

POLYU NURSING DIALOGUE:

Defining Nursing as STEM: Examples from Education, Practice and Research

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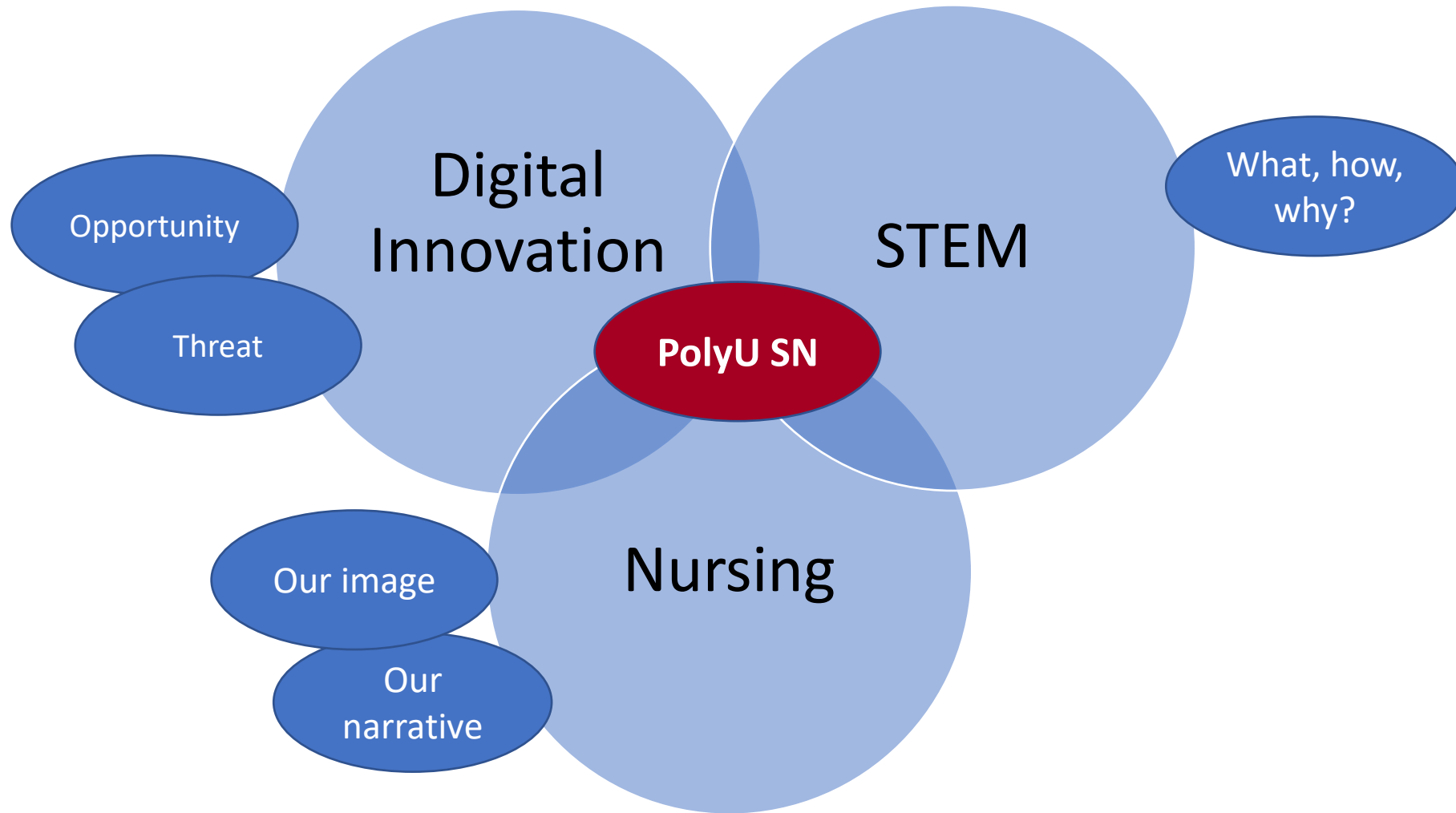
Chair Professor and Head, School of Nursing

The Hong Kong Polytechnic University, Hong Kong

Hong Kong SAR Global STEM Professor

Director, The Hong Kong Jockey Club STEM Lab – Digital Oncology Care Enhancement (DOCE)

Setting the scene



What is STEM?

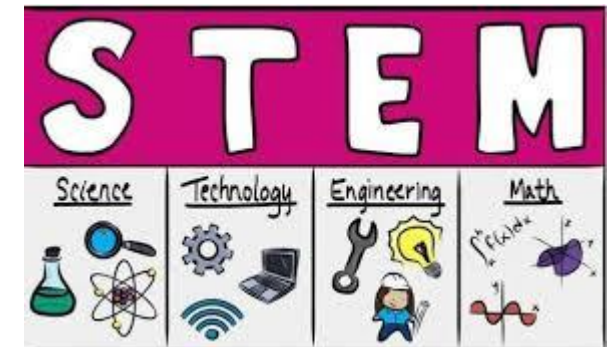


- Abbreviation for four closely connected areas of study:
 - **Science, Technology, Engineering and Mathematics**
- *Official use of 'STEM' in a mentoring program (New York) in 1991, followed by National Science Foundation (NSF) in 2001.*
- A STEM courses = one or more of the four core disciplines
- STEM courses are foundational for:
 - innovation
 - problem-solving
 - development of new industries and technologies
 - critical thinking and analysis
 - apply knowledge across different areas to solve real-world problem

What is STEM?



- Most popular STEM programmes:
 - computer science, data science, and various branches of engineering
- Major in: Biology, Chemistry, Computer Science, Earth Science, Engineering, Mechanical Engineering, Mathematics, and Physics
- **Implications** for funding – teaching and research
- **Implications** for study and work visas
- **Implications** to attract school leavers

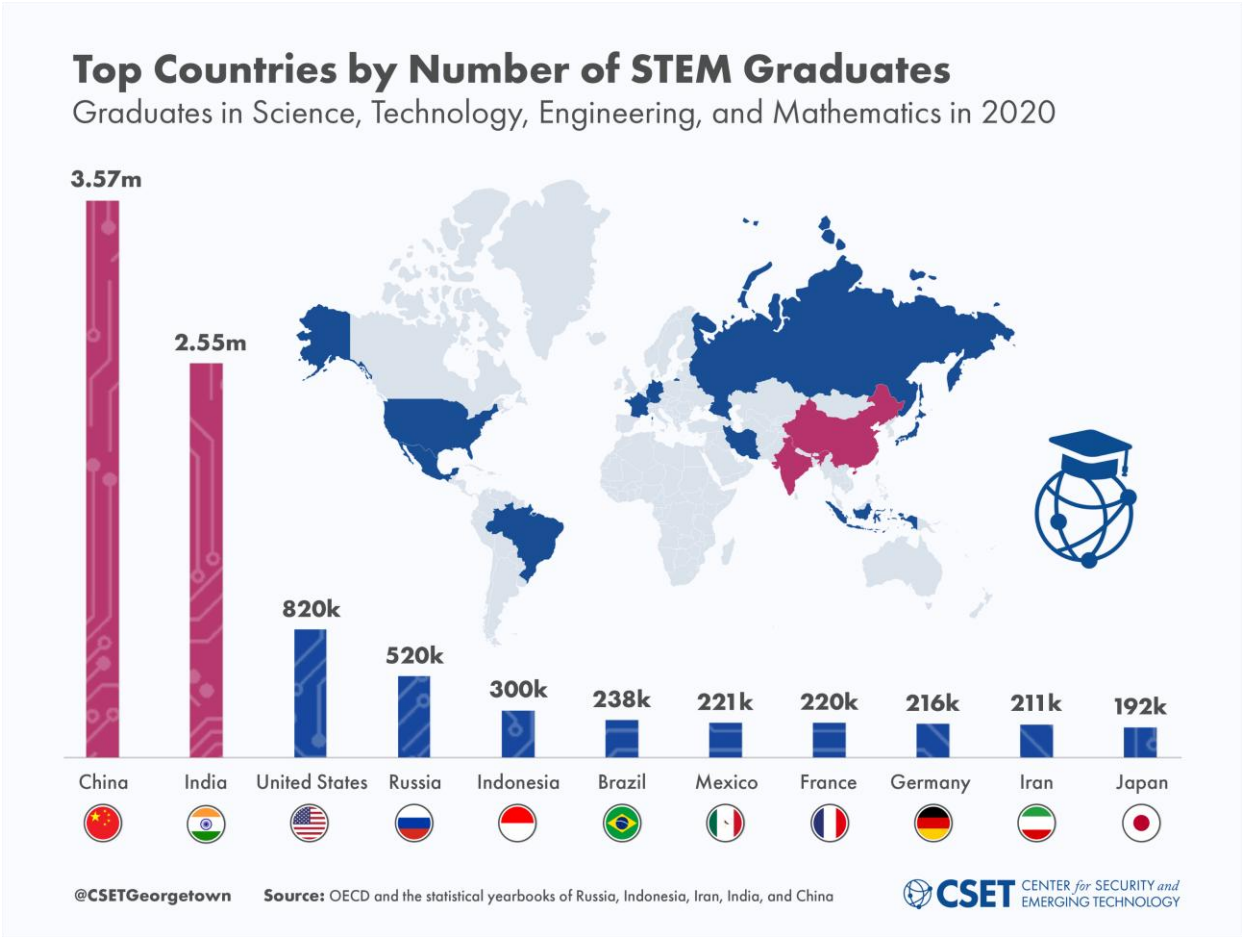


Rose D, Sept 16, 2022



STEM graduates by country

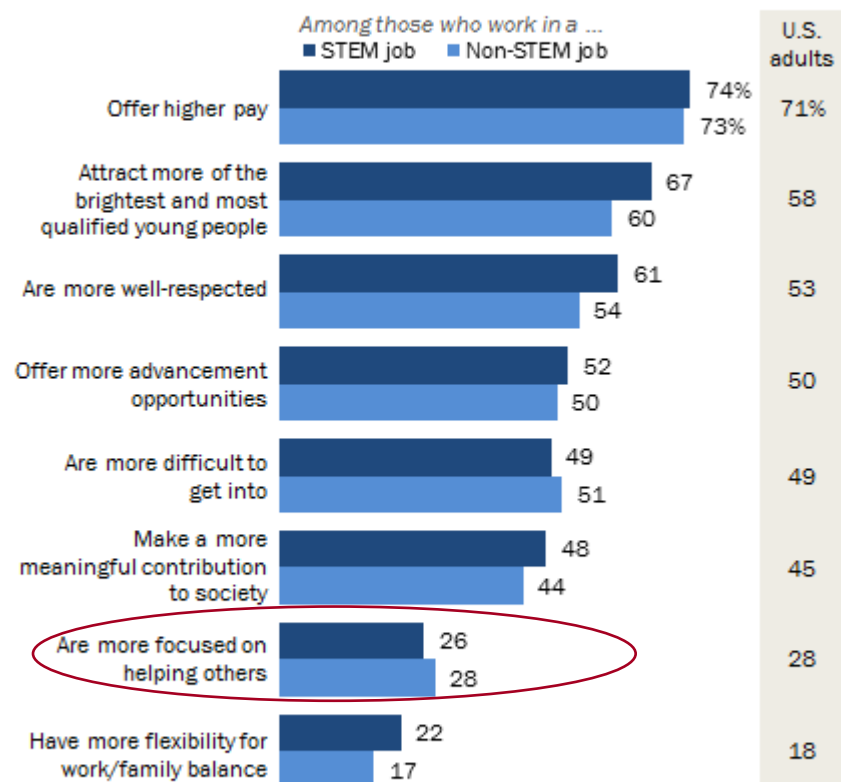
By the mid-2000s, China surpassed the United States in the number of STEM PhDs awarded and is expected to produce 77,000 PhDs in 2025, compared to 40,000 in the US



Top Countries by Number of STEM Graduates in 2020. CSET. B Oliss, C McFaul, JC Riddick, November 27, 2023. (Original graph created by [Niall McCarthy at Statista](#))

Most Americans believe STEM employment offers better pay than other industries

% of U.S. adults who say that, compared with jobs in other industries, jobs in science, technology, engineering and math ...



Note: Respondents who gave other responses or who did not give an answer are not shown.

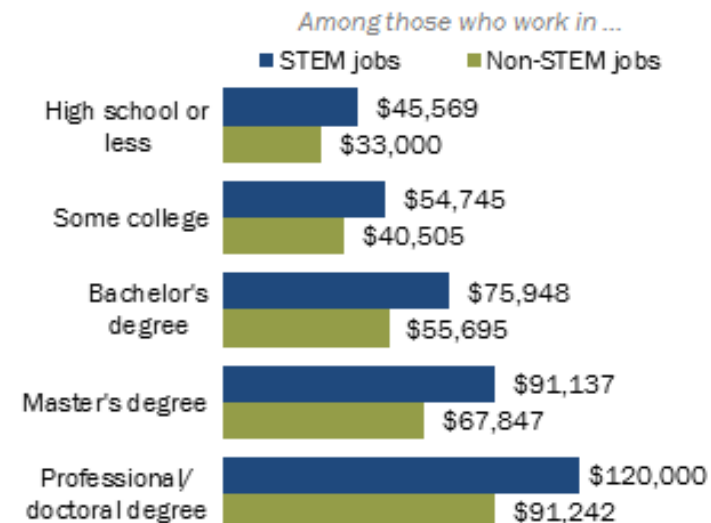
Source: Survey of U.S. adults conducted July 11-Aug. 10, 2017.

"Women and Men in STEM Often at Odds Over Workplace Equity"

PEW RESEARCH CENTER

STEM workers tend to earn more than similarly educated non-STEM workers

Median annual earnings of full-time, year-round workers ages 25 and older with positive earnings



Note: Figures based on 2016 dollars. Some college includes those with an associate degree and those who attended college but did not obtain a degree. Professional degree includes those with an M.D., D.D.S., D.V.M., LL.B or J.D. Doctoral degree includes those with a Ph.D. or Ed.D. STEM stands for science, technology, engineering and math.

Source: Pew Research Center analysis of 2014-2016 American Community Survey (IPUMS).

"Women and Men in STEM Often at Odds Over Workplace Equity"

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Is Nursing a STEM Discipline...?



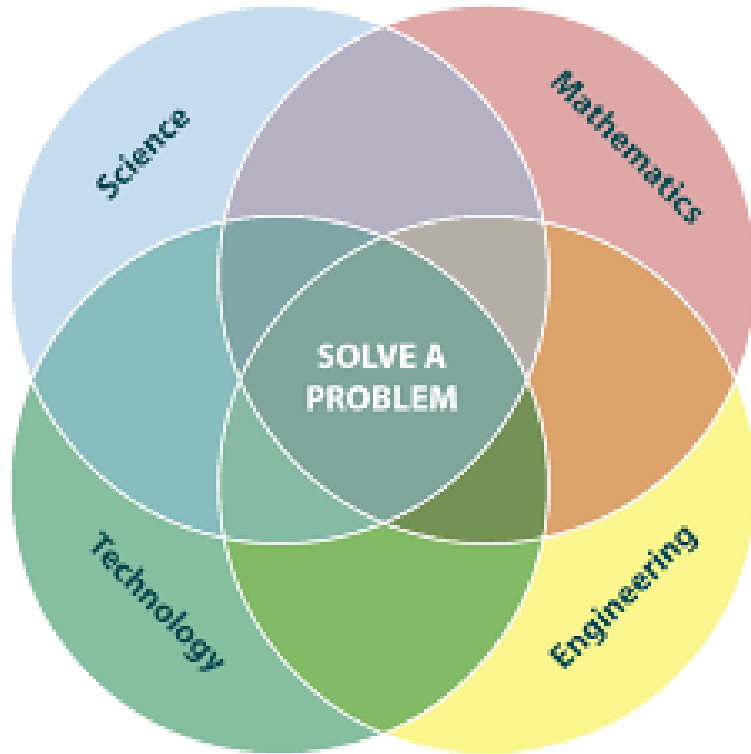
Renewing the Definitions of 'Nursing' and 'a Nurse'

Final Project Report
June 2025



2025 – ICN New Definition...

- 23 years since last ICN definition - a shift away from our identity based on tasks
-a profession requiring **scientific** knowledge, **ethical** standards, and **therapeutic** relationships
- Positions the nurse to play a role in shaping **policy**, and having comprehensive roles in **innovation**, **disaster response**, and **population health**



Science

- Anatomy, biology, microbiology, pathophysiology
- Health assessments
- Identify illness and disease
- Implement evidence-based interventions

Technology

- Computer-based technology
- Use of equipment and machinery
- Telemonitoring, dialysis, IV's, remote symptom monitoring

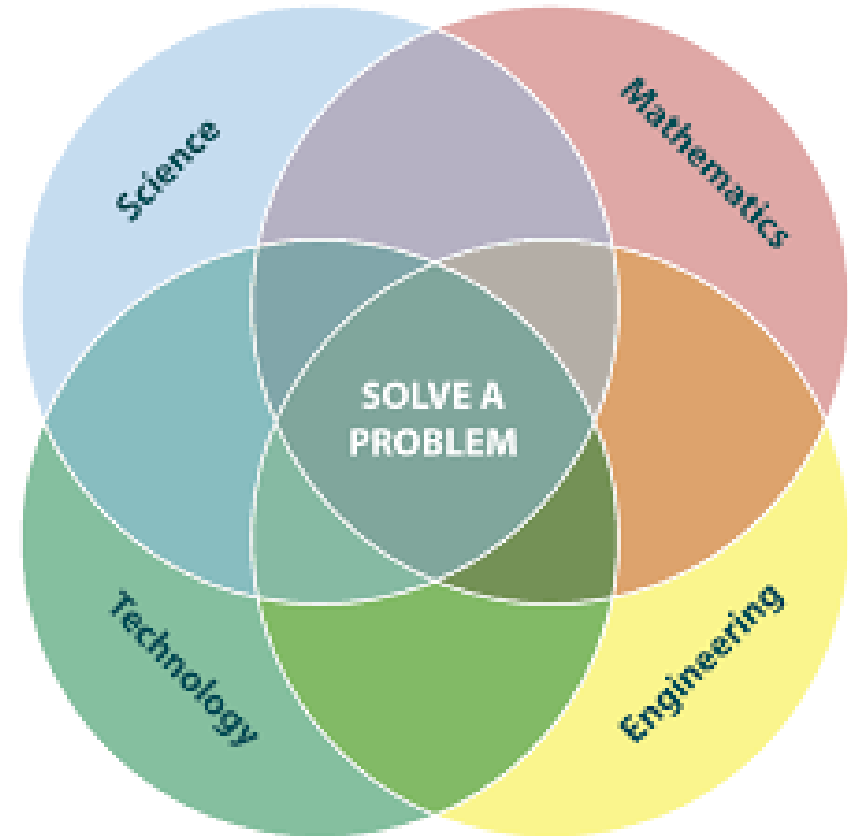
Engineering

- Computer programming, setting codes
- Health/nursing informatics
- Biomedical engineering
- Monitoring devices, wearables etc

Mathematics

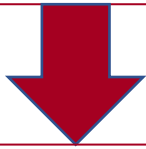
- Drug calculations and administration
- Blood gas analysis
- Biochemistry
- Statistics

Nursing STEM...in one picture

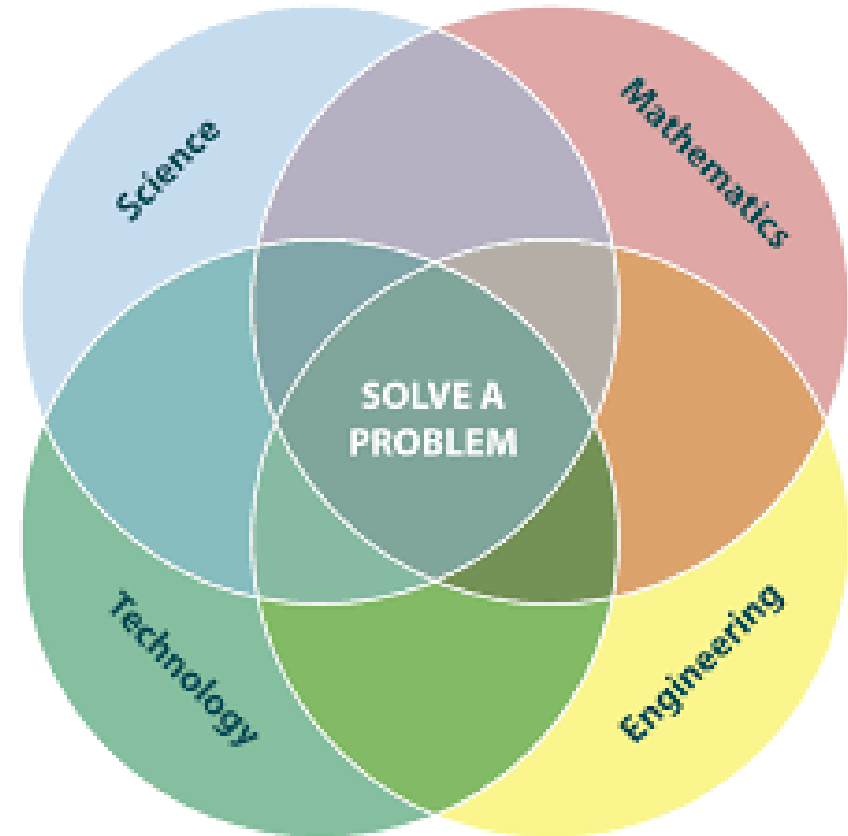


Key areas of impact:

- Patient outcomes and safety
- Health promotion
- Chronic disease management
- Symptom management
- Health disparities and equality
- Digital health and informatics



Evidence-based nursing practice



Why does it matter?

- Access to funding
 - Education, research
- Recruitment opportunities
- Modernize image of nursing
- Because nursing is a logical fit
- Examples from practice, education and research

Why is it hotly debated?

- Nursing image
- Nursing is about 'soft skills'
 - Science and Art ?
- Gender bias, sexism, hierarchy
- Professional confidence
 - Medicine is STEM
 - UK term: STEMM(edicine)

Without STEM we wouldn't be able to provide evidence-based, scientific and innovative practices to our patients or undertake research to develop and continually develop nursing science

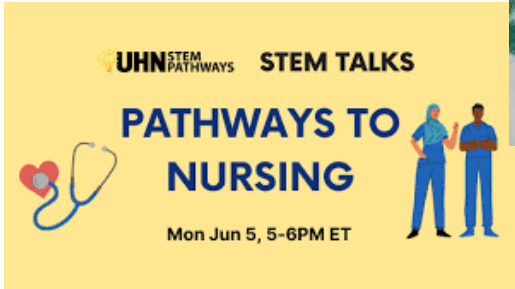
STEM Nursing...Hong Kong and PolyU leading the way



The Hong Kong SAR Global STEM Scholar Programme....



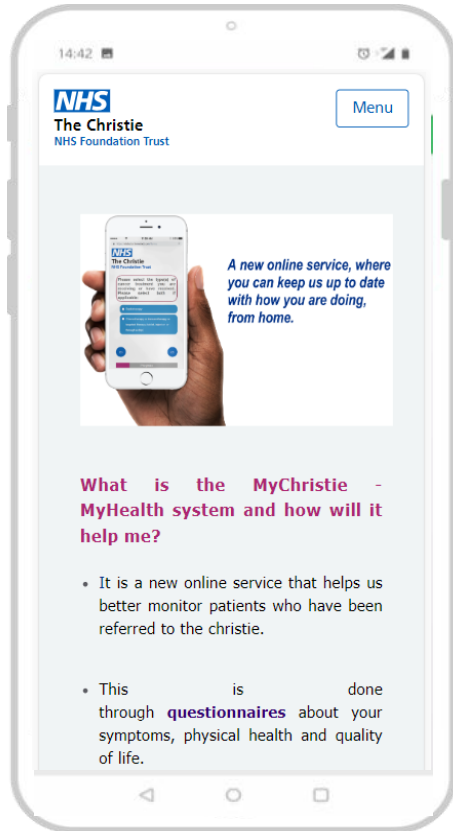
Searching for Nursing and STEM....



Nursing STEM Success
STEM Career Education



JC STEM Lab of Digital Oncology Care Enhancement
賽馬會「數碼提升腫瘤照護」創科實驗室



Science

- Symptomatology
- Cancer treatments and toxicities
- Personalised pathways
- Evidence-based intervention

Technology

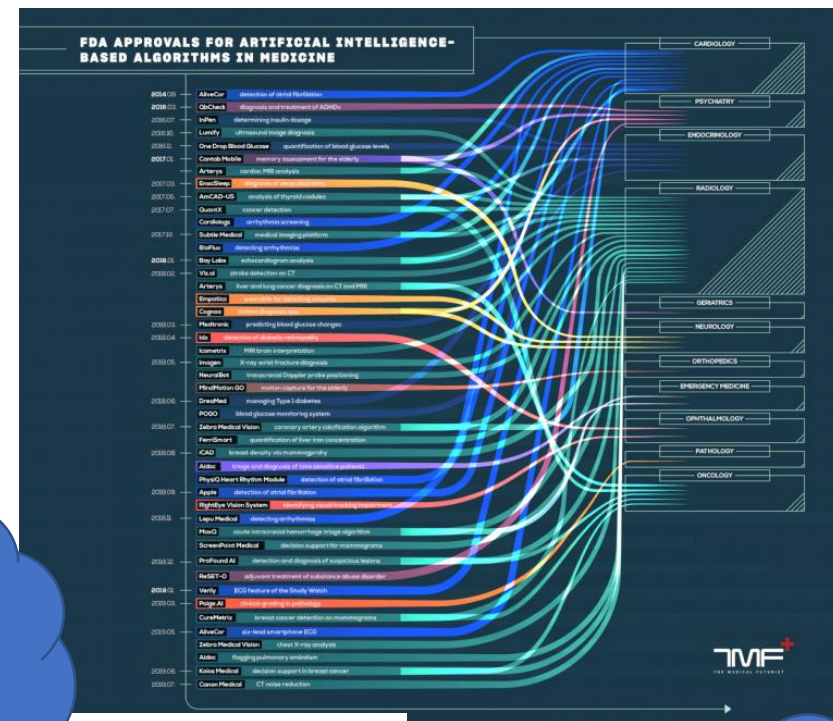
- Computer-based technology
- Linking remote reports to EHR
- Digital platform development

Engineering

- Computer programming
- Informatics
- Monitoring devices, wearables

Mathematics

- Advanced psychometrics
- Big data and statistics
- AI, predictive models, decision trees

[illegible]

patient?

Dataset

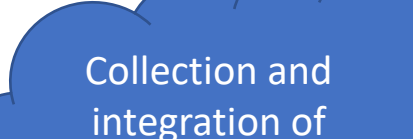
- DNA Methylation
- mRNA
- miRNA
- Copy Number Alteration
- Clinical Data

Machine and Deep Learning Techniques

Prediction of Survival Time

Final Treatment Planning

Deepali et al. Advances in AI-base genomic data analysis for cancer survival. Multimedia Tools and Applications 2024



Collection and
integration of
Patient Reported
Outcomes



2022 Miss Chau Chung Hang

Found a digital health device with biosensors for abdominal massage to relieve constipation in the elderly. User's intestinal activity transfers to cloud, alerting user and caregivers via Internet of Things (IoT).



2023 Mr Killian Tang

Co-founded PRESOLE, an innovative insole that uses AI technology for continuous monitoring of foot pressure distribution for reducing pain problems.



2024 Miss Mak On Yu

Co-founded PRESOLE
Co-founded EmoBay, a digital mental health platform providing AI-powered emotional support and self-care tools for young adults.

An innovative a groundbreaking Initiative

Pioneered by the PolyU School of Nursing, to champion nursing as a STEM discipline and encourage STEM engagement with undergraduate nursing students.

STEM in Nursing Example:

The only nurse Global STEM Professor, HKSAR

Multiple staff engaged with digital and AI technology

Supported by cutting-edge infrastructure:

1. Nurse-led Digital Oncology Care Enhancement(DOCE) lab.
 2. Centre for Smart Health.
-

Empowers Year 1 nursing students to innovate in ***Science, Technology, Engineering, and Mathematics.***

Fellowship Goals:



Foster Interdisciplinary Thinking

Expose nursing students to STEM tools and frameworks that enhance healthcare



Empower Peer Mentorship

Connect past awardees as peer mentors

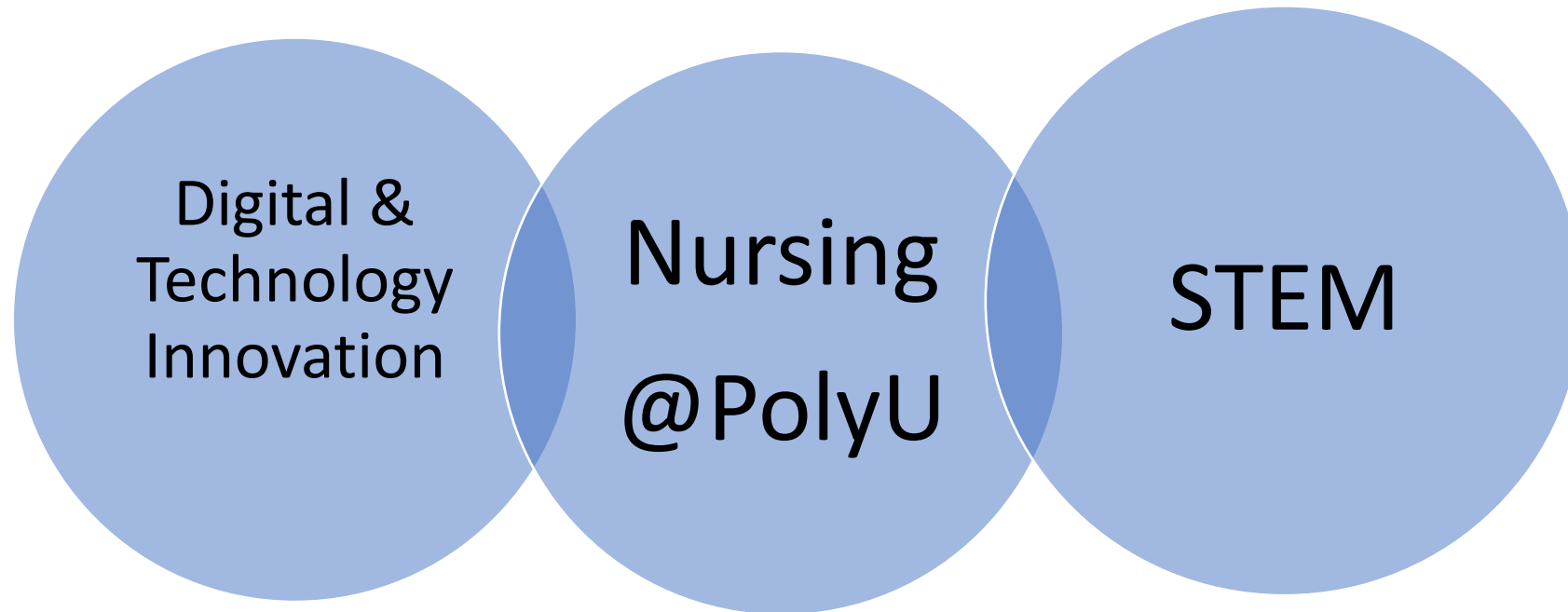


Explore Wellness Domains

Frame innovation through the lens of wellness and sustainability

- ✓ Enrich your CV with **diverse STEM** experience
- ✓ Broaden your horizons and networks in **innovation**
- ✓ Kick-start your ideas with **open-sourced applications**

In summary....



Thank you!

QS World University Rankings 2026

PolyU rises to **54th**
achieving record high



THE HONG KONG
POLYTECHNIC UNIVERSITY
香港理工大學

Nursing

QS WORLD UNIVERSITY RANKINGS
BY SUBJECT | 2025

16th
IN THE WORLD

3rd
IN ASIA

2nd
IN HONG KONG