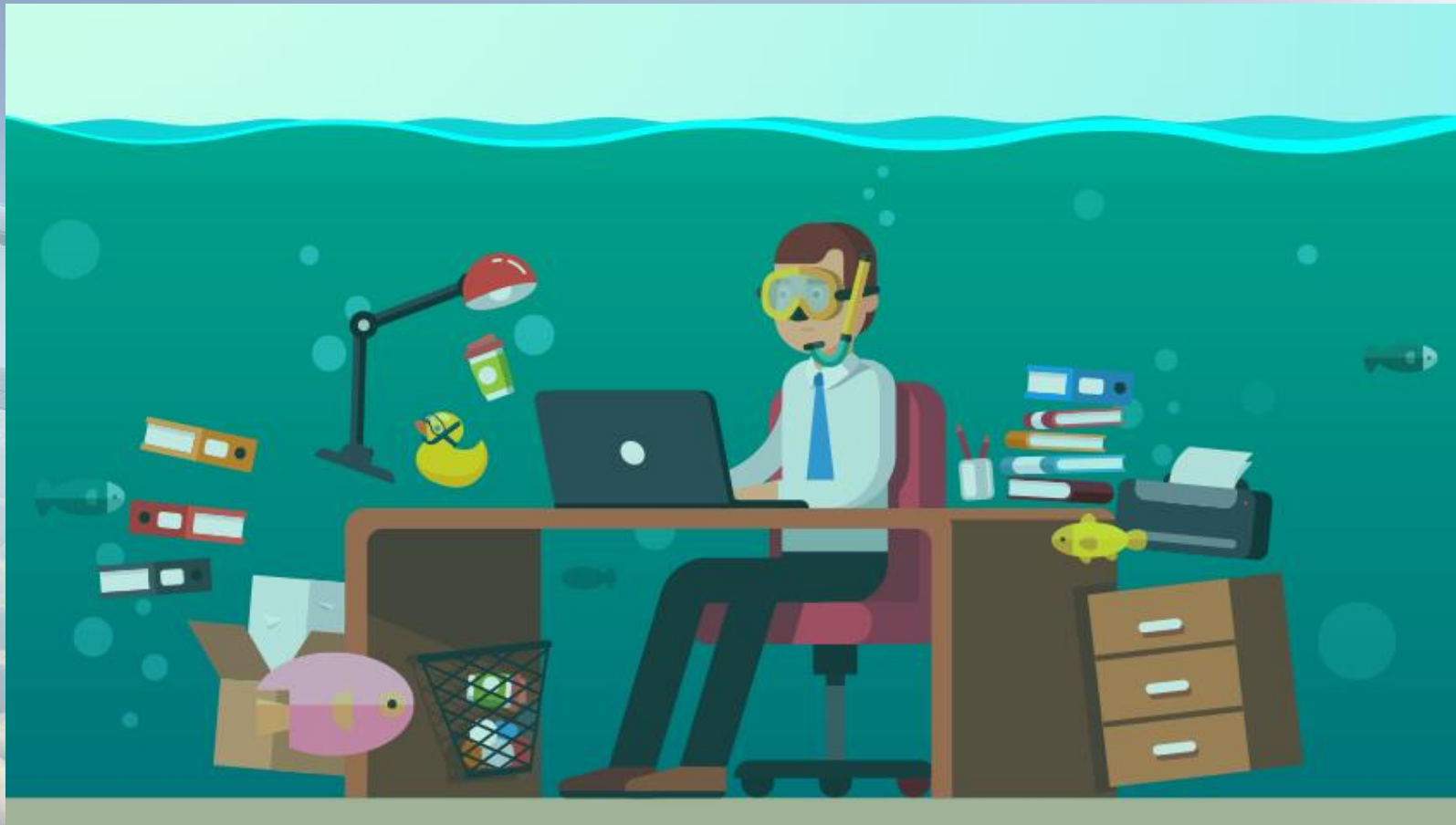
Available: <https://www.policyaddress.gov.hk/2022/en/p117.html>.

IMMERSIVE LEARNING = VIRTUAL REALITY?



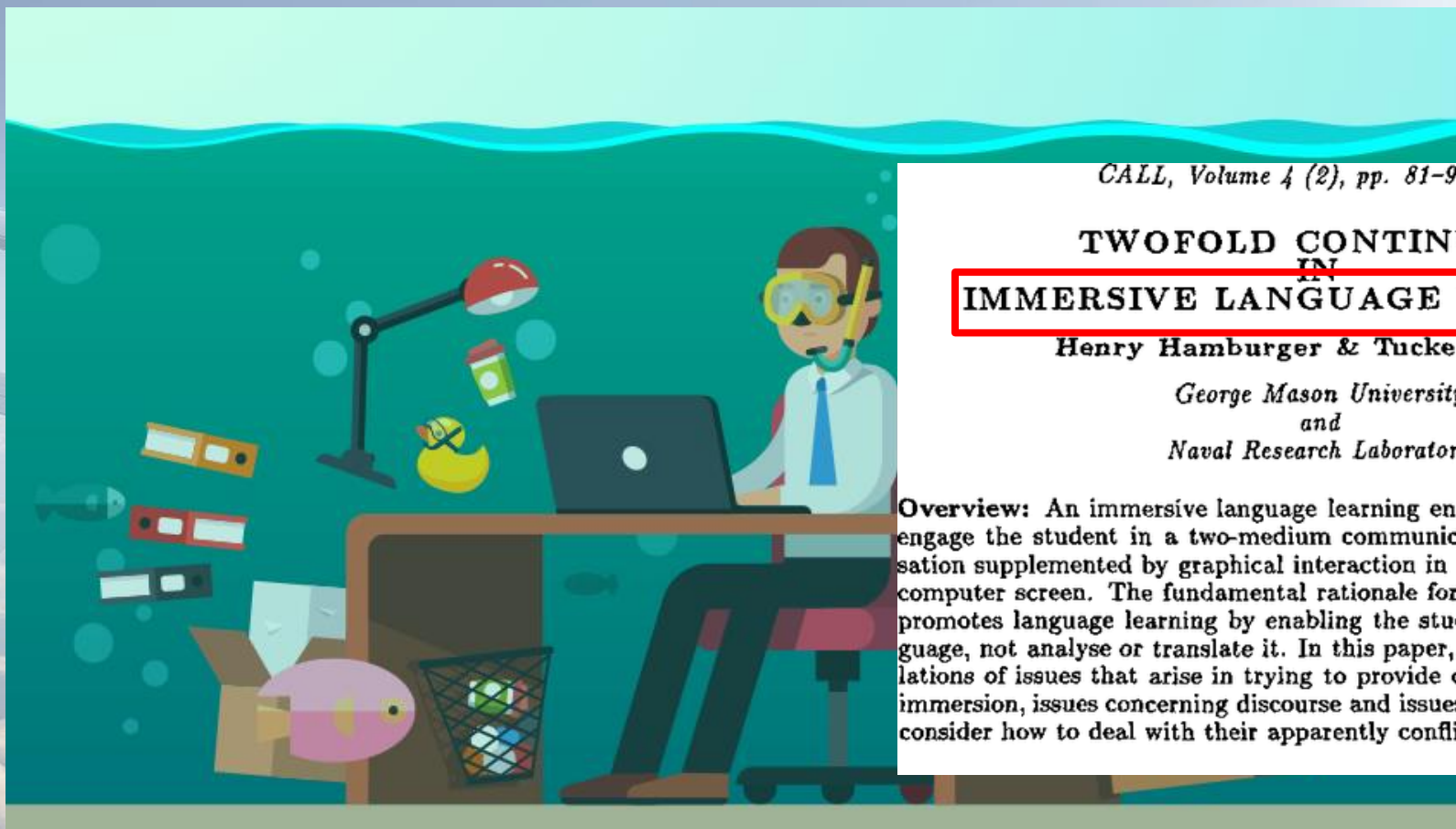
IMMERSIVE LEARNING = VIRTUAL REALITY?

- Immersive learning is a technique that makes use of artificial or simulated environments in which the learners can become immersed in the learning process.



IMMERSIVE LEARNING = VIRTUAL REALITY?

- Immersive learning is a technique that makes use of artificial or simulated environments in which the learners can become immersed in the learning process.



CALL, Volume 4 (2), pp. 81-92.

81

TWOFOLD CONTINUITY IN IMMERSIVE LANGUAGE LEARNING

Henry Hamburger & Tucker Maney

*George Mason University
and
Naval Research Laboratory*

Overview: An immersive language learning environment undertakes to engage the student in a two-medium communication process: a conversation supplemented by graphical interaction in an ordinary scene on the computer screen. The fundamental rationale for such a system is that it promotes language learning by enabling the student to *use* the new language, not analyse or translate it. In this paper, we examine two constellations of issues that arise in trying to provide computer-based language immersion, issues concerning discourse and issues of tutorial strategy, and consider how to deal with their apparently conflicting demands.

IMMERSIVE LEARNING = VIRTUAL REALITY?

- Immersive learning is a technique that makes use of artificial or simulated environments in which the learners can become immersed in the learning process.



CALL, Volume 4 (2), pp. 81-92.

81

TWOFOLD CONTINUITY IN IMMERSIVE LANGUAGE LEARNING

Henry Hamburger & Tucker Maney

*George Mason University
and
Naval Research Laboratory*

Overview: An immersive language learning environment undertakes to engage the student in a two-medium communication process: a conversation supplemented by graphical interaction in an ordinary scene on the computer screen. The fundamental rationale for such a system is that it promotes language learning by enabling the student to *use* the new language, not analyse or translate it. In this paper, we examine two constellations of issues that arise in trying to provide computer-based language immersion, issues concerning discourse and issues of tutorial strategy, and consider how to deal with their apparently conflicting demands.

BACKGROUND

- Students have been unable to travel around the world in the last two years due to the severe epidemic situation
- Almost half of Hong Kong secondary school students demonstrated symptoms of depression



Source:

D. T. Ng and S. K. Chu, "Motivating students to learn stem via engaging flight simulation activities," *Journal of Science Education and Technology*, vol. 30, no. 5, pp. 608–629, 2021.

P. Lee, "Almost half of Hong Kong secondary school students show signs of depression, survey finds," *Hong Kong Free Press HKFP*, 26-Sep-2022. [Online]. Available: <https://hongkongfp.com/2022/09/26/almost-half-of-hong-kong-secondary-school-students-show-signs-of-depression-survey-finds/>.

[Accessed: 04-Oct-2022].

RATIONALES

- Extracurricular activities have been found to be effective in developing students' motivation and achievement on STEM domain
- Hands-on activities involving interactive equipment and rich digital media content facilitate the development of students' STEM awareness and interest



Source:

N. K. Bollock and S. M. Belt, "Assessing an aviation out-of school time program: A collective case study."

The Collegiate Aviation Review International, vol. 38, no. 1, 2020.

D. T. Ng and S. K. Chu, "Motivating students to learn stem via engaging flight simulation activities,"

Journal of Science Education and Technology, vol. 30, no. 5, pp. 608–629, 2021.

OBJECTIVES

- Consolidate students' understanding of science concepts and develop their problem-solving skills
- Arouse students' interest in learning STEM-related knowledge
- Rekindle students' enthusiasm and hope



Source:

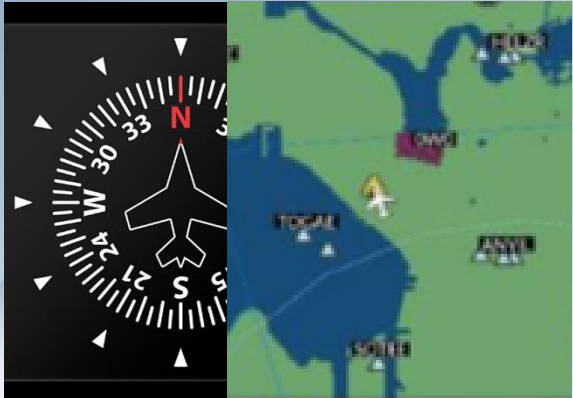
D. T. Ng and S. K. Chu, "Motivating students to learn stem via engaging flight simulation activities," *Journal of Science Education and Technology*, vol. 30, no. 5, pp. 608–629, 2021.

CONTENTS

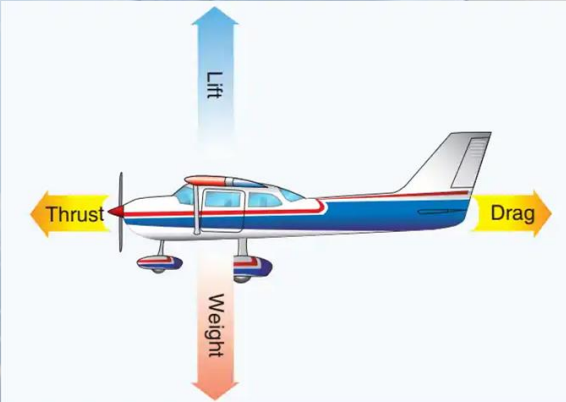
VR Technology



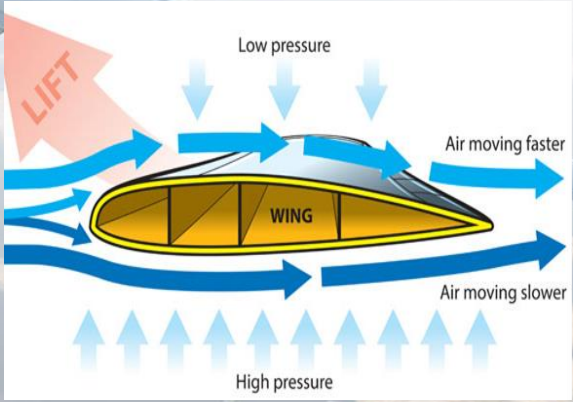
Map reading with compass skills



Scientific knowledge



Design considerations



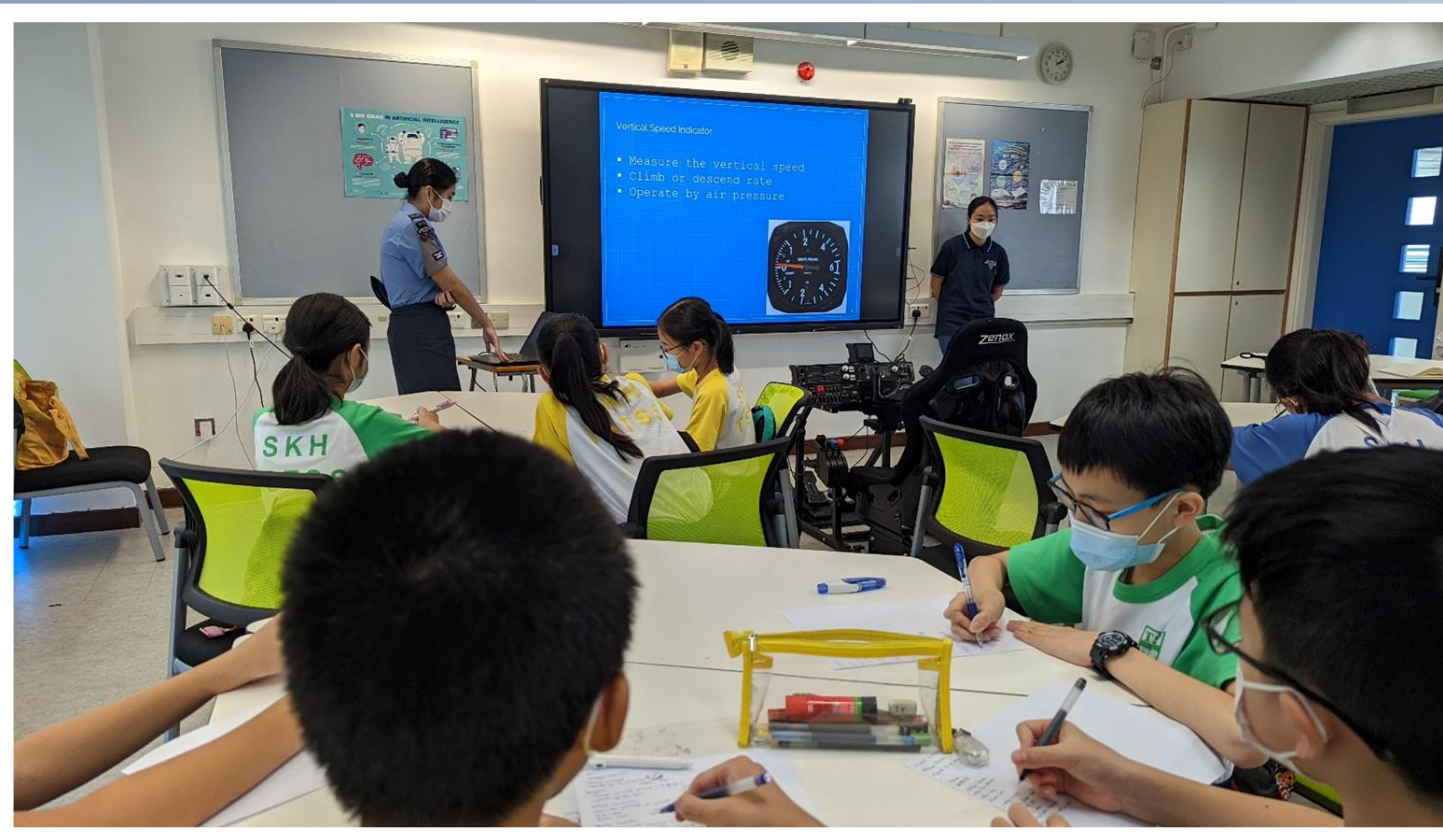
FLIGHT SIMULATION WORKSHOP

- Target: F.1 – F.3 students
- Theoretical Part & Practical Part
- Taught by instructors from Hong Kong Air Cadet Corps



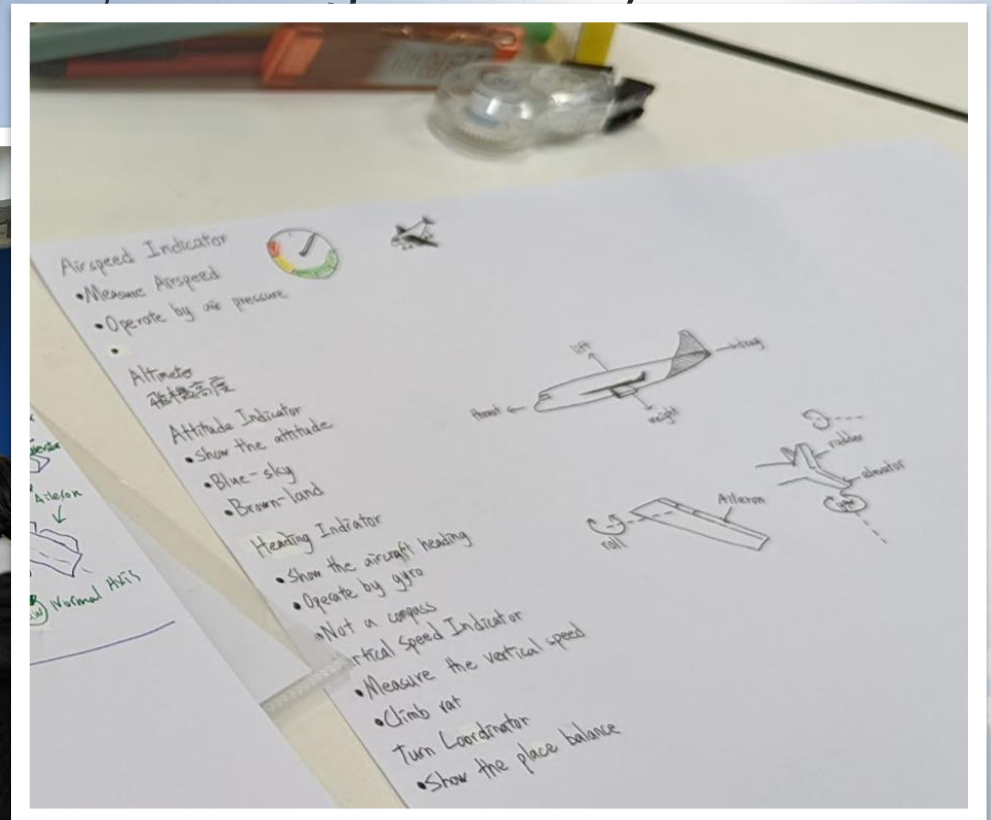
THEORETICAL PART

- Basic flight instruments (e.g. airspeed indicator, heading indicator)
- Checklists for a flight



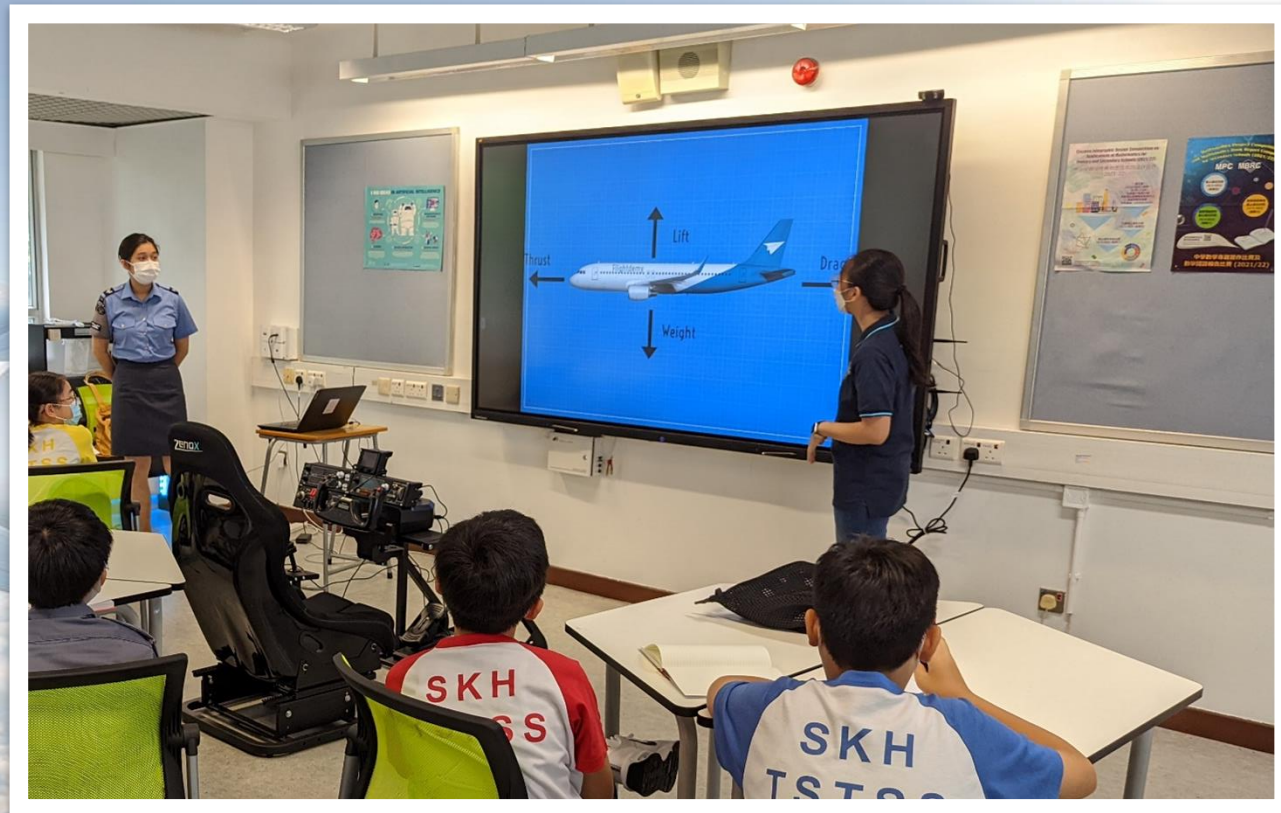
THEORETICAL PART

- Basic flight instruments (e.g. airspeed indicator, heading indicator)
- Checklists for a flight



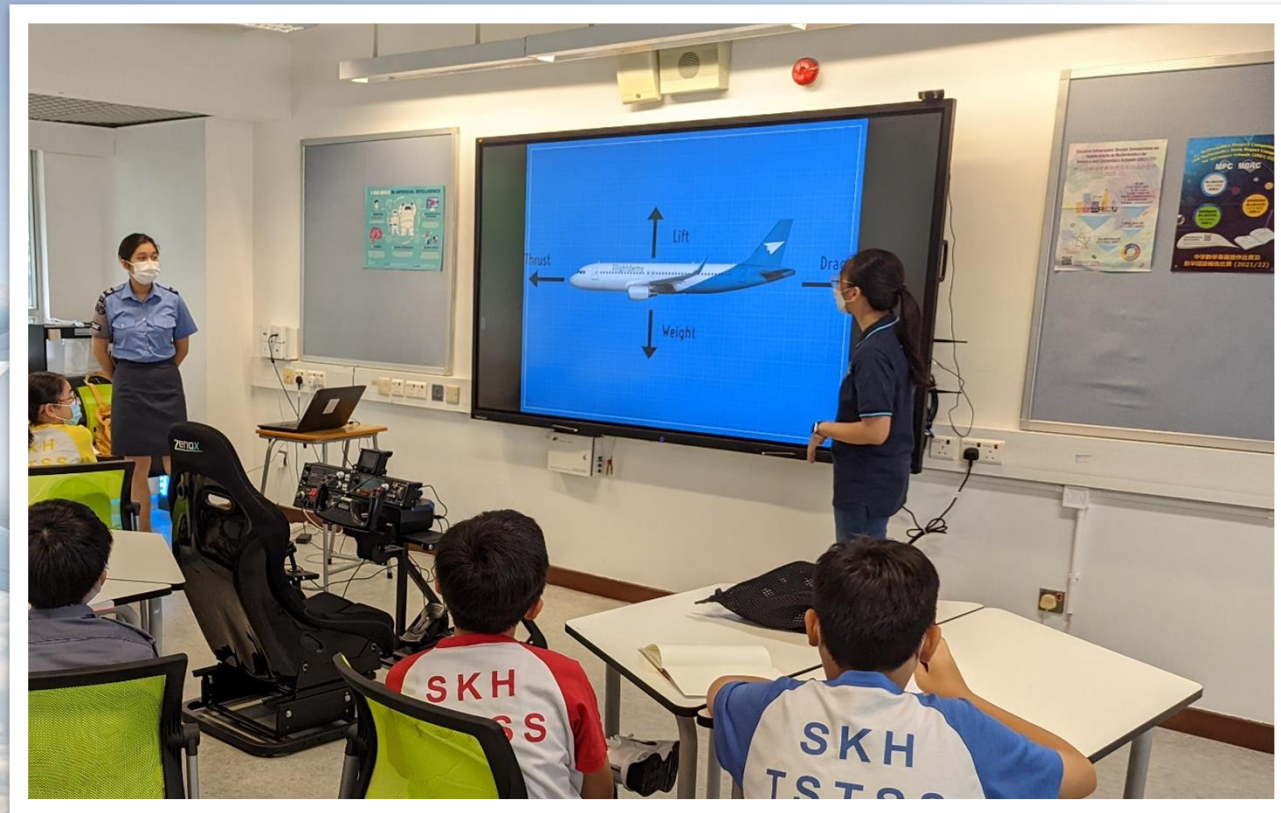
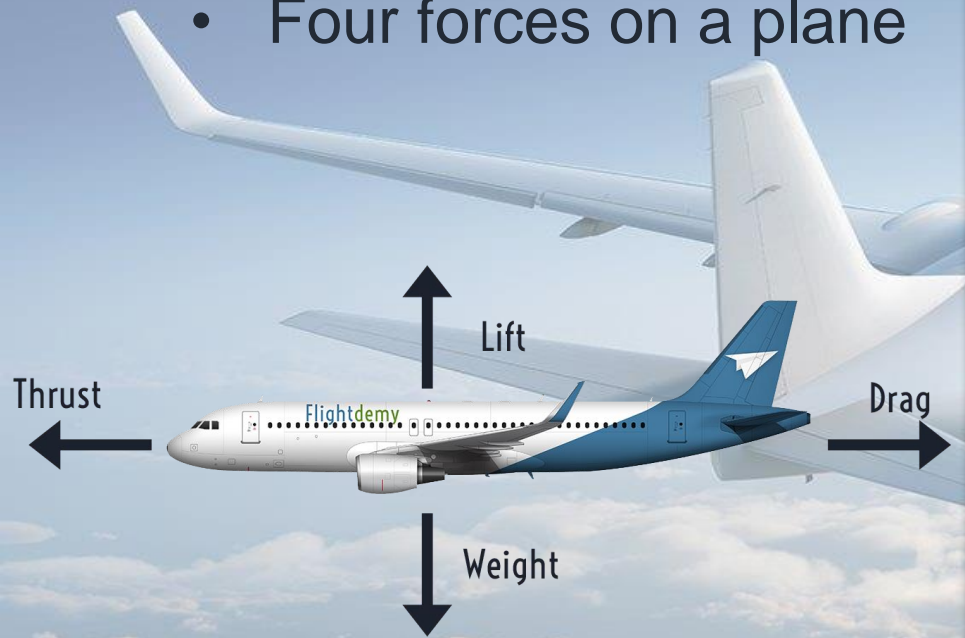
THEORETICAL PART

- Basic flight instruments (e.g. airspeed indicator, heading indicator)
- Checklists for a flight
- Four forces on a plane



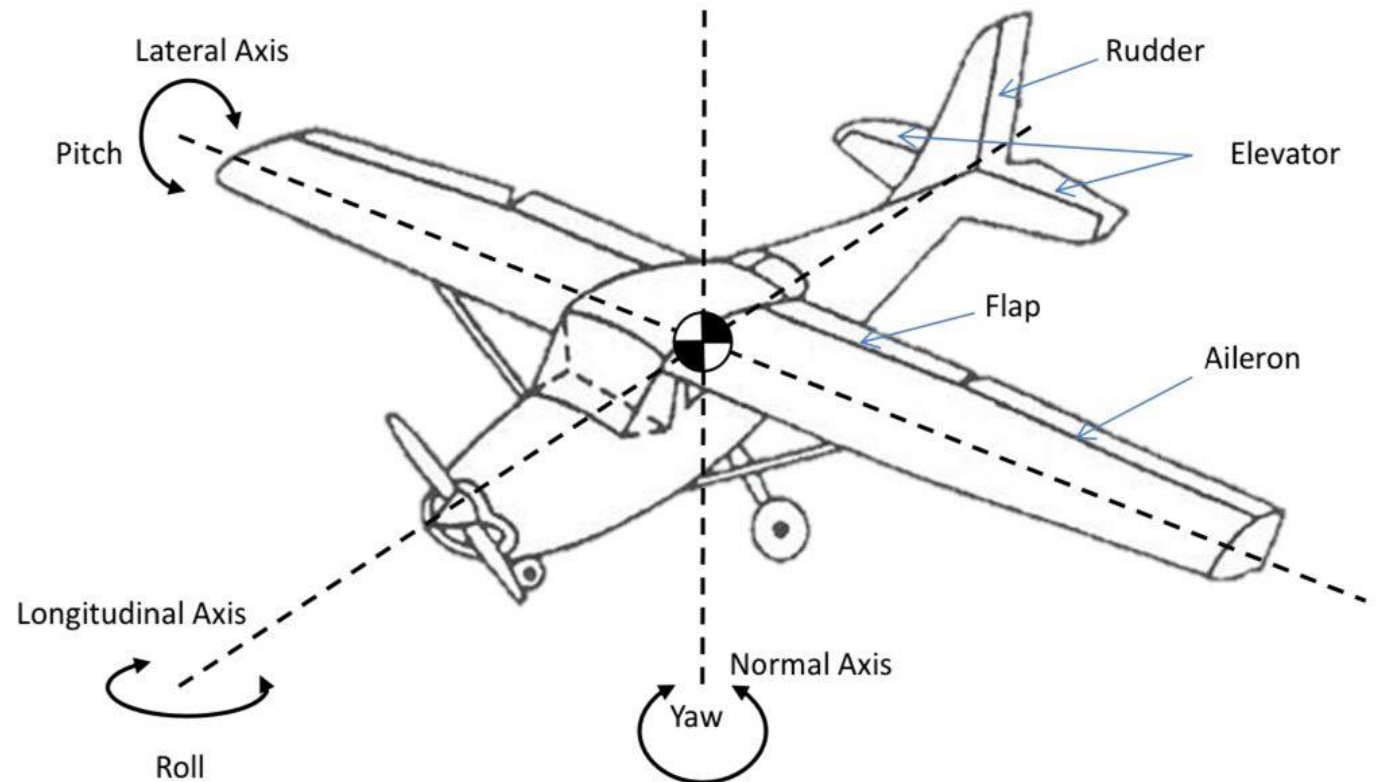
THEORETICAL PART

- Basic flight instruments (e.g. airspeed indicator, heading indicator)
- Checklists for a flight
- Four forces on a plane



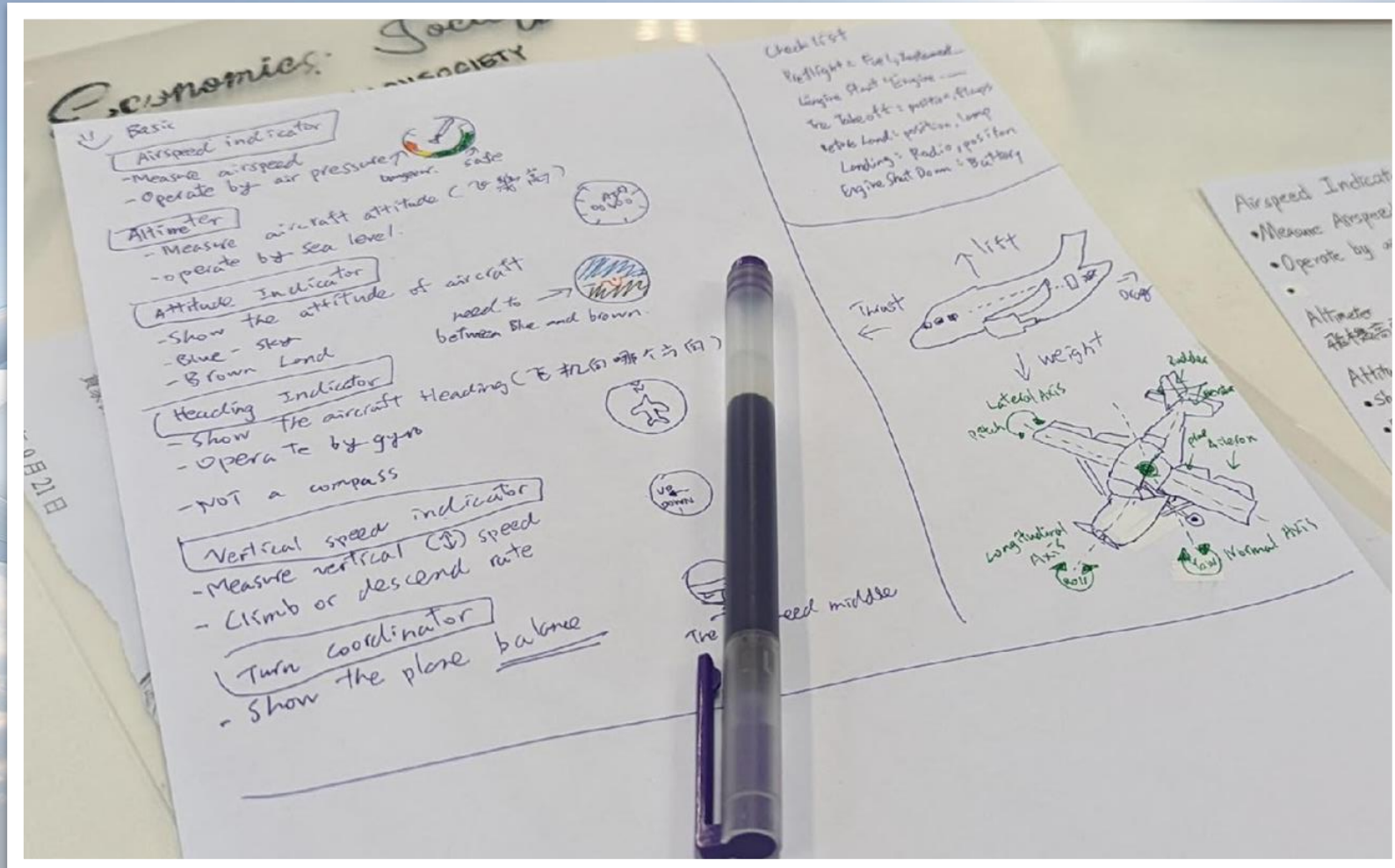
THEORETICAL PART

- Basic flight instruments (e.g. airspeed indicator, heading indicator)
- Checklists for a flight
- Four forces on a plane
- Rotation on a plane



THEORETICAL PART

- Basic flight instruments (e.g. airspeed indicator, heading indicator)
- Checklists for a flight
- Four forces on a plane
- Rotation on a plane



PRACTICAL PART

- Demonstration



PRACTICAL PART

- Demonstration



PRACTICAL PART

- Demonstration
- Trial flight under supervision



PRACTICAL PART

- Demonstration
- Trial flight under supervision



PRACTICAL PART

- Demonstration
- Trial flight under supervision



CURRICULUM MAPPING

- Information & Communication Technology

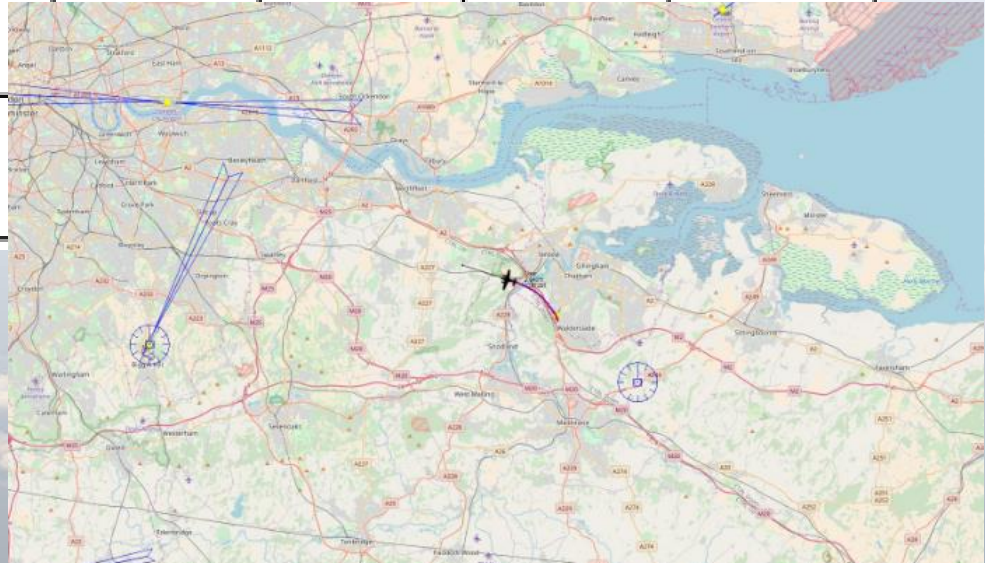


Topic	Learning Outcomes	Remarks
a. Technological Innovations (3 hours)	<ul style="list-style-type: none">• Understand the basic concepts of technological innovations and its applications.	<p>Examples include pattern recognition through artificial intelligence (AI) and data science, 3D printing technologies, augmented reality (AR) and virtual reality (VR).</p> <p>Students should have practical experience with these technologies.</p>

CURRICULUM MAPPING

- Geography

<p>Map skills</p> <p>1. Read maps of different kinds and at different scales</p>	<p>✓</p> <p>3 types of scale</p>	<p>✓</p> <p>Read maps of different scales</p>	<p>✓</p> <p>Read floor plan</p>	<p>✓</p> <p>Read large scale maps</p>	<p>✓</p> <p>Read small scale maps</p>
<p>2. Find specific information in an atlas by using the index and contents pages</p>	<p>✓</p>			<p>✓</p>	
<p>3. Locate specific features and places on a map using coordinates and references</p>	<p>✓</p> <p>Longitudes & latitudes, grid references</p>				



NAVAID

Latitude 47° 05' 8.28" N

Longitude 87° 58' 28.65" W

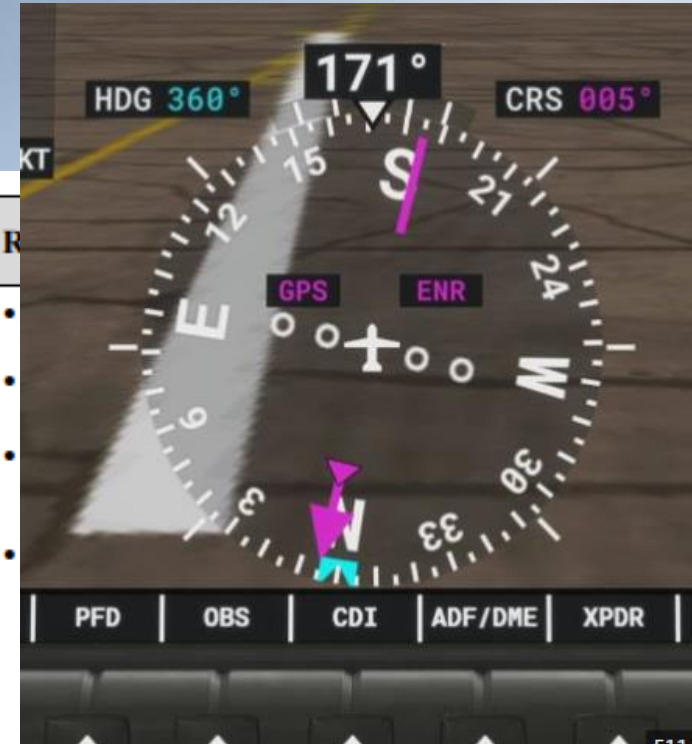
Altitude 1640Ft

Type Custom

CURRICULUM MAPPING

- Mathematics

Learning Unit	Learning Objective	Time	R
	27.3 understand the exact values of trigonometric ratios of 30° , 45° and 60°		
	27.4 solve problems related to plane figures		
	27.5 solve problems involving gradients, angles of elevation, angles of depression and bearings		Students are required to recognise the relation between gradients and inclinations. Students are required to recognise two kinds of bearing such as 010° and $N10^\circ E$.



CURRICULUM MAPPING

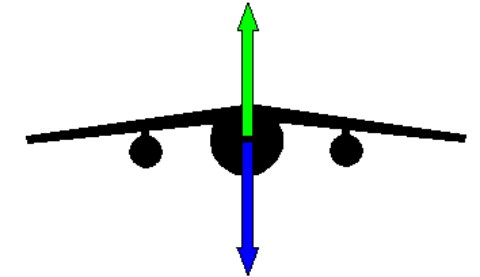
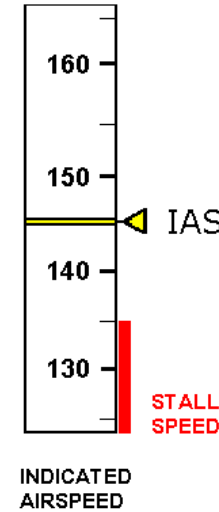
- Science / Physics

Students should learn	Students should be able to	Suggested learning and teaching activities
11.2 Force <ul style="list-style-type: none">• Effect of force	<ul style="list-style-type: none">• Describe the effect of force on changing the speed and direction of motion of an object	<ul style="list-style-type: none">• Demonstrate the effect of forces on motion by practical work, video clips or animations
<ul style="list-style-type: none">• Measuring forces• Contact forces and non-contact forces	<ul style="list-style-type: none">• State that newton (N) is a unit of force• Use a spring balance to measure forces• State that forces can act at a distance• Give examples of contact forces and non-contact forces	<ul style="list-style-type: none">• Investigate the relationship between the strength of a force acting on a spring and the extension of the spring• Demonstrate non-contact forces using magnets
<ul style="list-style-type: none">• Balanced forces and unbalanced forces	<ul style="list-style-type: none">• Recognise that an object will stay at rest or in uniform motion when the forces acting on it are balanced• Use free-body diagram to show the direction of forces acting on an object	<ul style="list-style-type: none">• Demonstrate that a stationary object, or a moving object with constant motion, has balanced forces acting on it (e.g. to pull an object with two spring balances in opposite directions)• Give examples of common situations where forces are unbalanced

CURRICULUM MAPPING

- Science / Physics

11.2 Force	
<ul style="list-style-type: none"> Effect of force 	<ul style="list-style-type: none"> Describe the effect of force on the speed and direction of motion of an object
<p>Students should learn</p> <ul style="list-style-type: none"> Measuring forces Contact forces and non-contact forces Balanced forces and unbalanced forces 	<p>Students should be able to</p> <ul style="list-style-type: none"> State that newton (N) is a unit of force Use a spring balance to measure force State that forces can act at a distance Give examples of contact forces and non-contact forces Recognise that an object will stay at rest or in uniform motion when the forces acting on it are balanced Use free-body diagram to show the direction of forces acting on an object
	<ul style="list-style-type: none"> Demonstrate non-contact forces using magnets Demonstrate that a stationary object, or a moving object with constant motion, has balanced forces acting on it (e.g. to pull an object with two spring balances in opposite directions) Give examples of common situations where forces are unbalanced



- Lift force
- Weight
- Centrifugal force (apparent)
- Vector sum of all body forces

CURRICULUM MAPPING

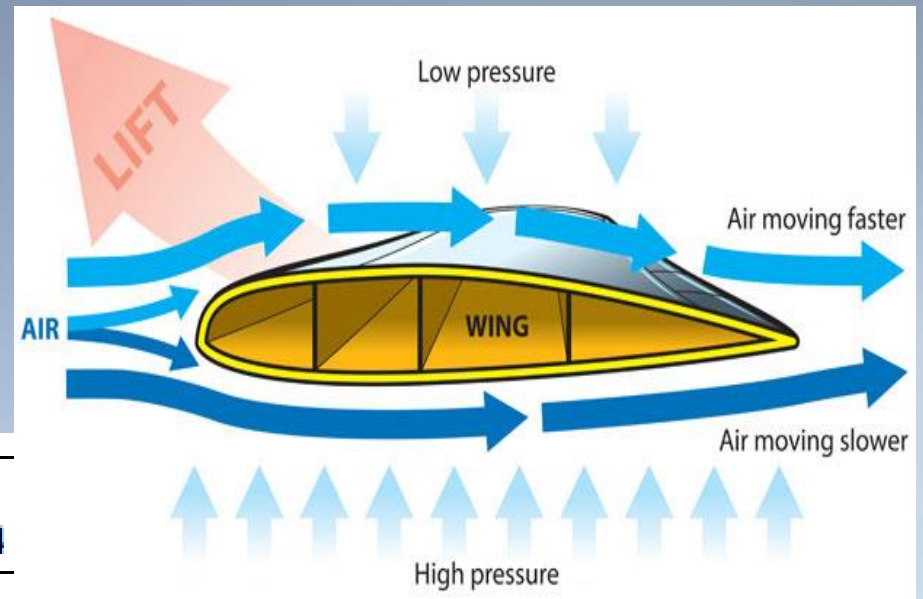
- Science / Physics

Students should learn	Students should be able to	Suggested learning and teaching activities
11.3 Gravity <ul style="list-style-type: none"> • Gravity and its effect • Weight and mass 	<ul style="list-style-type: none"> • State that gravity is the force that causes two objects to attract each other • Be aware that gravity exerted by Earth on an object pulls it towards the centre of the Earth • Recognise that the force of gravity experienced by an object increases with its mass • Recognise weight as a measure of the force of gravity on an object • Distinguish between weight and mass • <i>Recognise the relationship between weight and mass</i> 	<ul style="list-style-type: none"> • Study the motion of a free-falling object using a sensor (e.g. a motion sensor) • Find the weights of some objects with a spring balance • Search information to find out the weight of a 1 kg object on the Moon and on different planets • <i>Perform practical work to find out the relationship between weight and mass with a spring balance</i>
11.4 Friction and air resistance	<ul style="list-style-type: none"> • Recognise that friction and air resistance are forces that oppose the motion between contact surfaces • Describe ways for reducing friction and 	<ul style="list-style-type: none"> • Demonstrate the effects of friction and air resistance on the motion of an object • Perform practical work to show that friction can be reduced by lubricants, air
Students should learn	Students should be able to	Suggested learning and teaching activities
	air resistance	cushions and ball bearings, and that air resistance can be reduced by stream-lining the shape of an object



CURRICULUM MAPPING

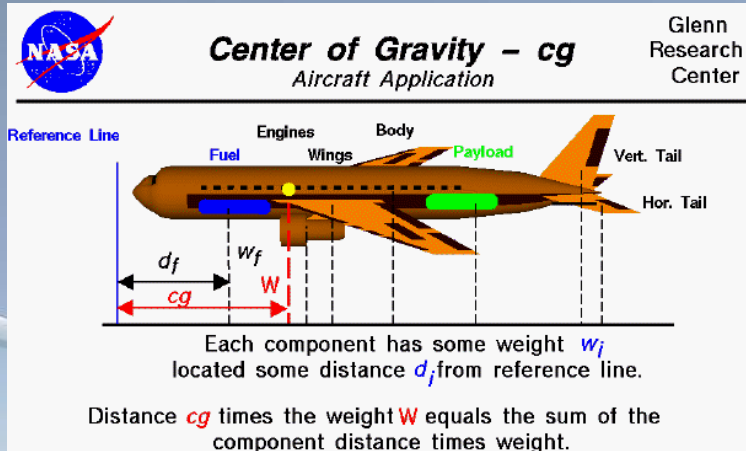
- Technology & Society / Design & Technology



Knowledge Contexts	Learning Elements	Key S1 Primary 1 - 3	KS2 Primary 4
			responses from the intended audience
	Design & Applications	<ul style="list-style-type: none"> • Design and make artefacts with commonly available resources • Develop interest and curiosity in knowing how things work • Be aware of the functional and aesthetic aspects in a variety of designs and products 	<ul style="list-style-type: none"> • Recognise the concepts used in the design cycle and apply them in solving problems • Understand the functional and aesthetic requirements in design and project work • Design and build models by using different materials and test the selected functional characteristics of the models built
			<ul style="list-style-type: none"> • Develop and evaluate a product or a system according to the functional, aesthetic and other standards • Know how to apply cost-benefit principles to technological processes

FUTURE DEVELOPMENT

Maths/ Physics – Centre of gravity



D&T – CAD, Airfoil design

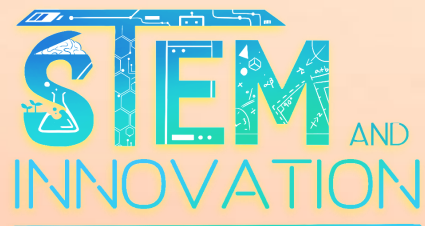


Geography – Weather & Climate



History – Industrial Revolution



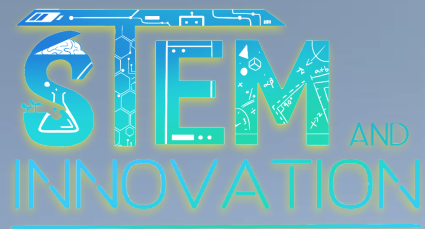


聖公會曾肇添中學
S.K.H. Tsang Shiu Tim
Secondary School

A large commercial airplane is shown from a rear perspective, flying over a runway at sunset. The runway lights are visible in the foreground, and the sky is a warm orange color. The sun is a bright, glowing orb in the upper right corner.

Thank You!

Q&A SESSION



聖公會曾肇添中學
S.K.H. Tsang Shiu Tim
Secondary School

