St. Paul's Convent School (Secondary Section) - Outstanding Teaching Award for Values Education

School-Based BIO X ECON Program: Vaccination and Community Health Theme: Health Education

校本跨學科「生物 X 經濟」課程:疫起共對為家園

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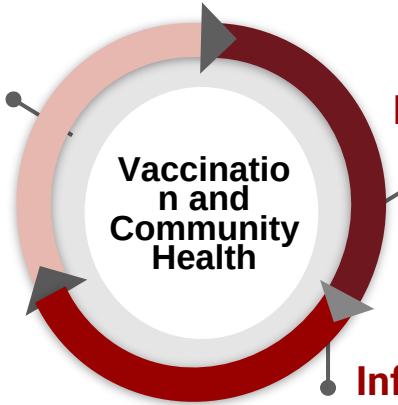
School-Based BIO X ECON Program: Vaccination and Community Health

Theme	Duration	Target Student
Health Education	7 Lessons (280 Minutes)	Form 4 NSS Biology

Curriculum Integration: Interdisciplinary Program

Hidden Curriculum:
- Values Education
- Positive Education
- Generic Skills



Formal Curriculum:

Science KLA
- NSS Biology (F.4)

PSHE KLA
- NSS Economics (F.4)

Informal Curriculum:
- STEAM Education

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Vaccination and Community Health

Topics to be covered:
- Lesson 1-2: Understanding Herd Immunity
- Lesson 3: SIR Modeling Simulation
- Lesson 4: Economic Impacts of Vaccination
- Lesson 5-6: Group Project and Presentation

Values and Attitudes:
- Be open-minded and understand the importance of being vaccinated to our society
- Achieve a long-term health planning and be self-responsible through risk-benefit analysis
- Strengthen the relationship between students, society and the government

Learing Objectives:
- Principle of Vaccination, which includes the advantages, risks and biological effects of vaccination on the public health
- Market failure - positive externality (under-consumption - external benefits) of being vaccinated and long-term government budget on medical expenses
- Use of a self-developed simulation SIR model to calculate herd immunity thresholds and discuss the ethical importance and values of achieving these thresholds.

Name: _____ Class: _____

Lesson Flow

Teacher-Led Teaching → **Co-Construction of Knowledge** → **Student-Led Learning**

Lesson 1-2
Understanding the Principle of Vaccination & Herd Immunity

Lesson 3
Mathematical Modelling & Modeling Simulation

Lesson 4
Economic Impacts of Vaccination

Lesson 5
Discussion & Poster Design

Lesson 6-7
Poster Presentation & Reflection

Part I - Background Information

School-Based Lesson Materials

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Vaccination and Community Health

Lesson 1-2

Understanding Herd Immunity

Case study - Polio

Introduction

Poliomyelitis, commonly known as polio, is a highly contagious viral disease that can lead to paralysis and even death. The poliovirus spreads primarily through person-to-person contact and can also be transmitted via contaminated food and water.

Source: https://compass.ravias.com/current-affairs/what-is-vaccine-derived-polio/

Definition of R0

The basic reproduction number (R0) represents the average number of people that one infected person will infect in a completely susceptible population.

Polio's R0

The R0 value for polio is estimated to be between 5 and 7. This means that, on average, one person infected with polio can spread the virus to 5 to 7 other individuals if no one in the population is immune.

The Herd Immunity

Threshold Formula V = 1- (1/R0)

*Denoted that V is vaccination rate required to achieve herd immunity

Exercise: Calculate the vaccination rate required to achieve herd immunity against polio by using the R0 value provided.

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Vaccination and Community Health

Lesson 3

Modeling Simulation

Introduction

This handout will guide you through using an online SIR (Susceptible- Infectious-Recovered) simulator to model the spread of infectious diseases. You will learn how to input parameters, run simulations, and interpret the results.

Understanding the Simulator Interface

Before you begin, familiarize yourself with the main components of the simulator:

- Parameter Input Fields: Where you enter values for the simulation.
- Graphical Output: Displays graphs of Susceptible, Infectious, and Recovered individuals over time.
- Simulation Controls: Buttons to run, pause, or reset the simulation.

Instruction: Setting the Parameters

A. Basic Reproduction Number (R0)

- Understanding R0:
  - R0 represents the average number of people one infected person will pass the disease to in a fully susceptible population.
- Input:
  - Transmission Rate (β) and Recovery Rate (γ) and Basic reproduction number R0.
  - To calculate β and γ from R0, use:

$$R_0 = \frac{\beta}{\gamma}$$

  - You can assign γ based on the average infectious period (D):

$$\gamma = \frac{1}{D}$$

  - Then calculate β:

$$\beta = R_0 \times \gamma$$

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Value Education SIR Simulator

Total Population (N):
1000

Vaccination Percentage (%):
0

Initial Infected (I_0):
1

Initial Recovered:
0

Initial Susceptible (S_0):
999

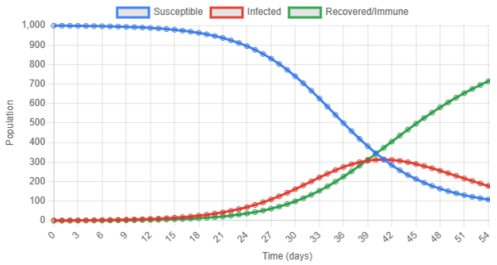
Infection Rate (β):
0.3

Recovery Rate (γ):
0.1

Basic Reproduction Number (R_0):
3

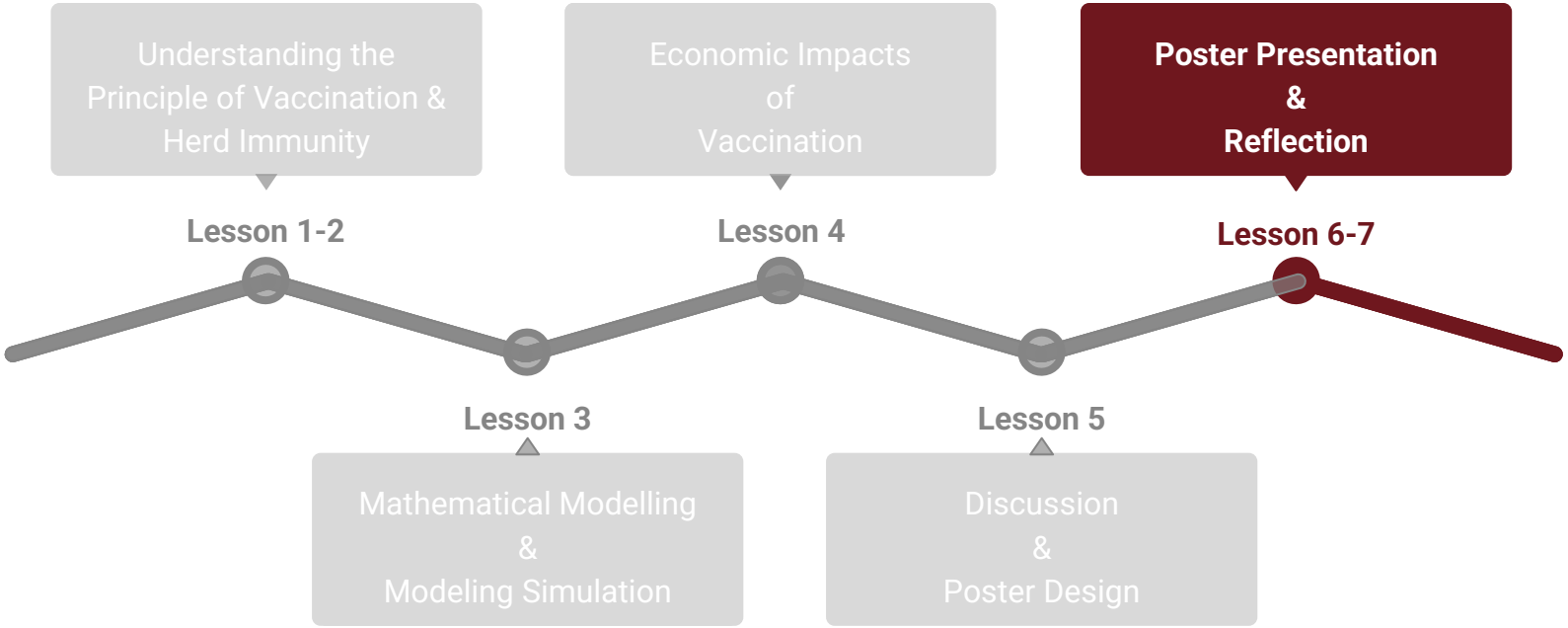
Simulation Days:
160

Run Pause



Lesson Flow

Teacher-Led Teaching | **Co-Construction of Knowledge** | **Student-Led Learning**



Student Profile

- **Subject:** F.4 HKDSE (NSS Biology)
- **Class size:** 25 students
- **Learner Diversity:** Medium to High Achievers (A portion of talented students)
- **Students Characteristics:**
  - Active
  - Hardworking
  - Inquisitive

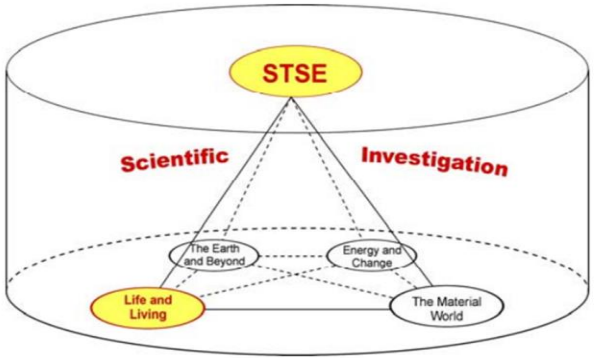
Pre-Built Knowledge

Form 1-2	Form 3
School-Based Junior Science	Edexcel IGCSE Biology

Part II - Student Profile and Lesson Plan

Curriculum Orientation in Science KLA (NSS Biology)

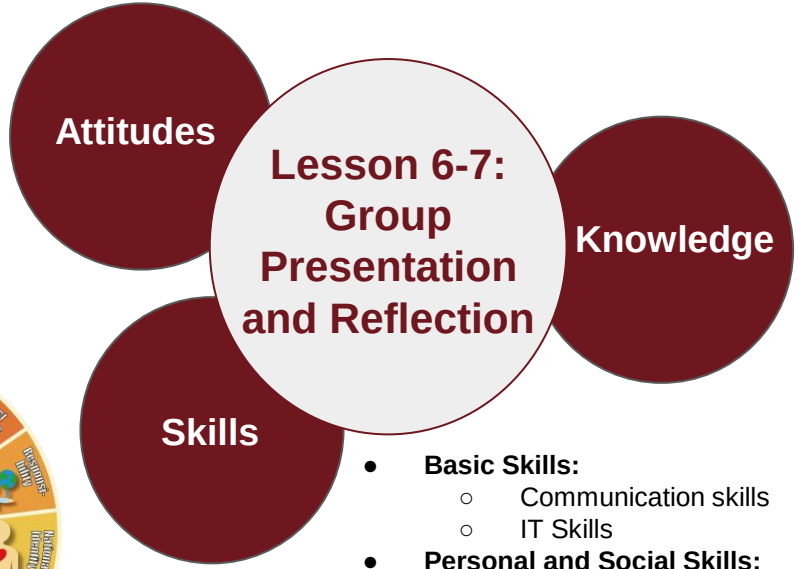
This curriculum draws and builds upon the knowledge and understanding, skills and processes, and values and attitudes developed in the junior secondary science curriculum. It extends the study of the "Life and Living", "Scientific Investigation" and "Science, Technology, Society and Environment (STSE)" strands in science education. Figure 1.1 depicts how the strands in this KLA are inter-related.



Part II - Student Profile and Lesson Plan

Understanding of Lesson Plan through ASK Model

- Be **open-minded** and understand the importance of being vaccinated to our society
- Be **self responsible** for achieving a long-term health planning through risk benefit analysis
- **Strengthen relationship** between students, society and government



- Outline the **principle of vaccination** and **evaluate the advantages and risks** of its application.
- Be **aware of personal responsibility** in preventing disease transmission and the importance of community health.
- **Economic impacts** of vaccination
- Basic understanding on the **use of the SIR simulation**

- **Basic Skills:**
  - Communication skills
  - IT Skills
- **Personal and Social Skills:**
  - Self-Learning skills
  - Collaboration skills
- **Thinking Skills:**
  - Critical thinking skills
  - Problem-solving skills

Detailed Lesson Plan and Procedure

School-Based BIO X ECON Program

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Lesson 5-6
Group Presentation - Assessment Criteria

Guiding Questions

1. What value(s) have been incorporated into the poster design of this group?
2. Regarding the theme or disease introduced by this group, what actions can be taken to manifest the twelve values?

	Excellent	Good	Fair	Need Improvements
Content Knowledge [30]	[22 - 30] Demonstrates exceptional understanding of externalities, economic impacts, and vaccination concepts.	[16 - 22] Shows good understanding with minor gaps in externalities or vaccination concepts	[10 - 15] Displays basic understanding of content with several gaps in key areas.	[5 - 9] Lacks understanding of key concepts; minimal knowledge of externalities and vaccinations.
Communication and Presentation [20]	[16 - 20]Presents ideas clearly and confidently, engaging the audience effectively.	[12 - 15] Communicates ideas clearly but may lack engagement.	[8 - 11] Communication is unclear and lacks structure.	[3 - 7] Fails to communicate ideas effectively.
Values Integration [20]	[16 - 20] Seamlessly integrates values such as responsibility and commitment with strong examples.	[12 - 15] Integrates values with some relevant but weaker examples.	[8 - 11] Shows limited integration of values; examples may be unclear.	[8 - 11] Values are not integrated or poorly understood.
Effective Use of Data [15]	[12 - 15] Uses accurate data effectively to support arguments and insights.	[8 - 11] Data supports arguments but may lack depth or accuracy.	[5 - 7] Limited use of data; inaccuracies or lack of relevance present.	[2 - 4] No effective use of data; arguments are unsupported.
Critical Thinking and Analysis [15]	[12 - 15] Demonstrates high-level critical thinking and insightful analysis of content.	[8 - 11] Shows some critical thinking with basic analysis	[5 - 7] Limited critical thinking; analysis is superficial.	[2 - 4] Lacks critical thinking; analysis is absent or flawed.

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St. Paul's Convent School
Vaccination and Community Health
Lesson 5-6
Group Presentation - Peer Assessment Form

Observation Group: _____ **Observed by: Group** _____
Topic: _____

Category	Mark	Comments
Content Knowledge [30]		
Communication and Presentation [20]		
Values Integration [20]		
Effective Use of Data [15]		
Critical Thinking and Analysis [15]		

Group Presentation (20 Minutes)

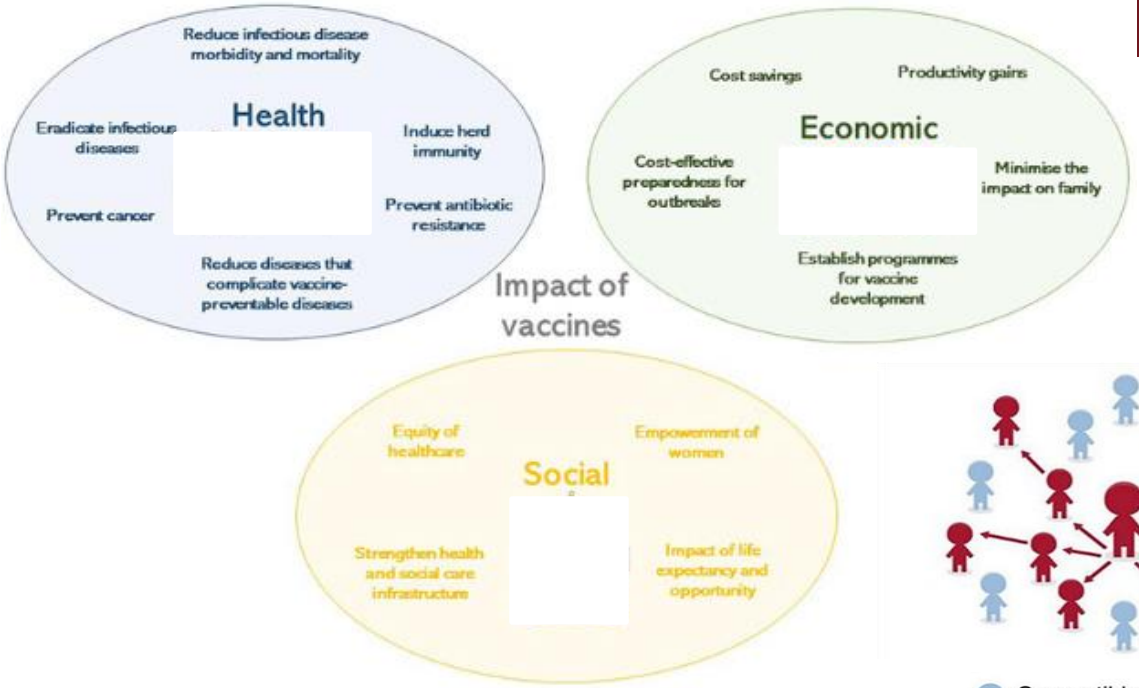
5 minutes presentation + 5 minutes follow-up

- The **remaining two groups** will present their ideas with their designed A3 digital posters.
- **Procedure:**
  - 5 minutes: 1st group presentation
  - 5 minutes: 1st group follow-up and feedback
  - 5 minutes: 2nd group presentation
  - 5 minutes: 2nd group follow-up and feedback

Learning Activity

Other students will have to fill out the peer evaluation form and offer **TWO** positive comments and **ONE** improvement

Detailed Lesson Plan and Procedure

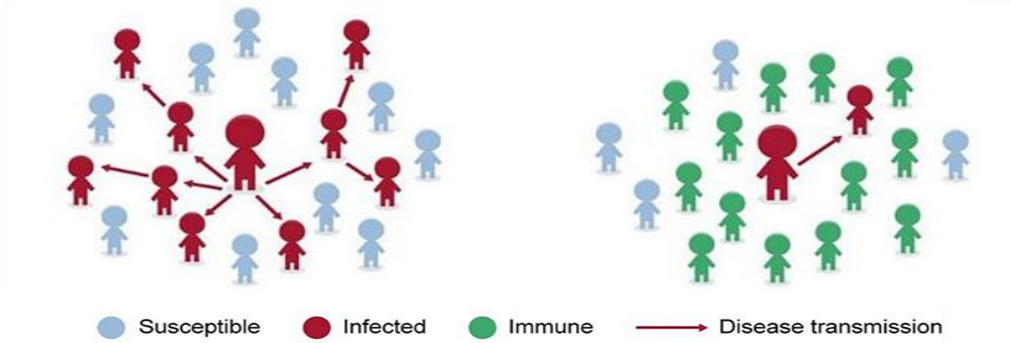


Brief Summary (5 Minutes)

Learning Activity

Provide general feedback on the group project work and **recall all the learning checkpoints**

- Basic biological concepts
- The economic impacts
- Mathematical modeling (SIR Simulation)



Detailed Lesson Plan and Procedure

Key Focus Question
What and how can the students achieve after the lessons?

Guided Reflection (10 Minutes)

Mandatory Vaccination?

Learning Activity

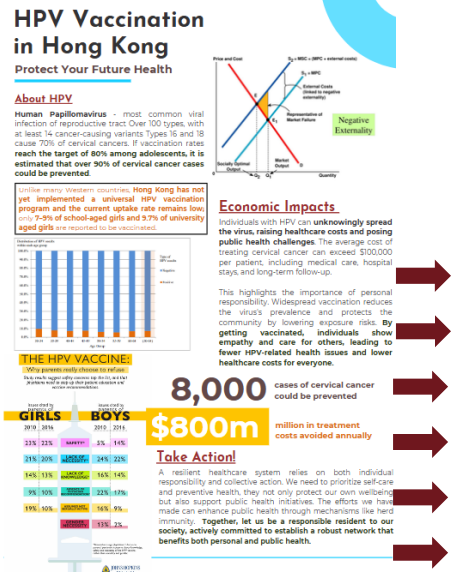
Discuss whether **vaccination should be legalized** to promote community health

- **Key Focus Question:**
  If vaccination is beneficial to society, should it be legalized?

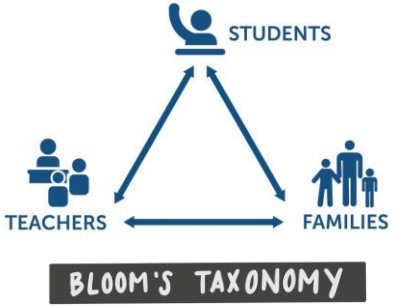
Filial Piety and Empathy

Critical Thinking
Problem Solving

Social Responsibility



What are the possible methods to promote vaccination?



Learning Activity

Prompt the students to think about **how they can be socially responsible** in promoting the importance of vaccination

- **Parenting Education:**
  How vaccination can strengthen the **relationship** between the students and their families.
- **"Learning by Doing" Practice:**
  The students can **create** their own projects and provide resources to them to achieve what they planned.

Detailed Lesson Plan and Procedure

St. Paul's Convent School
Community Project Guideline

Project
"Informed Choices, Healthy Communities": A Vaccination Awareness Community Project Campaign

Learning Objective
The goal of this project is to educate the community about the ethical, scientific, social and economical aspects of vaccination. Through interactive student-led project activities, research, and engagement initiatives, your group will develop a comprehensive understanding of the role vaccines play in public health and global well-being.

Project Content
The project research plan should cover:
- Project overview (refer to the designed poster)
- Target Audience (Focus group)
- Collaboration Organization(s)
- Timeline
- Material(s) Needed and Budgets
- Key Performance Indicators (KPIs)

Project Timeline

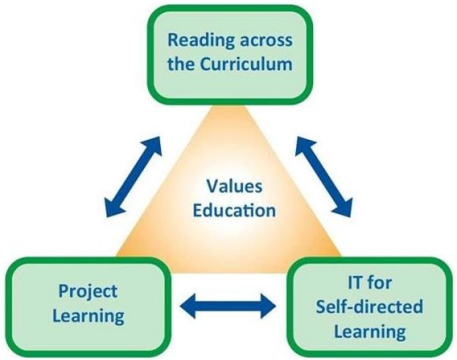
Content(s)	Duration
Project Preparation	Mar 2025 - Apr 2025
Project Consultation (Ongoing Modification)	Apr 2025 - May 2025
Project Deadline	30 May 2025
Community Outreach Learning Experience	Early July 2025
Preparation, Debriefing and Reflection	Early July 2025

Assessment Criteria
Your group should submit a project plan before **15 April 2025**. Late submissions will result in mark penalties. The project's performance will be assessed based on:

- Research & Knowledge (30%)
- Presentation (25%)
- Creativity & Innovation (15%)
- Reflection (15%)
- Impact & Sustainability (15%)

SDG Goal 3 & 11

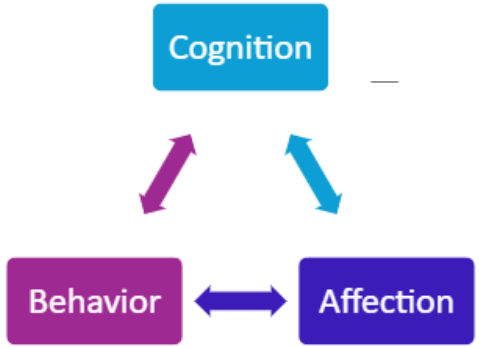
"Four Key Tasks"



Assign Group Work (5 Minutes)

Learning Activity
Explore ways to promote positive values in their communities in the Community Engagement Project.

- **Cognition-Affection-Behavior Framework:**
  The students would integrate the CAB framework into their community project with ongoing feedbacks.



Part III - School-Based Lesson Design Framework

School-Based BIO X ECON Program: Vaccination and Community Healthc

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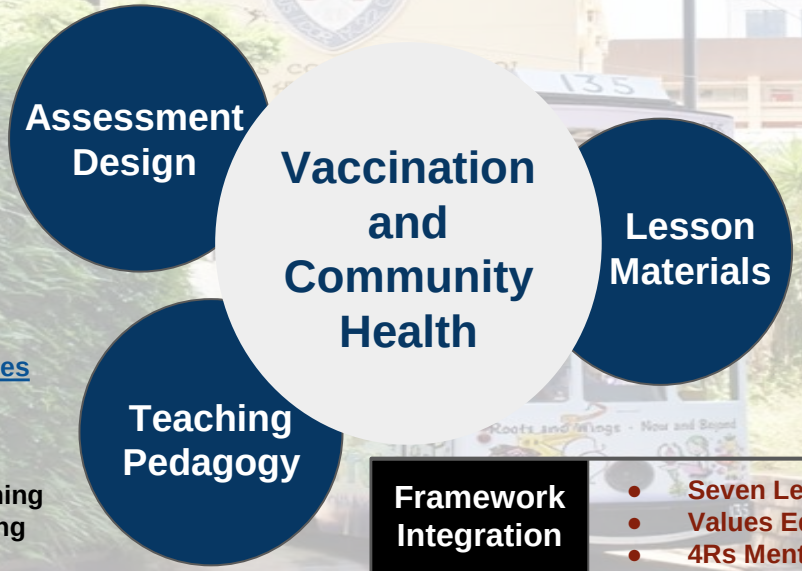
Assessment For Learning Practice

- Formative Assessment: Ongoing lesson responses
- Summative Assessment: Poster and Group Presentation
- Aims to assess the unintended learning outcome
- Ongoing Interdisciplinary Program: Community Project

Mixed Pedagogy Approaches

- Direct Teaching
- Flipped Classroom
- Project-Based and Collaborative Learning
- Experiential Learning



Self-Developed School-Based Materials

- Interdisciplinary Approach: NSS Biology and Economics
- Stimulation Model through GenAI

Adoption Practice - Learner Diversity

- Cross-subjects knowledge and materials for gifted students

Curriculum Integration

- Informal curriculum: STEAM Education
- Hidden curriculum: Values Education

Framework Integration

- Seven Learning Goals & SDG Goals
- Values Education Framework
- 4Rs Mental Health Charter & Positive Education

Remark: It aligns with NSS Biology and Economics Curriculum Framework and the School-Based Lesson Design Framework has referenced to Secondary School Educational Reform, NSS Curriculum Framework, Values Education Framework and 4Rs Mental Health Charter.

Part III - School-Based Lesson Design Framework

Lesson Plan Integration - School-Based Core Values

School Mission - "7Cs" Core Values

The school aims at providing an all-round education, based on Christian values, that enhances the quality of life, both spiritually and materially, for our Paulinians so that they can **contribute positively to their home, profession and society with charity, conscience, confidence, courage, creativity, competence and commitment.**

Confidence

Student-Centered Learning Approach

- Group discussion with cross-curriculum knowledge
- Group work and presentation

+

Creativity

Diverse Teaching Pedagogy Approaches

- Values-infused inquiry-based learning
- Cross-curriculum learning
- Socratic method

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Commitment & Competence

Learning-by-Doing through Co-construction of Knowledge

- Ongoing student-led community outreach programme
- Informal curriculum integration

Part III - School-Based Lesson Design Framework

Framework Integration (Seven Learning Goals for Secondary Education)

Interdisciplinary Program

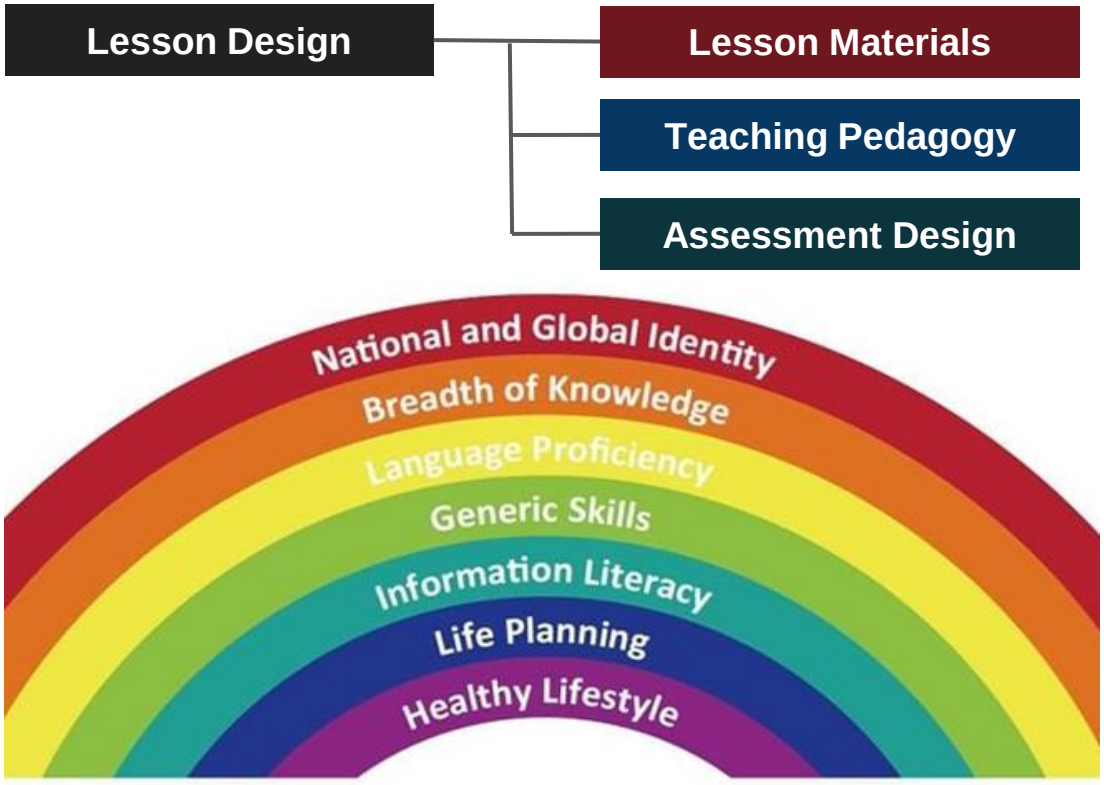
The lesson materials integrated NSS Economics can **enhance students' breadth of knowledge**. With extra readings and presentation, it also helps to **improve language proficiency**.

Co-teaching Development

Adopting co-teaching can enhance overall teaching quality, allowing teachers to actively learn beyond their expertise. This collaborative approach supports professional development and **enriches the cross-curriculum teaching experience**.

Group Project

By implementing a BYOD policy in assessments, the group work **improves students' information literacy skills**. It **enhances generic skills**, such as collaboration skills. The research further **strengthened national identity** and relationship with our community.



Part III - School-Based Lesson Design Framework

Hidden Curriculum: Framework Integration (Values Education)

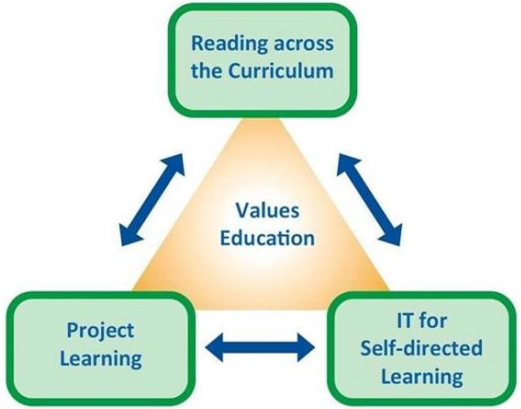
We have naturally **integrated positive values into the lesson design as part of the hidden curriculum**. From the perspective of learning outcomes, students are expected to incorporate these values into posters.

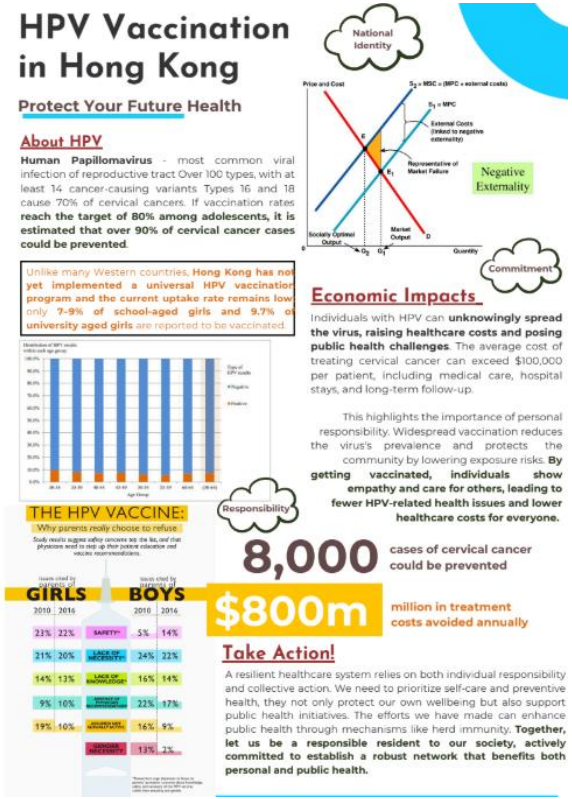
Core Values:

- **National Identity: Filial Piety**
- **Responsibility (Commitment)**

Other Values:

- **Unity**
- **Empathy (Conscience)**





Part III - School-Based Lesson Design Framework

Hidden Curriculum: Framework Integration (4Rs Mental Health Charter & Positive Education)

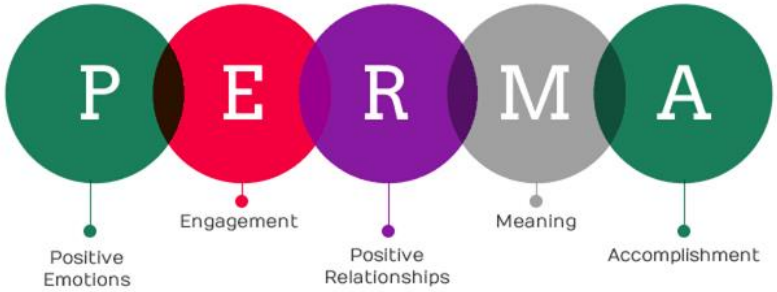
4Rs Mental Health Charter

Besides the written assessment, the **use of multiple assessment tools**, such as group presentations and community projects, can help **reduce academic stress and achieve the purpose of assessment for learning**.

Relationship

Different tasks such as **group project and community project** aim to help students to develop a strong relationship with peers, families and our community.

Positive Education - PERMA Model



P ositive emotions on promoting health improvements

E ngagement with our community

R elationships with peers, family and community

M eaning of vaccination onto our society

A ccomplishment in helping others

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