Science Education: Future-Proofing Human Capital

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July 19, 2022

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Menu for today…

- Our Aim
- The Game Changers
- Our State
- New Inputs
- Science Education
- Our Contributions

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Future-Proofing

- **Future-proofing** is the process of anticipating the future and developing methods of minimizing the effects of shocks and stresses of future events.
- Future-proofing is used in industries such as electronics, medical industry, industrial design, and more recently, in design for climate change.

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Future-Proofing

- ”Future-proof" refers to the ability of something to continue to be of value into the distant future—that the item does not become obsolete.

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Our Aim!

Future-Pro of Human Capital

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Global Innovation Index 2021

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Virtual Reality	Gamification	Story Based Learning
360° Learning enviroment	Simulation	Micro Learning
Virtual Classroom	Video Training	Learning Apps
Learning Management System	Blended Learning	Cloud Learning
Webbased Training	Adaptive Learning	Mobile Learning
Collaborative Learning	Social Learning	Workplace Learning

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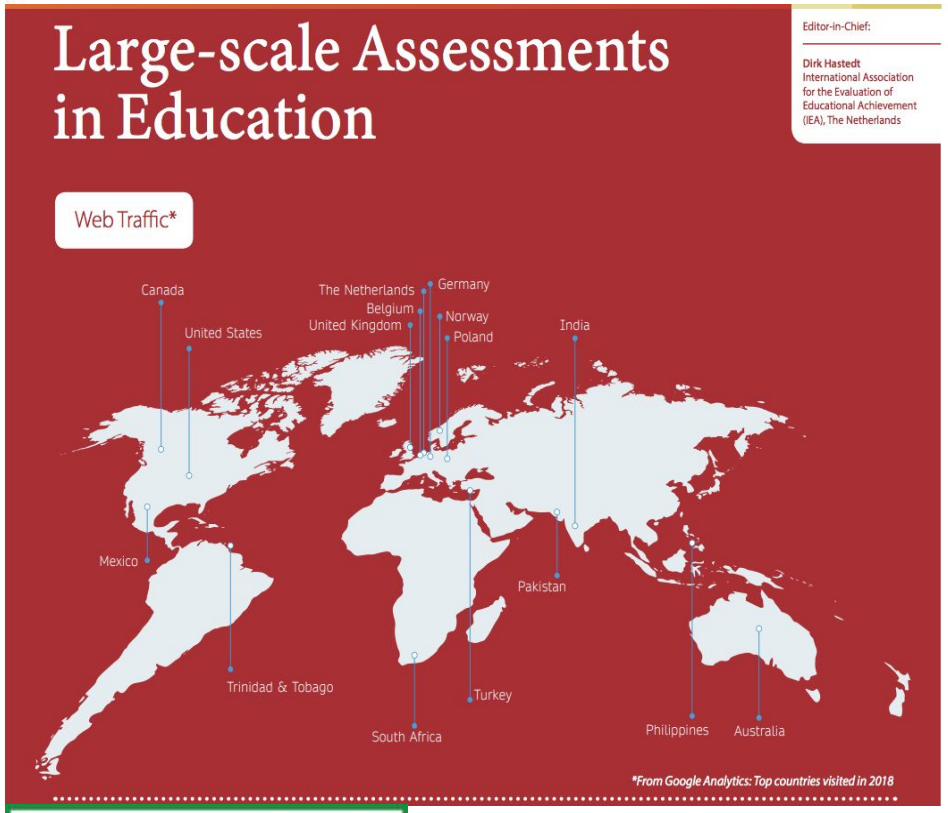
QS WORLD UNIVERSITY RANKINGS®

THE TIMES HIGHER EDUCATION WORLD UNIVERSITY RANKINGS



TIMSS 2019

PISA

OECD

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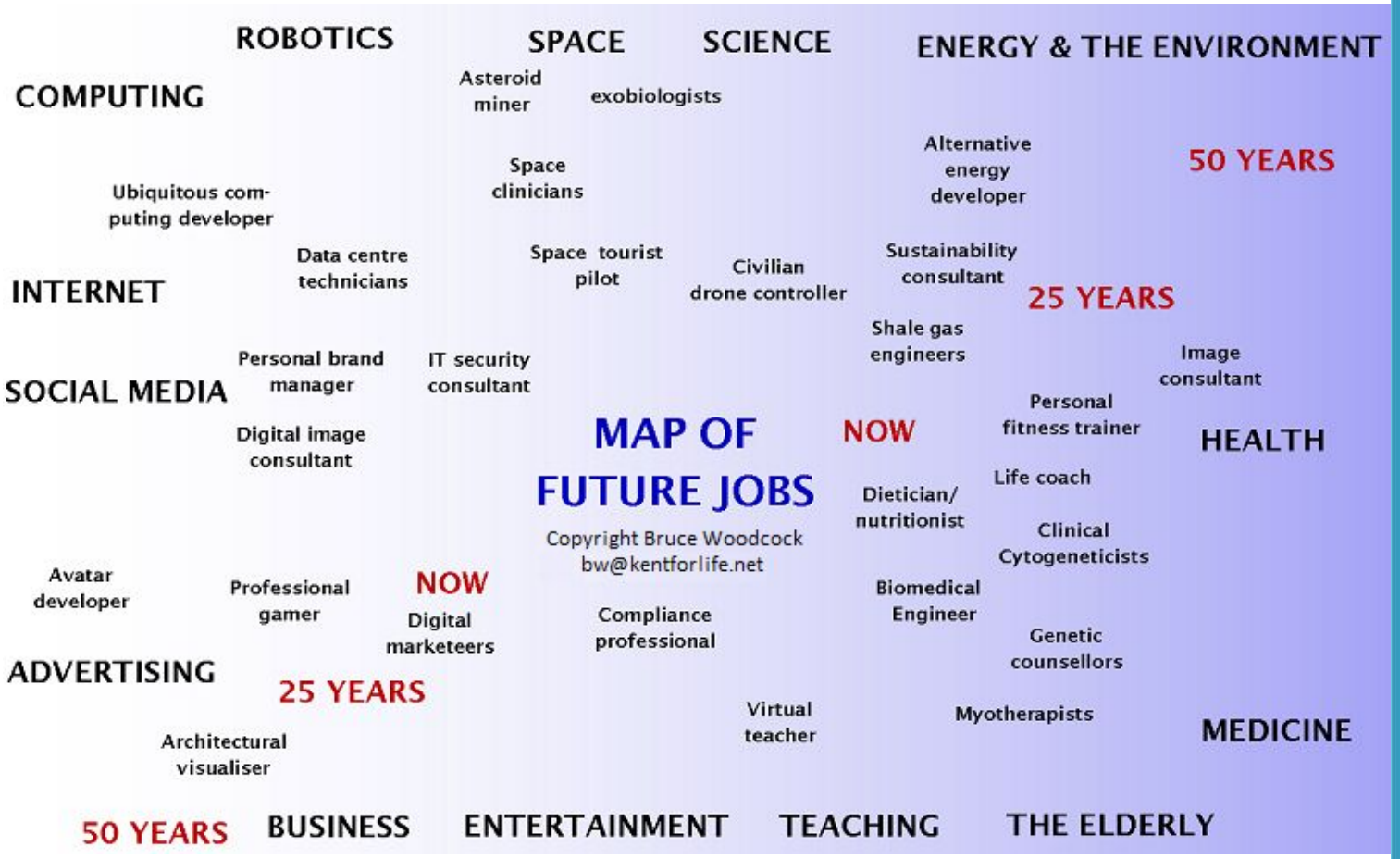
ROBOTICS
SPACE
SCIENCE
ENERGY & THE ENVIRONMENT
COMPUTING
Asteroid miner
exobiologists
Alternative energy developer
50 YEARS
Space clinicians
Ubiquitous computing developer
Data centre technicians
Space tourist pilot
Civilian drone controller
Sustainability consultant
INTERNET
25 YEARS
Shale gas engineers
Image consultant
Personal brand manager
IT security consultant
SOCIAL MEDIA
Personal fitness trainer
Digital image consultant
MAP OF FUTURE JOBS
NOW
HEALTH
Life coach
Dietician/ nutritionist
Copyright Bruce Woodcock
bw@kentforlife.net
Clinical Cytogeneticists
Avatar developer
Professional gamer
NOW
Biomedical Engineer
Digital marketeers
Compliance professional
Genetic counsellors
ADVERTISING
25 YEARS
Virtual teacher
Myotherapists
MEDICINE
Architectural visualiser
50 YEARS
BUSINESS
ENTERTAINMENT
TEACHING
THE ELDERLY


Five Jobs of the Future
Can you imagine what the world will look like in ten, fifty or even one hundred years from now? With new technologies and innovations shaking up every industry, here are five jobs to look out for in the future.
Biomedical Engineers
Biomedical engineering will become more important, with future biomedical engineers creating advanced prosthetics and artificially created organs.
Online Image Developers
As more of our lives move online, companies and individuals may want to hire someone to manage and promote their digital 'brand'.
Body Modification Surgeons
An inbuilt eye camera to record the world? A built-in compass? They've already been done, so just imagine where body modification surgery could go next...
Robotics Engineers
In the future, robots could take on all manner of dangerous or unpleasant jobs, and someone will need to design, build and maintain our little android friends.
Space Travel Agents
Sound a bit futuristic? Some wealthy individuals have already enjoyed holidays in space and, as costs fall, more of us could enjoy guided tours of the galaxy.
Predicting the future can be a dangerous game and nobody really knows what to expect in tomorrow's world of work. These are just five careers which may become more important in the next few years - think it's time to retrain?

What's VUCADD?

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What's VUCADD?

- **Volatility (V)**: Turbulence or the unexpected which may have been due to digital economy, connectivity and increased global competition and innovation *(Brodnick & Gryskievicz, 2018)*
- **Uncertainty (U): A**bsence of predictability *(Cook, 2015*)
- **Complexity (C):** Describes the multiplex of factors, interconnectedness and confounding issues
- **Ambiguity (A):** Lack of clarity that surrounds an event *(Stensaker, frolich, Huisman, Waagene, Scordato, & Pimentel-Btas, 2014)*

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What's VUCAD^2?

DIVERSITY

- Technology readiness
- Cognitive ability
- Self-efficacy

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Addressing VUCAD^2?

VUCAD	Counter	Action
Volatility	Vision	Clarify purpose
Uncertainty	Understanding	Gather information
Complexity	Clarity	Have discrete and manageable chunks
Ambiguity	Agility	Run small test, learn, share
Diversity	Differentiation	Consider uniqueness

Our State


PHILIPPINE NORMAL UNIVERSITY
1901


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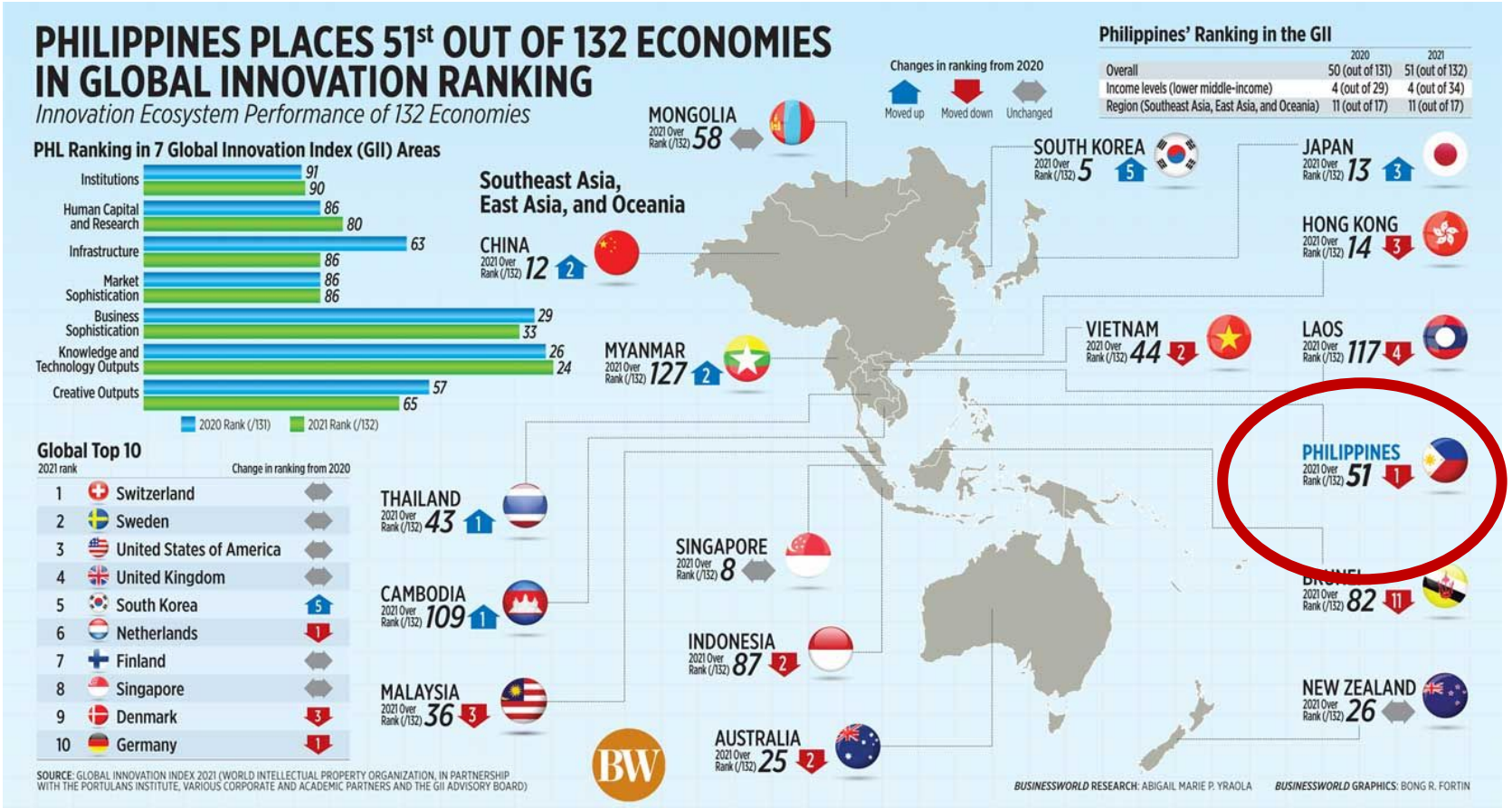
GII-2021



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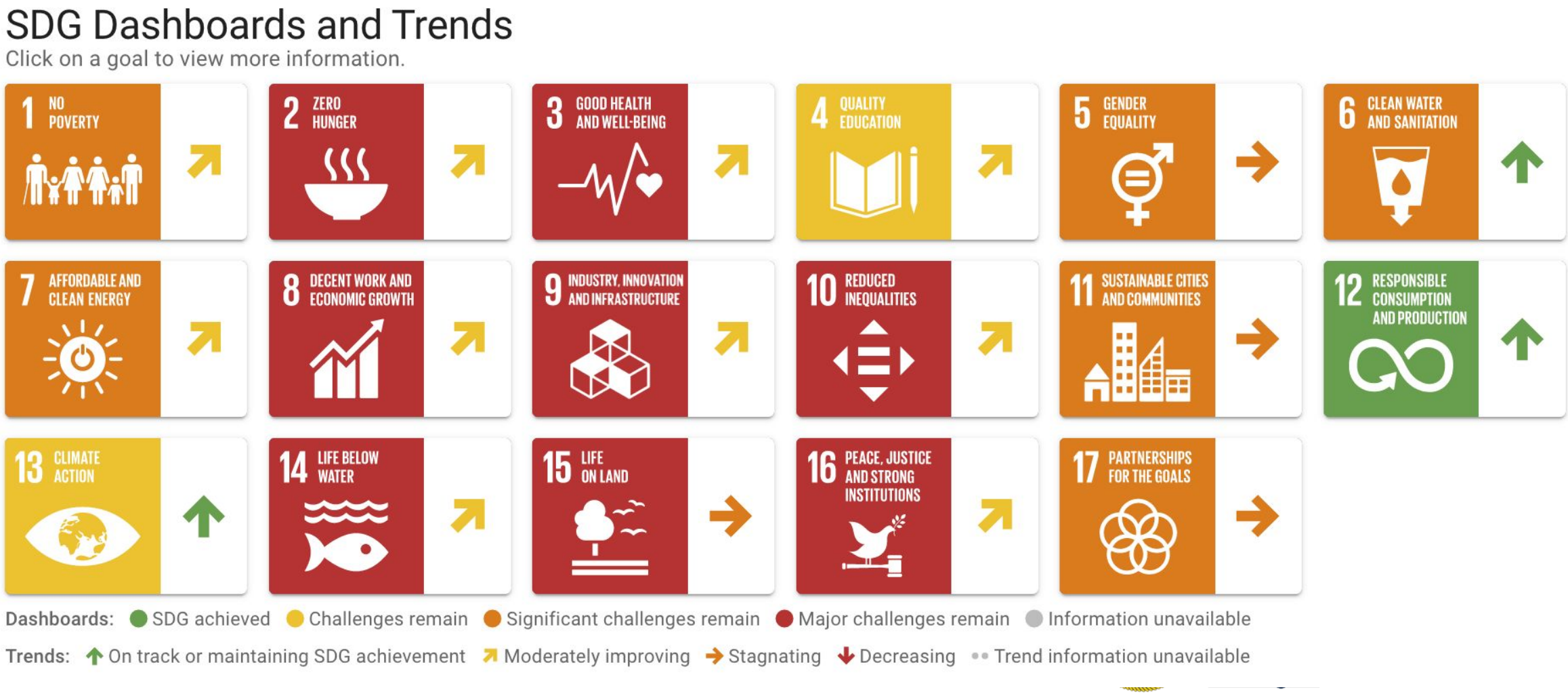
Researchers in R&D (per million people)

Korea, Rep.	2020	8,714
Japan	2020	5,455
Singapore	2019	7,287
Thailand	2019	1,790
Philippines	2018	174

SDG's Status in Phil



THE, QS, PISA

THE IMPACT RANKINGS 2022

SUSTAINABLE DEVELOPMENT GOALS

[1] Ateneo De Manila University (101-200)
[2] De La Salle University (401-600)
[2] Mariano Marcos State University (401-600)
[4] Central Luzon State University (601-800)
[4] Mapua University (601-800)
[4] University of Santo Tomas (601-800)
[4] Tarlac Agriculture University (601-800)

[8] Visayas State University (801-1000)

[8] MSU-Iligan Institute of Technology (801-1000)
[8] Nueva Ecija University of Science & Technology (801-1000)
[8] San Beda University (801-1000)
[12] University of Asia and the Pacific (1001+)
[12] Cebu Technological University (1001+)
[12] St. Paul University Philippines (1001+)

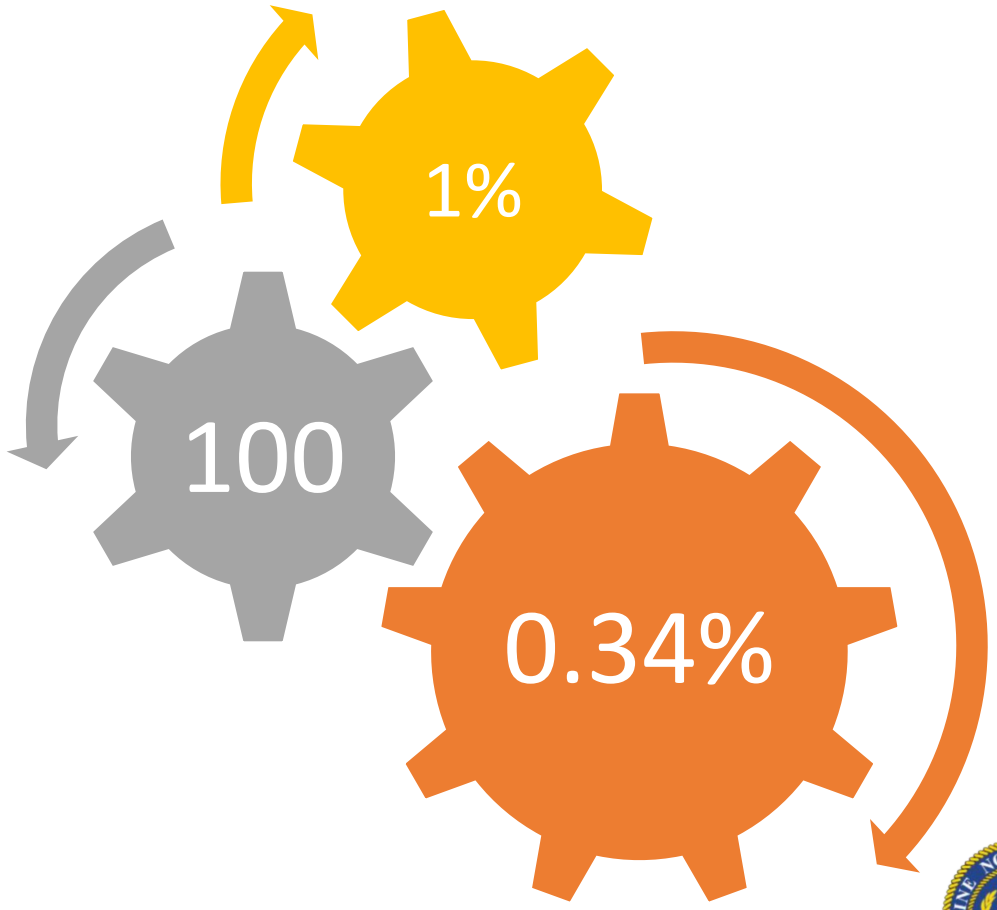
Table 1 Philippine Average TIMSS Scores
(Trends in International Mathematics and Science Study)

	Scores	International Average	Rank	Participating Countries
2003 Results				
Grade IV				
Science	332	489	23	25
Mathematics	358	495	23	25
HS II				
Science	377	473	43	46
Mathematics	378	466	34	38
2008 Results				
Advanced Mathematics	355	500	10	10

Source: TIMSS, 2003 and 2008

The poor quality of basic education is reflected in the low achievement scores of Filipino students ☹

STEAM Education in Phil.



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STEAM Education in Phil.

Enrolment vs Completers

Discipline	SUCs	LUCs	OGS	Private	Completers vs Enrolment
Science	25%	21%	34%	22%	23%
Technology	30%	28%	27%	25%	28%
Agriculture	20%	17%		18%	19%
Engineering	26%	27%	25%	22%	25%
Mathematics	30%	27%		29%	29%
STEAM	26%	25%	30%	22%	45%
STEAM vs total enrolment	11%	6%	12%	8%	9%

STEAM Education in Phil.

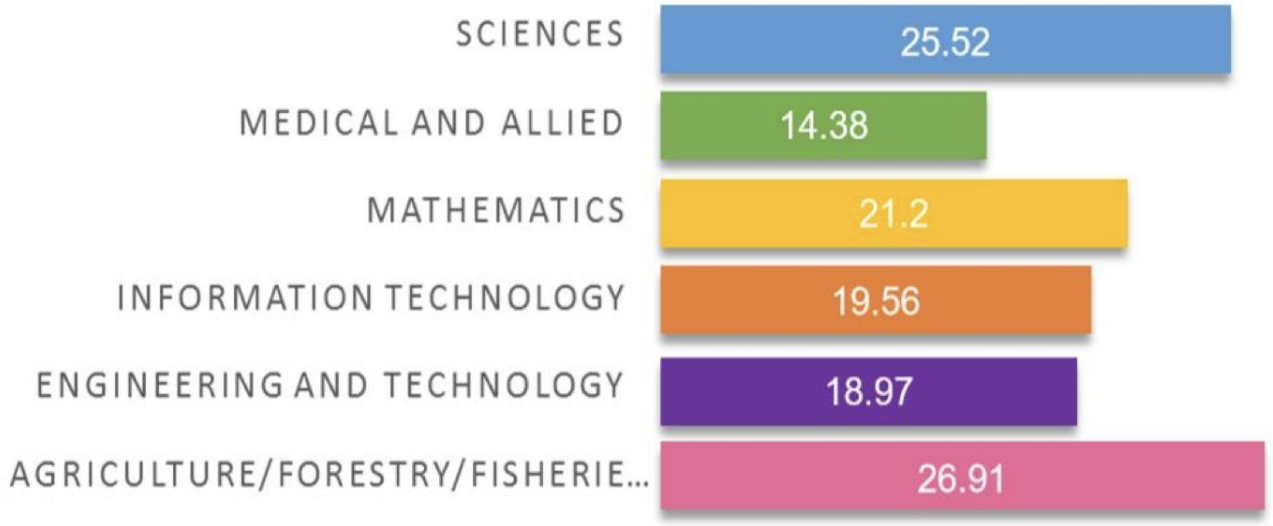

Figure 1. Completion rate (%) across STEAM areas calculated from a 5-year data until SY 2016-2017. Source of Data: Commission on Higher Education

"Low rate of completion in STEAM outlines a negative outlook on how the country may utilize STEAM professionals for knowledge capital of the country."

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STEAM Education in Phil.

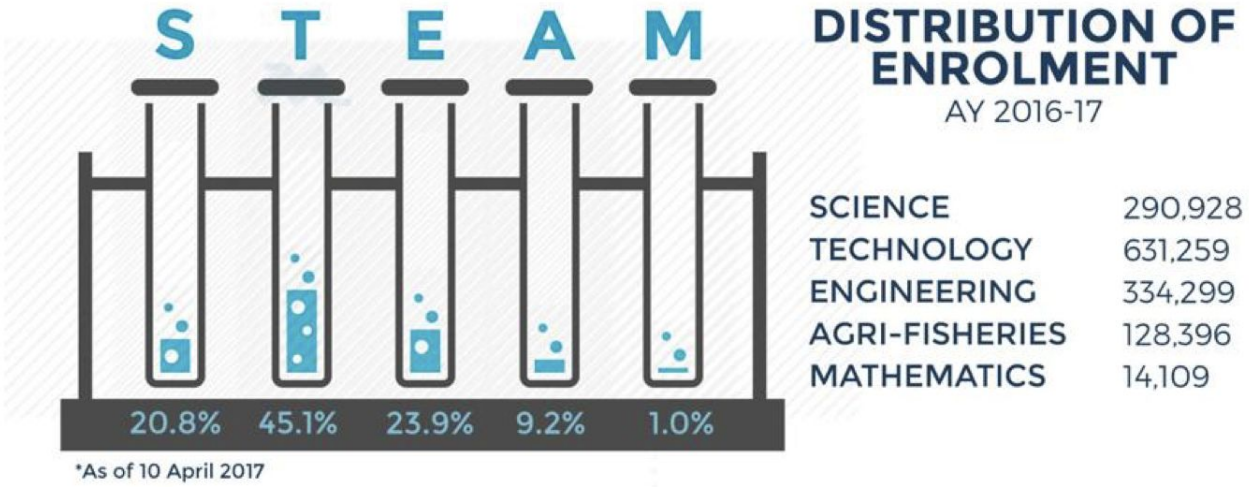

Figure 1. STEAM enrolment (source: PHCHED.gov)

"Out of the 3,589,484 tertiary enrollment in the year 2017, only 35.9% chose STEAM. About 20% completion rate in State Universities and Colleges, and an average of 21.9% completion rate for STEAM."

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STEAM Education in Phil.

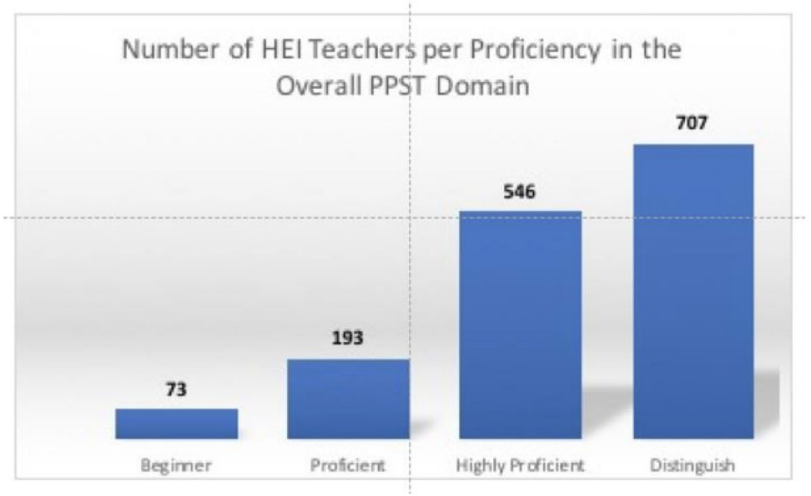

Figure 1. Number of HEI Teachers per Proficiency in the Overall PPST Domain

"Philippine Higher STEAM educators' perceived proficiency ranges from 'Highly Proficient to Distinguished leaning on the `'Distinguished' self-perception as STEAM educators."

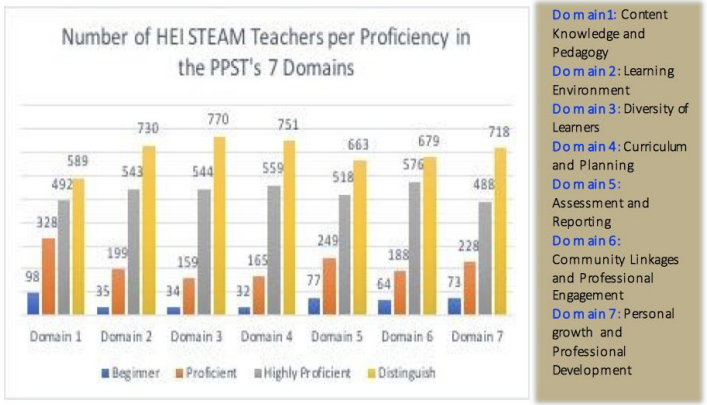

Figure 2. Number of HEI Teachers per Proficiency in the Overall PPST's 7 Domains

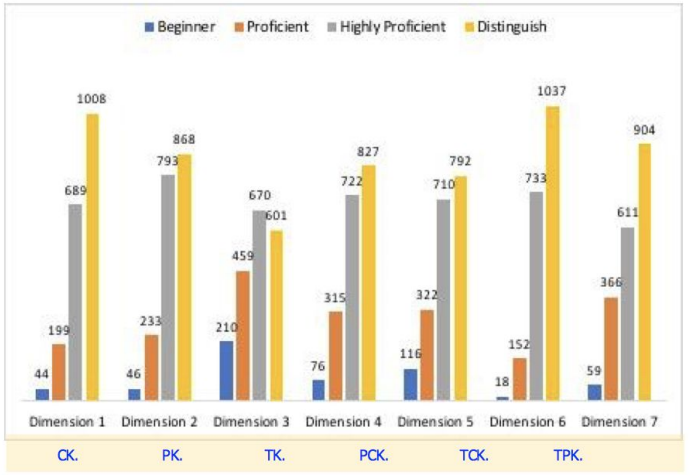

Figure 3. Number of HEI Teachers per Proficiency according to TPACK Dimensions

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STEAM Education in Phil Basic Ed

609
Special Sci Elem School

686
STE-Implementing Schools

58
Legislated Science High Schools

15
Regional Science High Schools

30
Public City Science High Schools

16
PSHS

256
Private Science High School

(Vea, 2020)

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Inputs

Global and National Contexts

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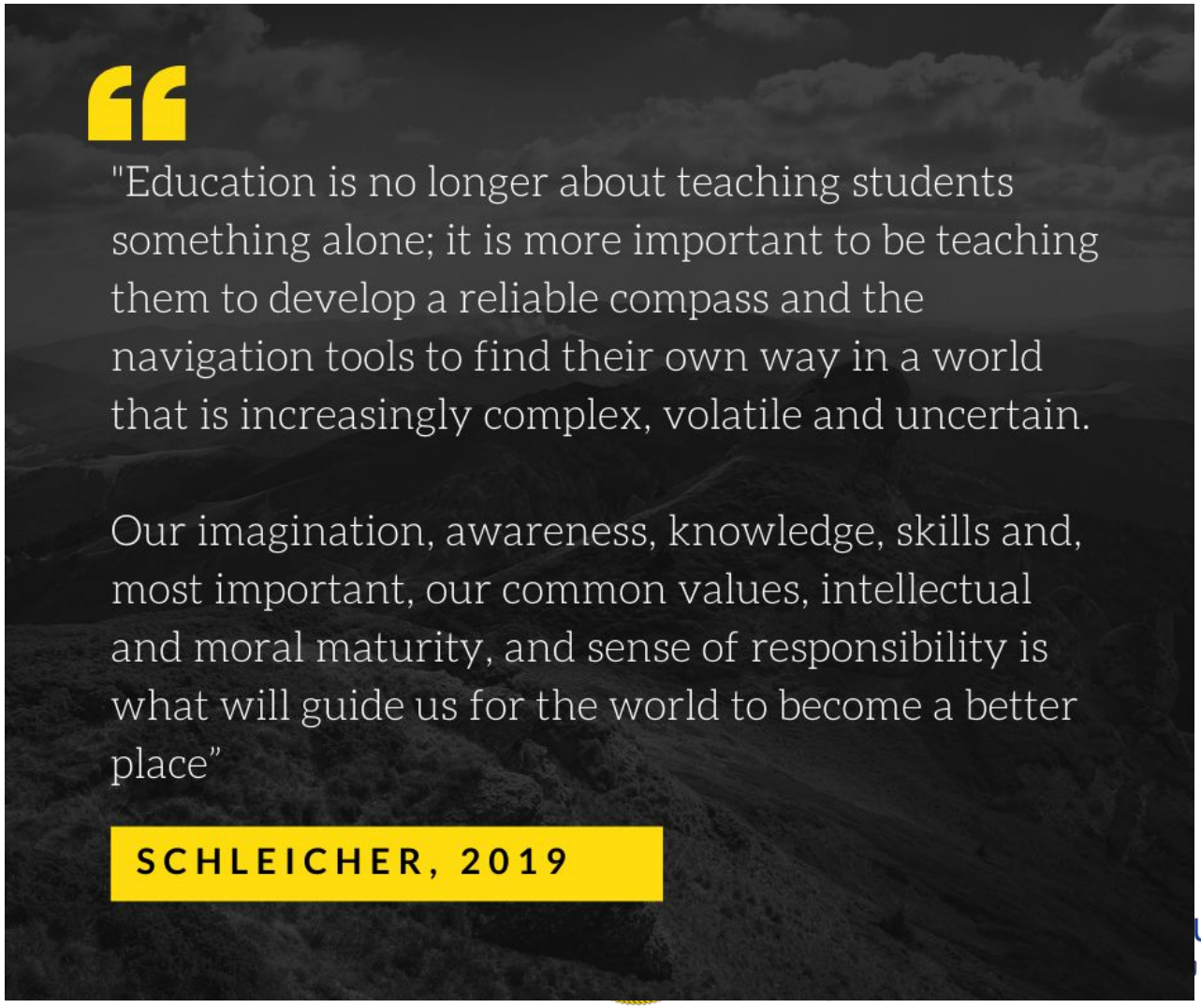
Agenda 2030 Learning Compass

OECD's Future of Education and Skills 2030



Agenda 2030 Learning Compass

Future of Education and Skills 2030

Phase 1 (2015-2018)

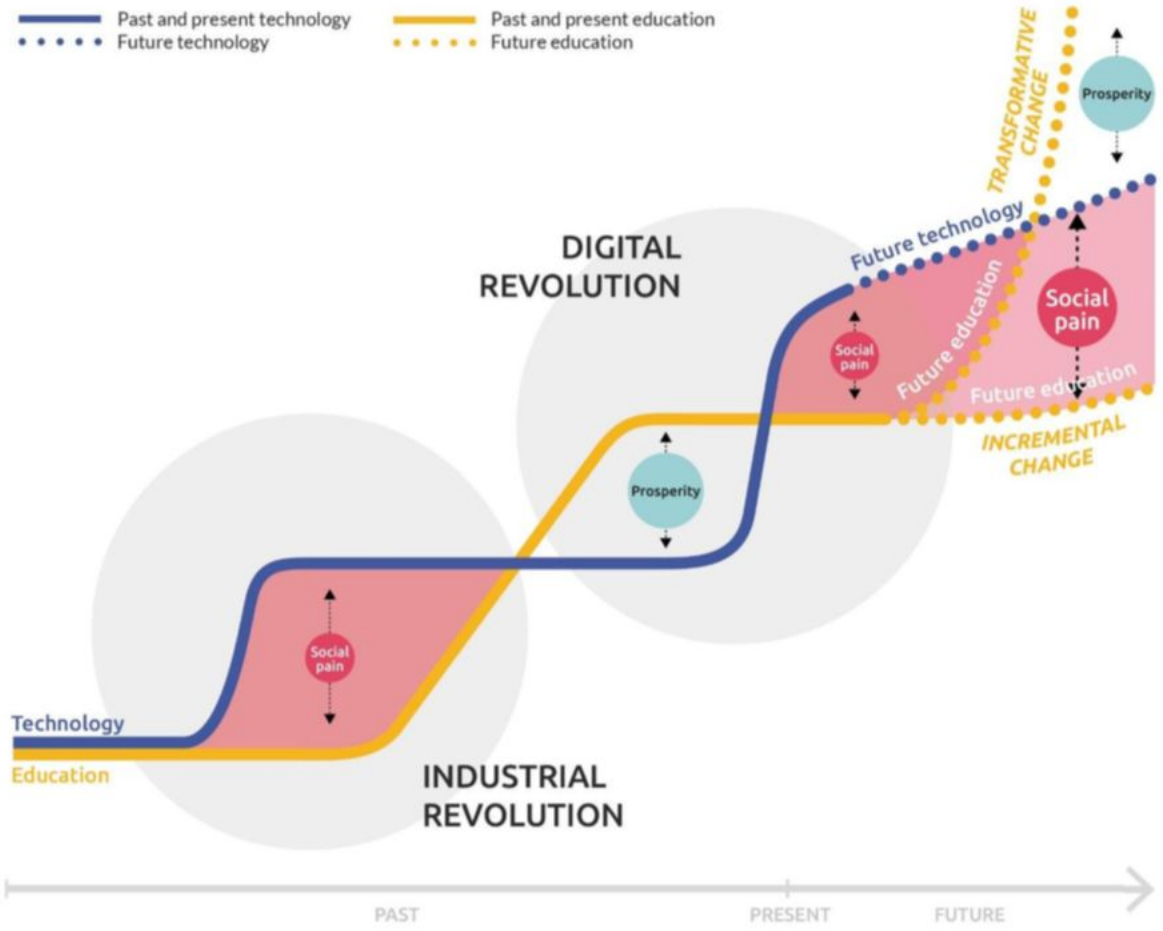
Kinds of competencies students need to thrive in and shape the future for better lives and societal well-being

Phase 2 (2019 onwards)

The focus on the “how’s” (how to design learning environments that can nurture such competencies)

Agenda 2030 Learning Compass

Figure 2. The race between technology and education



Source: Inspired by "The race between technology and education", Goldin and Katz (2010[2]).

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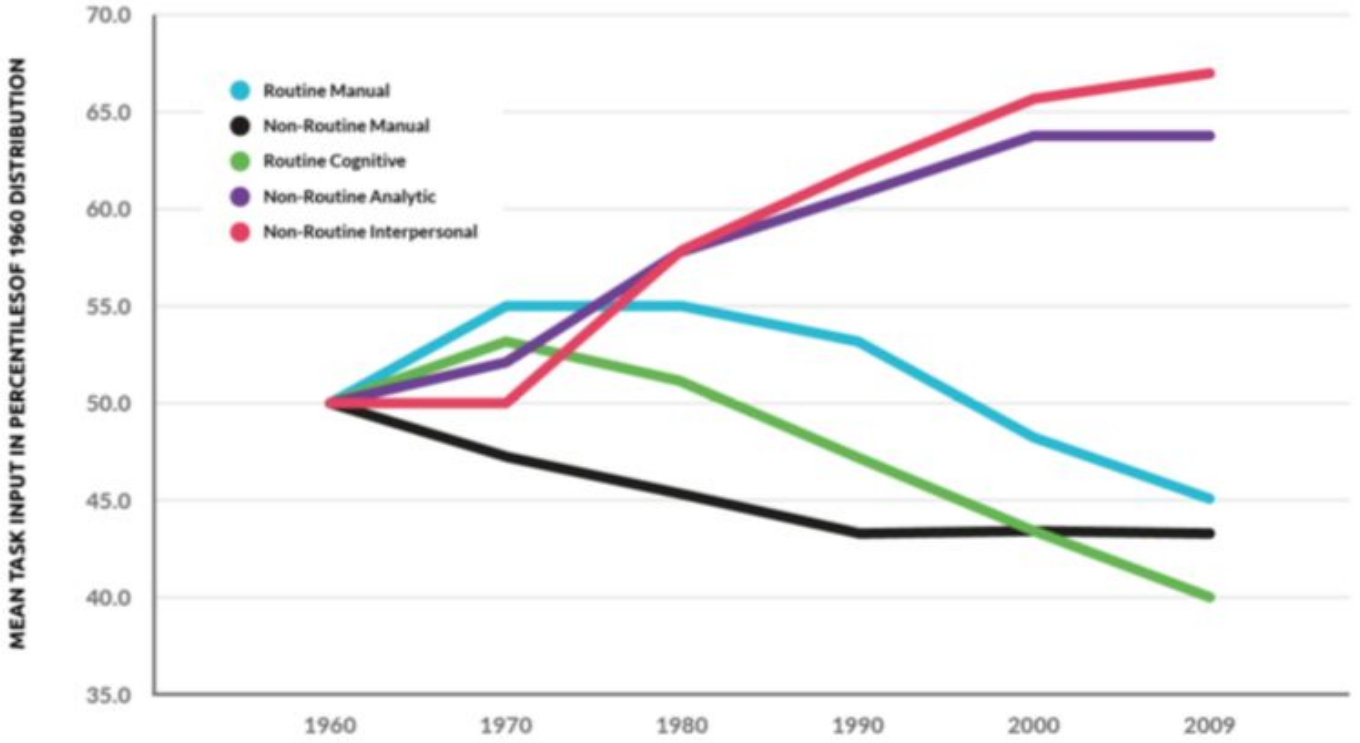
Agenda 2030 Learning Compass

Figure 3. Change since 1960 in prevalence of types of tasks required for work



Note: This figure shows how the task composition performed by US workers has changed from 1960 to 2009.
Source: Autor and Price (2013) in Bialik and Fadel (2018[7]), p.7.

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Agenda 2030 Learning Compass

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From Key Competencies to Transformative Competencies

Key Competencies	Transformative Competencies

• **Use tools interactively (e.g. language, technology)**
  • The ability to use language, symbols and text interactively
  • The ability to use knowledge and information interactively
  • The ability to use technology interactively
	Creating new value

• **Interact in heterogeneous groups**
  • The ability to relate well to others
  • The ability to co-operate
  • The ability to manage and resolve conflicts
	Reconciling tensions and dilemmas

• **Act autonomously** • The ability to act within the “big picture”	**Taking responsibility**

7 Elements of OECD's Learning Compass

Core foundations

- fundamental conditions and core skills, knowledge, and attitudes and values that are prerequisites for further learning across the entire curriculum

Transformative competencies

- creating new value,
- reconciling tensions and dilemmas,
- taking responsibility

Student agency/co-agency

- Student agency is defined as the capacity to set a goal, reflect and act responsibly to effect change
- Co-agency recognizes that students, teachers, parents and communities work together to help students progress towards their shared goals

Knowledge for 2030

- disciplinary
- interdisciplinary
- epistemic
- procedural

7 Elements of OECD's Learning Compass

Skills for 2030

- Cognitive and metacognitive
- Social and emotional
- Practical and physical

Attitudes and values for 2030

- Principles and beliefs that influence one's choices, judgements, behaviours and actions on the path towards individual, societal and environmental well-being

Anticipation-Action-Reflection competency development cycle

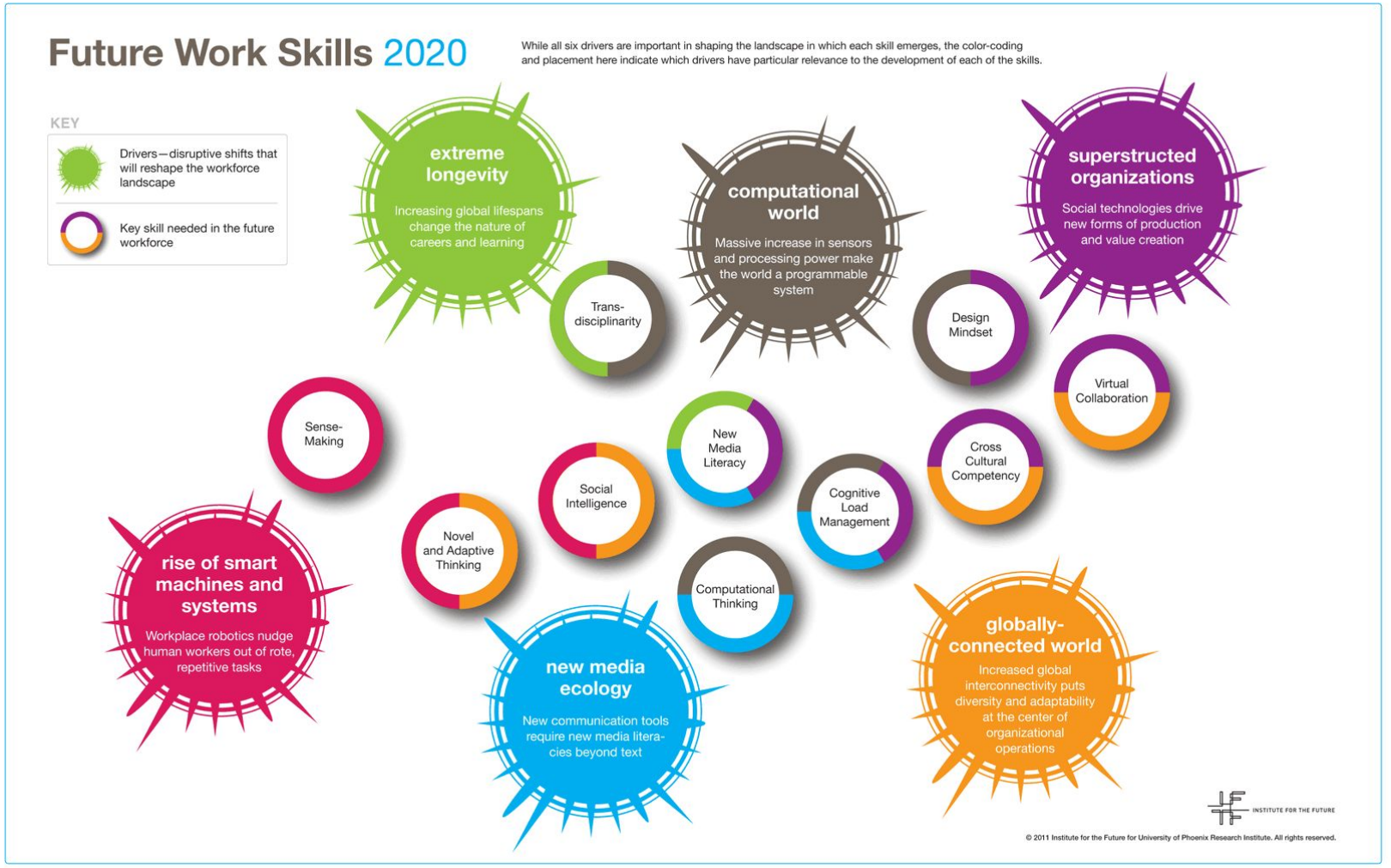
- Iterative learning process whereby learners continuously improve their thinking and act intentionally and responsibly

OECD Future of Education and Skills 2030 Phase II

- **Concept-making**
  - "learning for 2030" to "teaching for 2030"
  - Exploration of the types of teacher competencies and teacher profiles that can help all students realise their potential

- **Curriculum analysis**
  - "curriculum redesign" to "curriculum implementation"
  - Focus on:
    - curriculum change as part of a larger system of change management
    - aligning curriculum changes with changes in pedagogies and assessments
    - aligning curriculum changes with changes in initial teacher education and professional development (including school leaders)

Skills Demand of the Future



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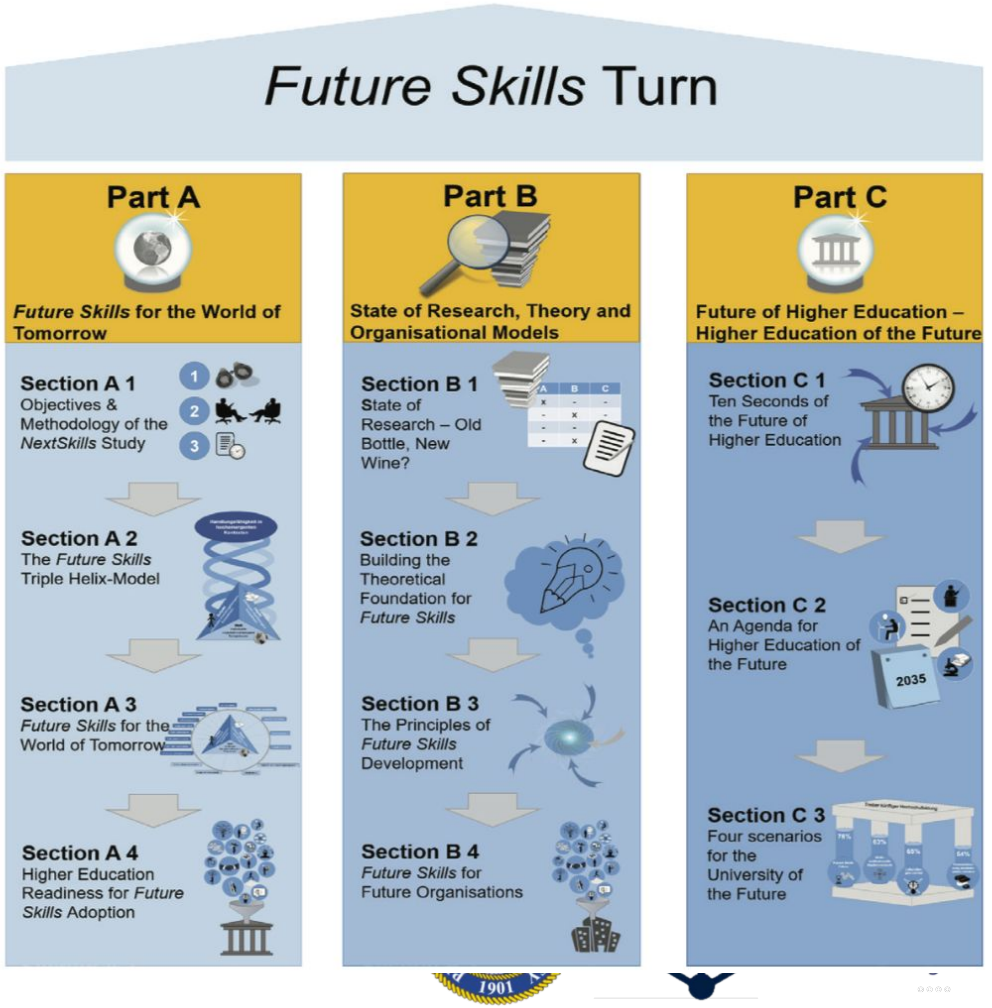
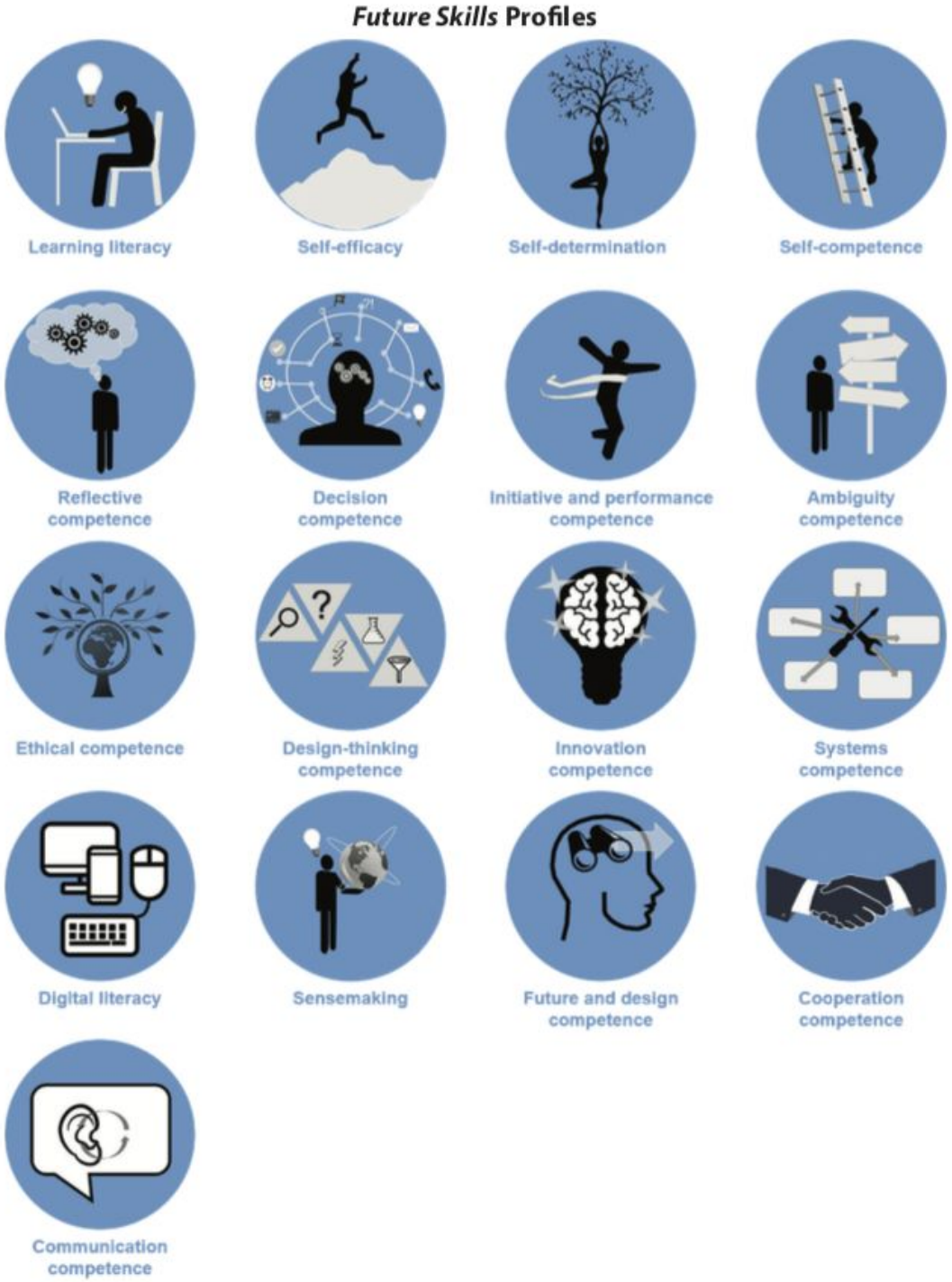
Skills Demand of the Future

Ehlers, U.D. (2020). Future skills - the future of learning and higher education. Springer (open-access). Karlsruhe, Germany.



Future Skills Profile



Future Skills

Subject-Related Skills

- Analytical and Critical Thinking
- Creativity and Learning Skills
- Action and Initiative
- Health Literacy
- Flexibility
- Reflective competence

Object-Related Skills

- Digital and Data Literacy
- STEM-skills, complex problem solving
- Financial Literacy

Organization-Related Skills

- Communication Competence
- Cooperation Competence
- Future and Design Competence
- Sense-making

Skills Inventory

Consolidated Skill Inventory	*Nr. of matches*	The OECD Future Skill Framework	PISA Key Competence Framework	European Commission Future Learning Model	OECD Key Competencies	OECD Global Competencies	WEF 21st Century Skills	P21 Partnership for 21st century learning	Tuning Transversal Skill Model	AEGEE Transversal Skills and Competencies Policy Paper	21st century stem model	National Reseaech Council Model: Skills for Work and Life	21st skills envision experiences	Hardvard Global Citizenship education	Graduate Employability 2.0	Social and Emotional Learning Methodology	The future of Skills. Employment in 2030	Future Skills Model NextSkills
Subject oriented skills																		
Analytical and critical thinking	*10*					1	1	1	1		1	1	1			1	1	1
Creativity	*11*	1	1	1			1	1	1				1		1	1	1	1
Learning skills	*6*								1	1	1	1					1	1
Action & Initiative	*6*	1		1				1		1						1		1
Health Literacy	*4*					1	1									1		1
Intercultural knowledge and understanding	*9*		1		1		1	1	1	1			1			1		1
Taking Responsibility	*5*	1		1		1		1										1
Persistence/grit	*4*					1	1									1		1
Ability to reflect	*3*	1								1								1
Curiosity	*3*						1									1		1
Entrepreneurship Skills	*5*				1				1	1		1					1	
Flexibility	*3*					1		1					1					
Global-mindedness	*2*				1	1												
Anticipation	*2*	1								1								
Deal w. ambiguity and uncertainty	*2*			1														1
Empathy	*2*			1		1												
Form & conduct life plans, personal projects	*2*		1							1								
Resilience	*2*			1					1									
Compassion	*1*			1														
Failing Forward	*1*			1														
Reconciling Tensions & Dilemmas	*1*	1																
Risk Taking	*1*			1														

Skills Inventory

Consolidated Skill Inventory	*Nr. of matches*	The OECD Future Skill Framework	PISA Key Competence Framework	European Commission Future Learning Model	OECD Key Competencies	OECD Global Competencies	WEF 21st Century Skills	P21 Partnership for 21st century learning	Tuning Transversal Skill Model	AEGEE Transversal Skills and Competencies Policy Paper	21st century stem model	National Reseaech Council Model: Skills for Work and Life	21st skills envision experiences	Hardvard Global Citizenship education	Graduate Employability 2.0	Social and Emotional Learning Methodology	The future of Skills. Employment in 2030	Future Skills Model NextSkills
Object related skills																		
Digital & Data Literacy	9	1			1	1	1	1				1	1			1		1
STEM skills, complex problem solving	7				1		1	1			1	1	1				1	
Financial Literacy	5					1	1	1		1						1		

Projecting Higher Education of the Future

Dimension	Current higher education model	Future higher education model (postmodern)
Degrees	The aim is to achieve a clearly defined comprehensive study degree, with the degree designations being awarded by the higher education institution on a statutory, sovereign basis.	• The program consists of small study units, which can also come from different (higher education) institutions. • There will be more short courses, certification courses, refresher courses. • This results in patchwork studies that can then be combined into larger final degrees or certificates, such as a final degree, and certified by a higher education institution.
Certification	Teaching/ transfer (tutoring, courses), examinations and certification are linked within the framework of an institution.	Teaching/ transfer (tutoring, courses), examinations and certification (final examination) are decoupled and can be offered by various institutions.

Projecting Higher Education of the Future

Dimension	Current higher education model	Future higher education model (postmodern)
Science and research structure or institution structure	• Higher education institutions are structured in disciplinary units, the faculties; they are decisive in terms of content and structure of studies.	• Higher education institutions are strongly organized by interdisciplinary and transdisciplinary cooperation forms. • Studies are strongly organized on the basis of comprehensive issues as well as interdisciplinary and transdisciplinary work units.
Learning Model	• Learning principally follows the idea of a knowledge divide which needs to be compensated for. • Teaching is expert-oriented. Teachers organize knowledge transfer.	Learning follows the idea of students and teachers forming a learning community (renaissance of the *Universitas* ideal)

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Other Model of Future Skills

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Methodology

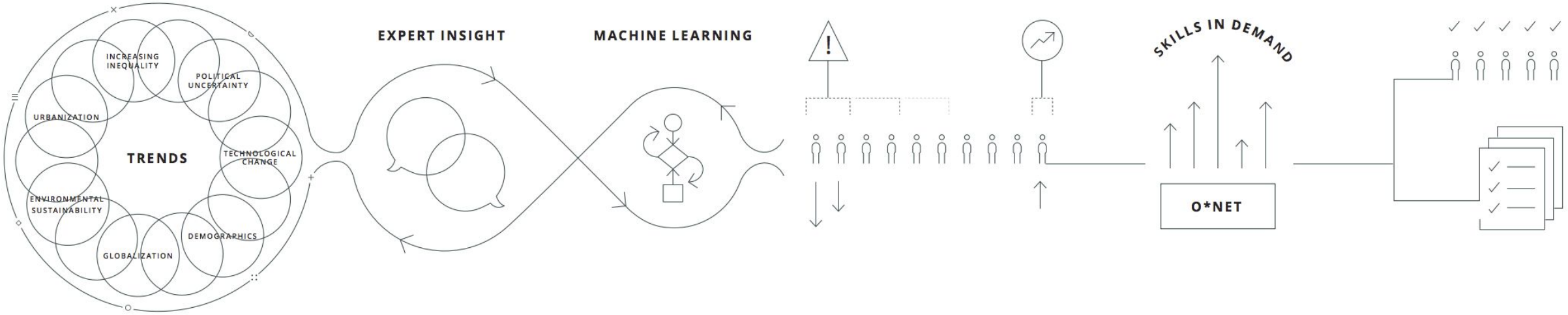
TREND ANALYSIS

FORESIGHT WORKSHOPS

PREDICTING JOBS DEMAND IN THE FUTURE

PREDICTING SKILLS OF THE FUTURE

TRANSLATING FOR ACTION



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Top 10 Jobs with increased Demand by 2030

	UK	USA
1	Food Preparation and Hospitality Trades	Preschool, Primary, Secondary, And Special Education School Teachers
2	Teaching and Educational Professionals	Animal Care And Service Workers
3	Sports and Fitness Occupations	Lawyers, Judges, And Related Workers
4	Natural and Social Science Professionals	Postsecondary Teachers
5	Managers and Proprietors in Hospitality and Leisure Services	Engineers
6	Health and Social Services Managers and Directors	Personal Appearance Workers
7	Artistic, Literary and Media Occupations	Social Scientists And Related Workers
8	Public Services and Other Associate Professionals	Counselors, Social Workers, And Other Community And Social Service Specialists
9	Other Elementary Services Occupations	Librarians, Curators, And Archivists
10	Therapy Professionals	Entertainers And Performers, Sports And Related Workers

Top 10 KSA by 2030

	UK		USA
1	Judgment and Decision Making	1	Learning Strategies
2	Fluency of Ideas	2	Psychology
3	Active Learning	3	Instructing
4	Learning Strategies	4	Social Perceptiveness
5	Originality	5	Sociology and Anthropology
6	Systems Evaluation	6	Education and Training
7	Deductive Reasoning	7	Coordination
8	Complex Problem Solving	8	Originality
9	Systems Analysis	9	Fluency of Ideas
10	Monitoring	10	Active Learning

National Perspectives

Ambisyon Natin 2040

PDP 2017-2022

Pagtanaw 2050

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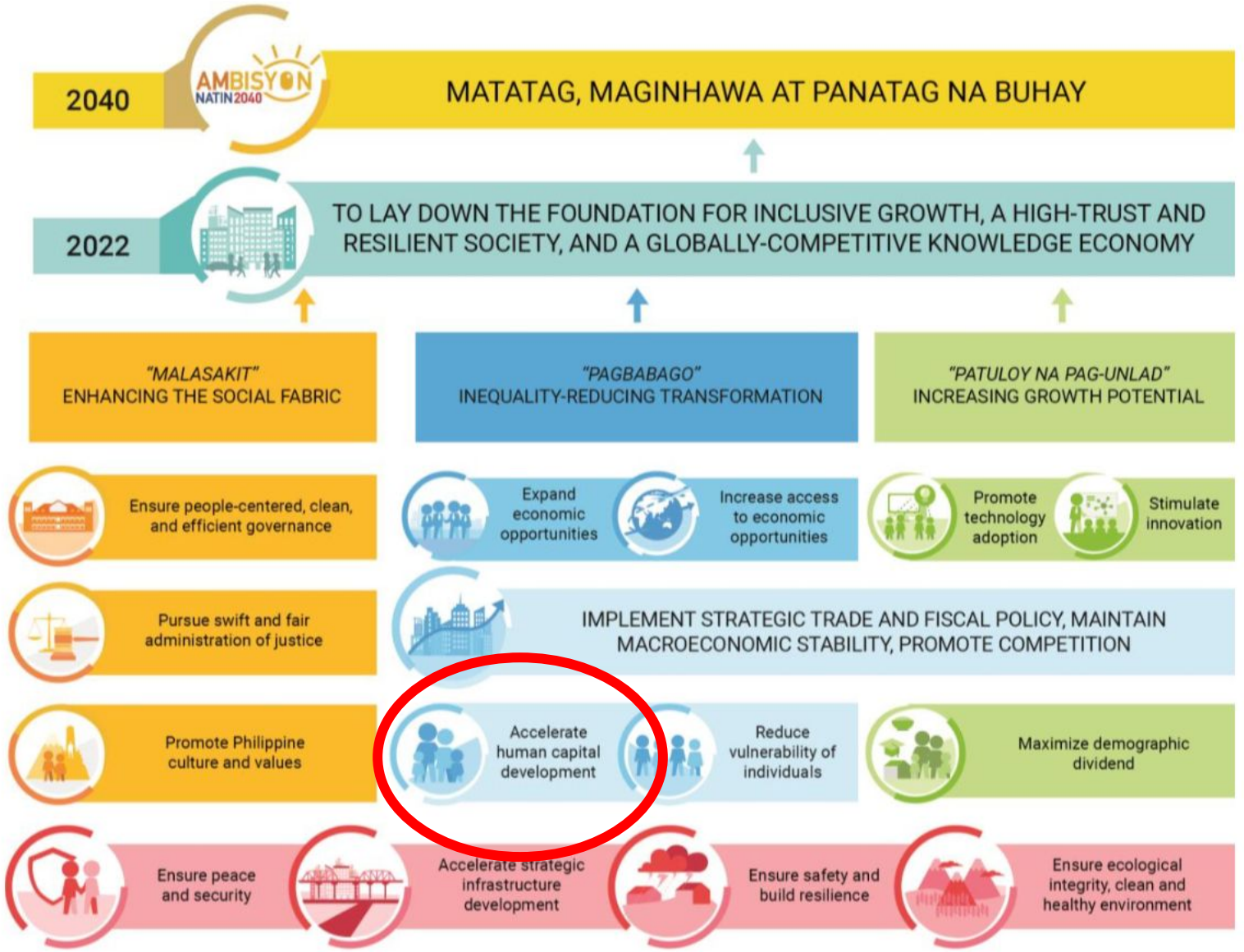
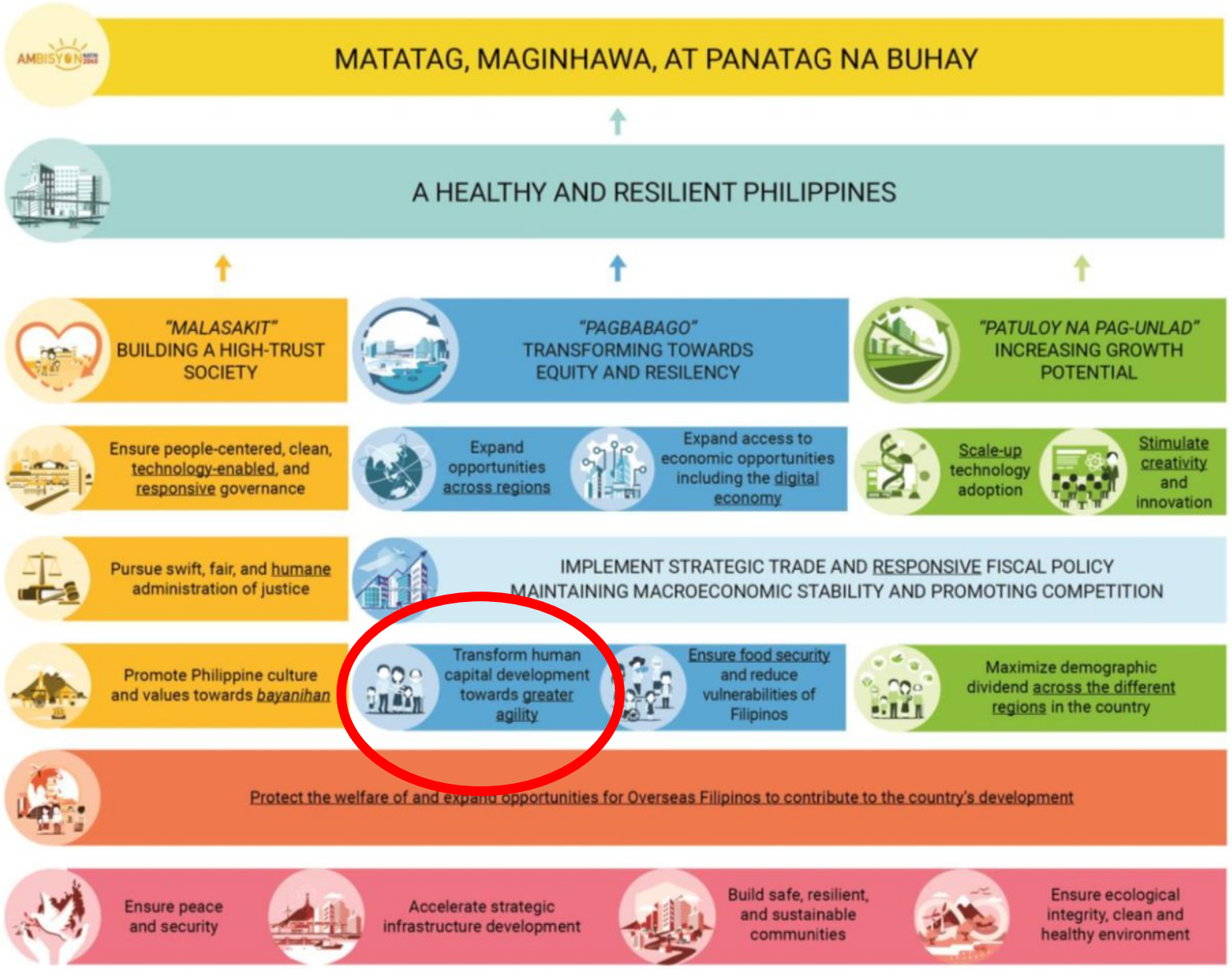
Ambisyon 2040



Ambisyon 2040



Pagtanaw 2050

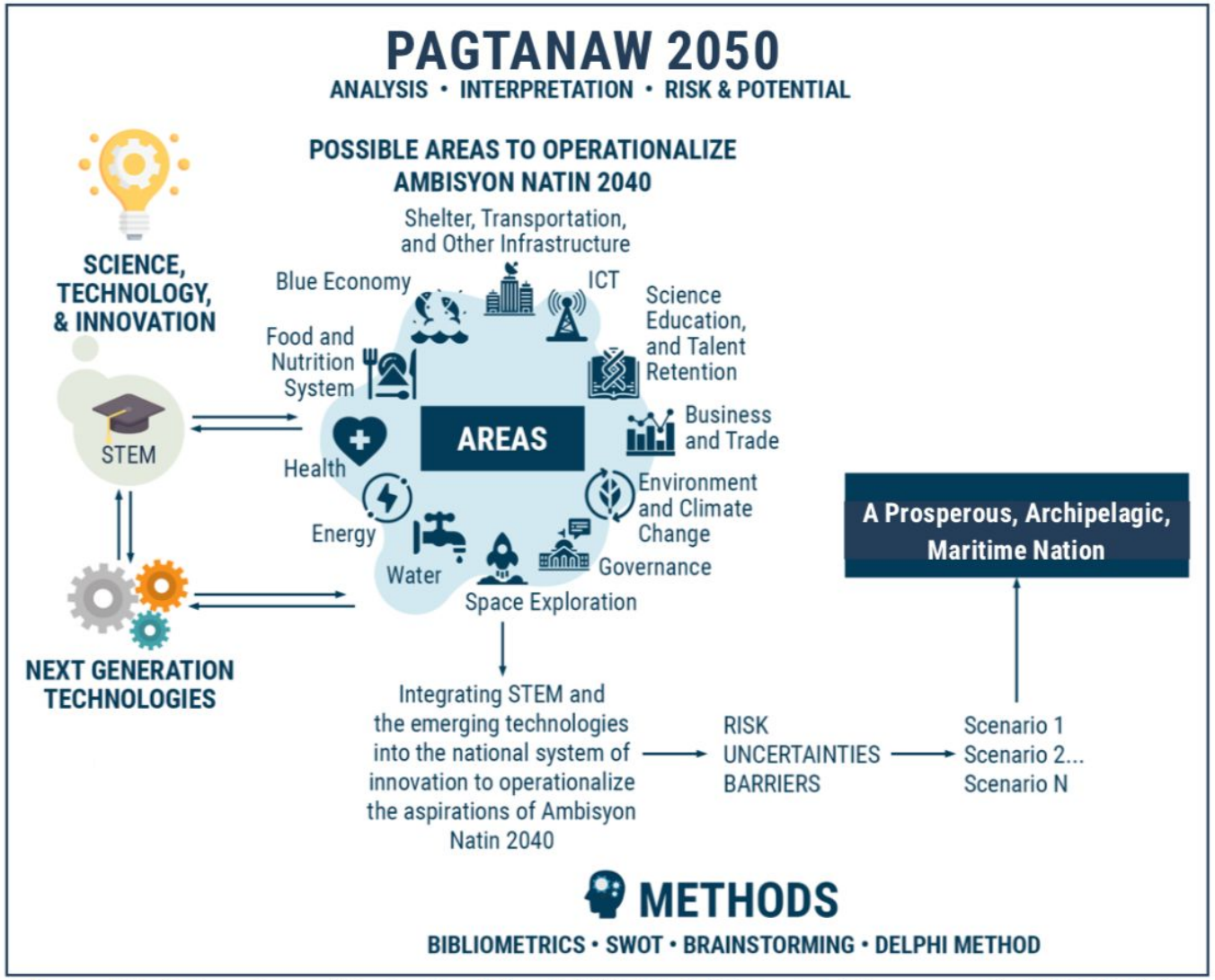


Figure 1.1_2. Inputs and Outputs of the NAST PHL STI Foresight Framework: PAGTANAW 2050

Roadmap of STI

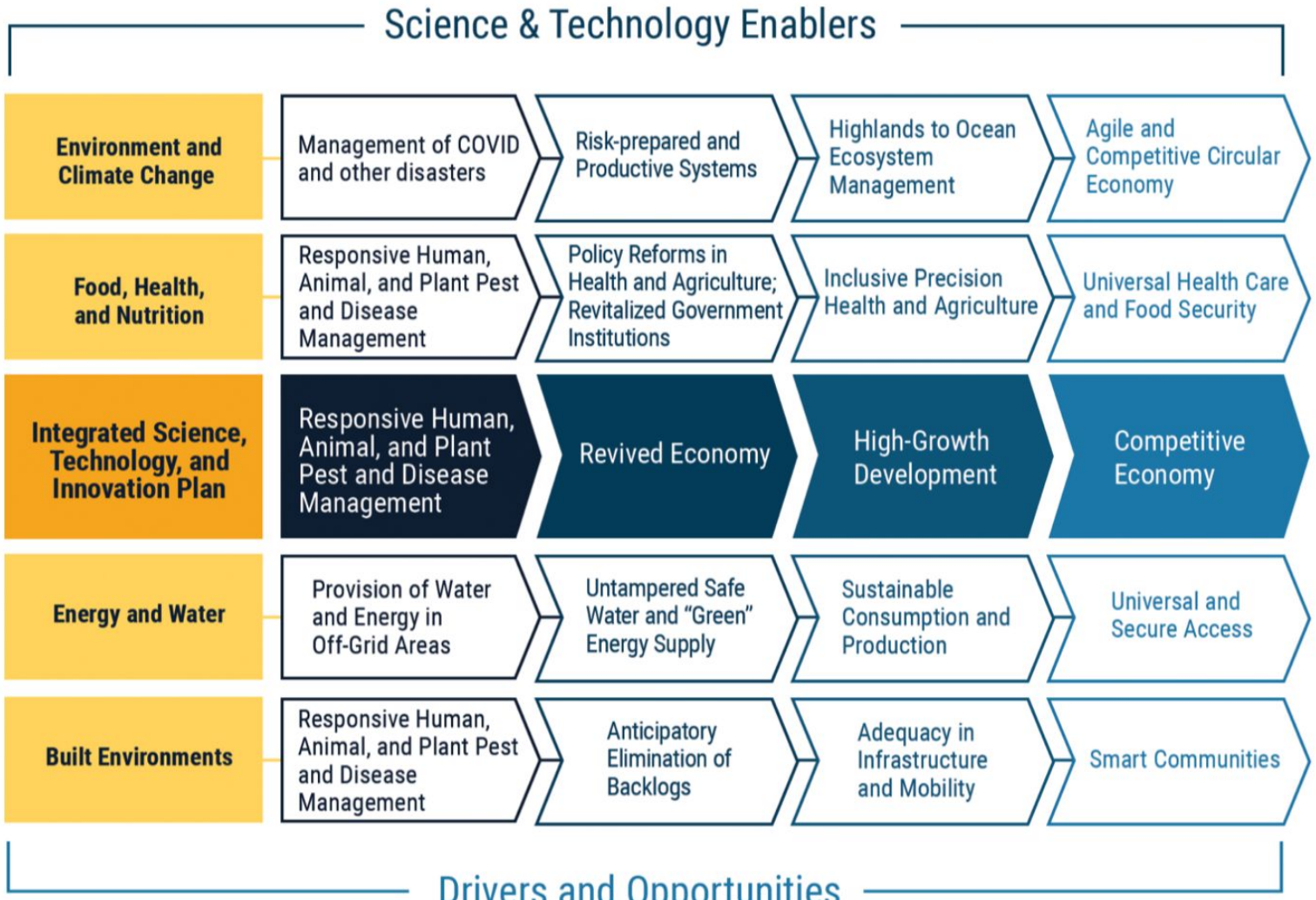


Figure 6.2_1. Integrated STI Roadmap

Drivers and Enablers

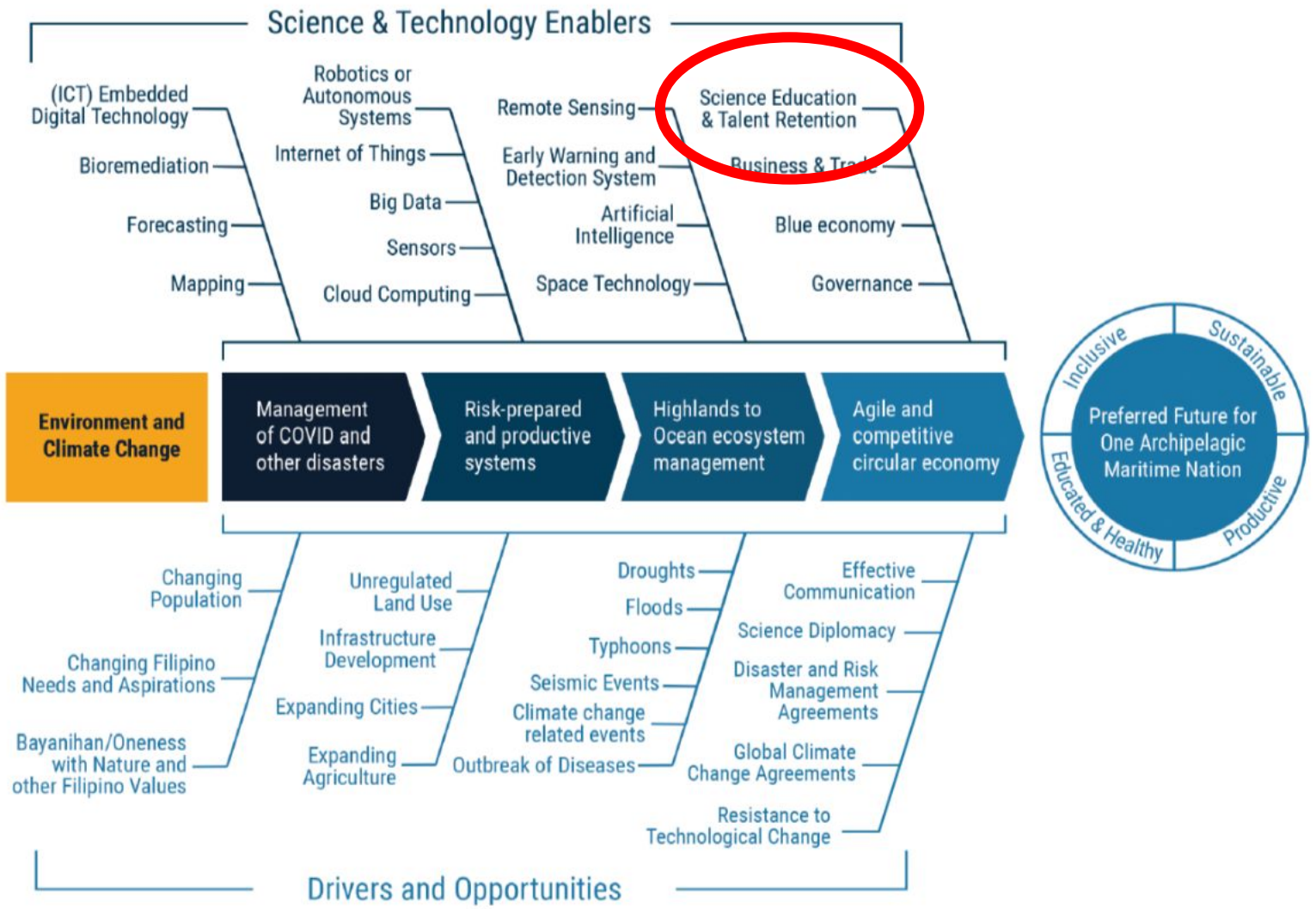


Figure 6.2_2. Environment, Climate Change, and Space Exploration Cluster Map

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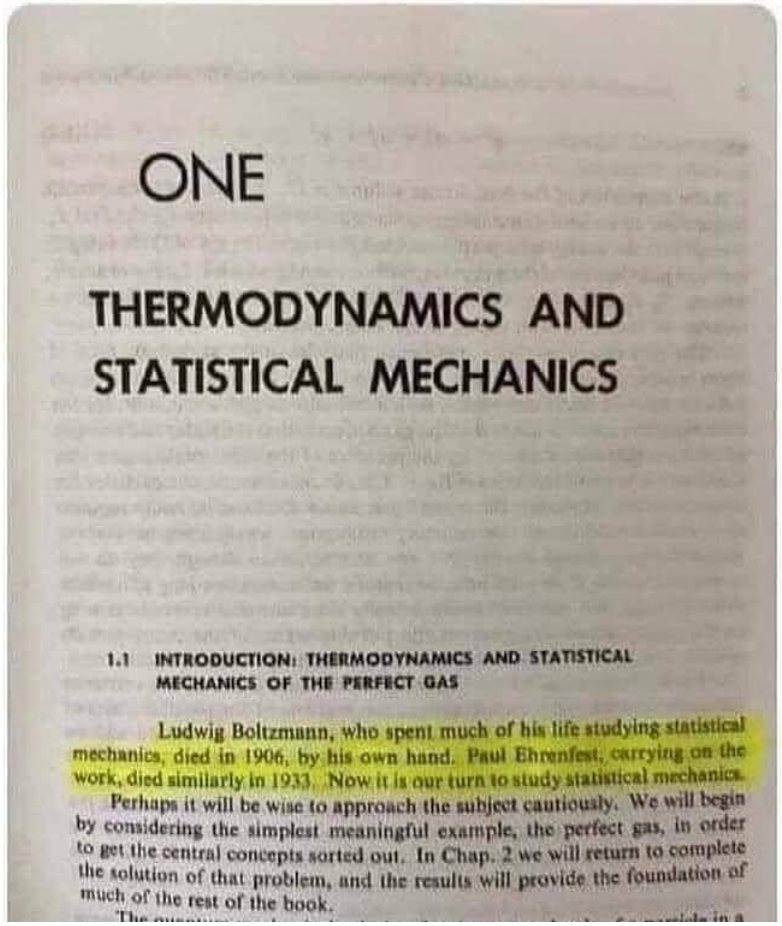
P2050: Science Education and Talent Retention

- Coding and computer programming skills should be considered in the Philippine basic education sector
- A systematic review of the curriculum should be in place as well as the recruitment of highly qualified instructors in STEM
- Poor qualifications of STEM teachers have been identified as a problem that must be addressed with urgency
- Compensate for the loss of good STEM teachers who have gone abroad
- Revise our qualification standards and adopt a more supportive working environment
- **Quality of instruction and materials in both the private and public science high schools**

(Bevins & Price, 2015)

P2050: Science Education and Talent Retention

One of the best openings in a book



ONE

THERMODYNAMICS AND STATISTICAL MECHANICS

1.1 INTRODUCTION: THERMODYNAMICS AND STATISTICAL MECHANICS OF THE PERFECT GAS

Ludwig Boltzmann, who spent much of his life studying statistical mechanics, died in 1906, by his own hand. Paul Ehrenfest, carrying on the work, died similarly in 1933. Now it is our turn to study statistical mechanics.

Perhaps it will be wise to approach the subject cautiously. We will begin by considering the simplest meaningful example, the perfect gas, in order to get the central concepts sorted out. In Chap. 2 we will return to complete the solution of that problem, and the results will provide the foundation of much of the rest of the book.

Quality of instruction and materials in both the private and public science high schools

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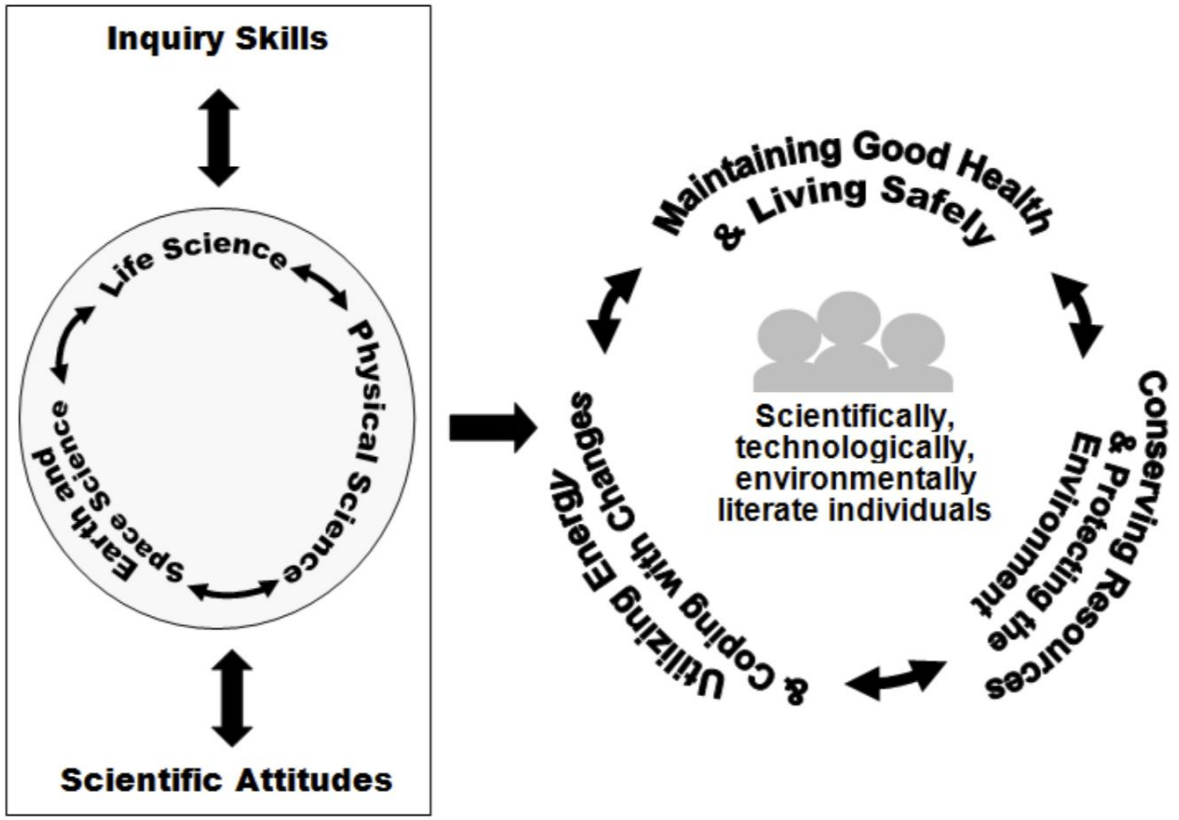
Anu nga ba ang Science Education?

Science Education

- School science education should support the development of scientific literacy in all students as well as motivate them to pursue careers in science, technology, and engineering (SEI-DOST & UP NISMED, 2011)
- **Vision**:
  - The Philippines' Grades 1-10 Science Curriculum envisions the development of scientifically, technologically, and environmentally literate and productive members of society.
  - They must possess effective communication and inter personal and life long learning skills as well as scientific values and attitudes
  - A curriculum that focuses on knowledge relevant to real world and encompasses methods of inquiry.
  - A curriculum that will be implemented in a learning environment that promotes the construction of ideas and instills respect for others.

(SEI-DOST & UP NISMED, 2011)

Science Education Framework



(SEI-DOST & UP NISMED, 2011)

Science Education Framework

Curriculum Components

(*inquiry skills, scientific attitudes, and content and connections*)

Focus Questions

Science Ideas

Sample Learner's Performance

(SEI-DOST & UP NISMED, 2011)

K-12 Science Curriculum

Constructs	Science Ed Framework	K-12 Science Curriculum
Vision/Outcome	Development of scientifically, technologically, and environmentally literate and productive members of society.	
Curriculum Content	1. Inquiry skills 2. Scientific attitudes 3. Content and connections	Three domains of learning science: 1. **Understanding and applying scientific knowledge in local setting** as well as global context whenever possible 2. performing scientific processes and skills, 3. developing and demonstrating scientific attitudes and values.
Other inclusions	1. Science Ideas 2. Focus Questions 3. Sample Learner's Performance	1. Teaching Approaches 2. Educational Pedagogies 3. Science Content and Processes 4. Content Areas: Life Sciences, Physics, Chemistry, and Earth Sciences

(SEI-DOST & UP NISMED, 2011; K-12 Science Curriculum Guide, 2012)

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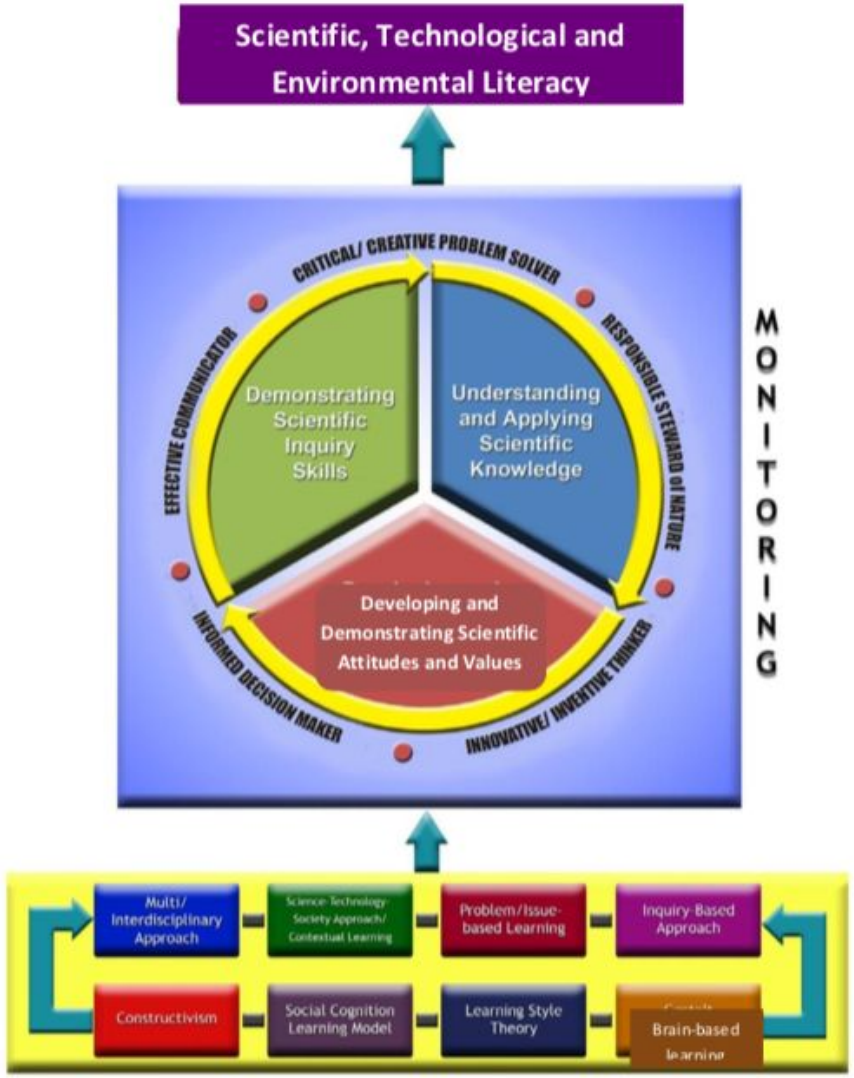
K-12 Science Curriculum



The Conceptual Framework of Science Education

(K-12 Science Curriculum Guide, 2012)

Achieving Global Goals

PISA, GII, UNESCO 2030, Future Skills

- Careers in Science
- Scientific Literacy

IR4, E4.0, Society 5.0, Ambisyon 2040, Pagtanaw 2050

- Human Capital
- Skilled Workforce

VUCADD

- Clarity
- Information
- Agility
- Uniqueness

Anu naman ang aming AMBAG?

Ano ambag ko?

Educating Science Teachers for All

Philippine Normal University

The National Center for Teacher Education

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Project Details

- Project Coordinator:
  - Organization: PADAGOGISCHE HOCHSCHULE LUDWISBURG
  - Address: REUTEALLEE 46, 71634 LUDWIGSBURG, BADEN-WURTTEMBERG DE
- Project Information
  - Identifier: 6097-19-EPP-1-2019-1-DE-EPPKA2-CBHE-JP
  - Start Date: January 15, 2020
  - End Date: January 14, 2024

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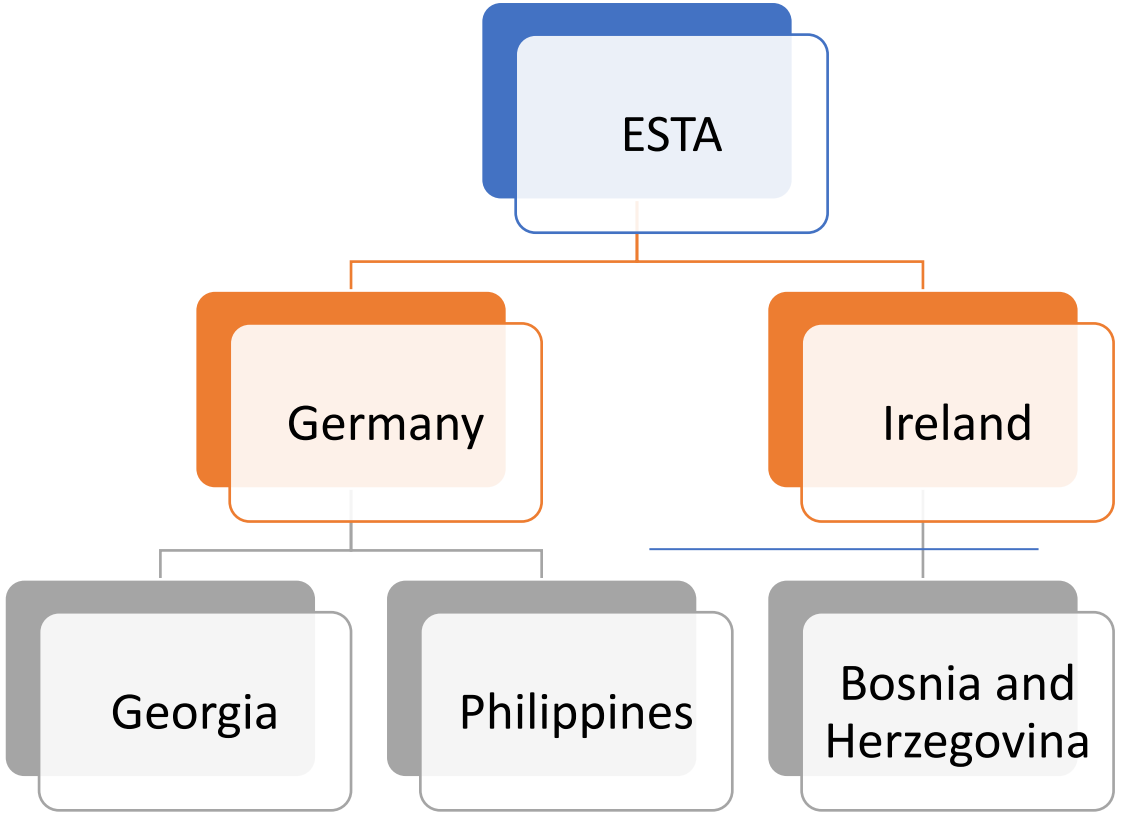
Project Organization



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ESTA

Educating Science Teachers for All

Co-funded by the Erasmus+ Programme of the European Union

Group by Educating Science Teachers for All

Philippines ESTA Community

Public group · 114 members

Joined | + Invite

About | Discussion | Announcements | Topics | People | Events | Media

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What is ESTA?

For PNU as NCTE

ESTA foresees science education enhancement by improving the level of teaching competencies in the partner universities.

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PNU as NCTE

University Science Educators

Pre-service Science Teachers

In-service Science Teachers

Inclusive and Higher-Quality PH Sci Ed

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Dr. Marie Paz E. Morales

Dr. Zenaida Q. Reyes

Dr. Ruth A. Alido

Dr. Arlyne C. Marasigan

Dr. Brando C. Palomar

Prof. Ruel A. Avilla

Dr. Crist John M. Pastor

Dr. Leah Amor S. Cortez

Prof. Alfons Jayson O. Pelgone

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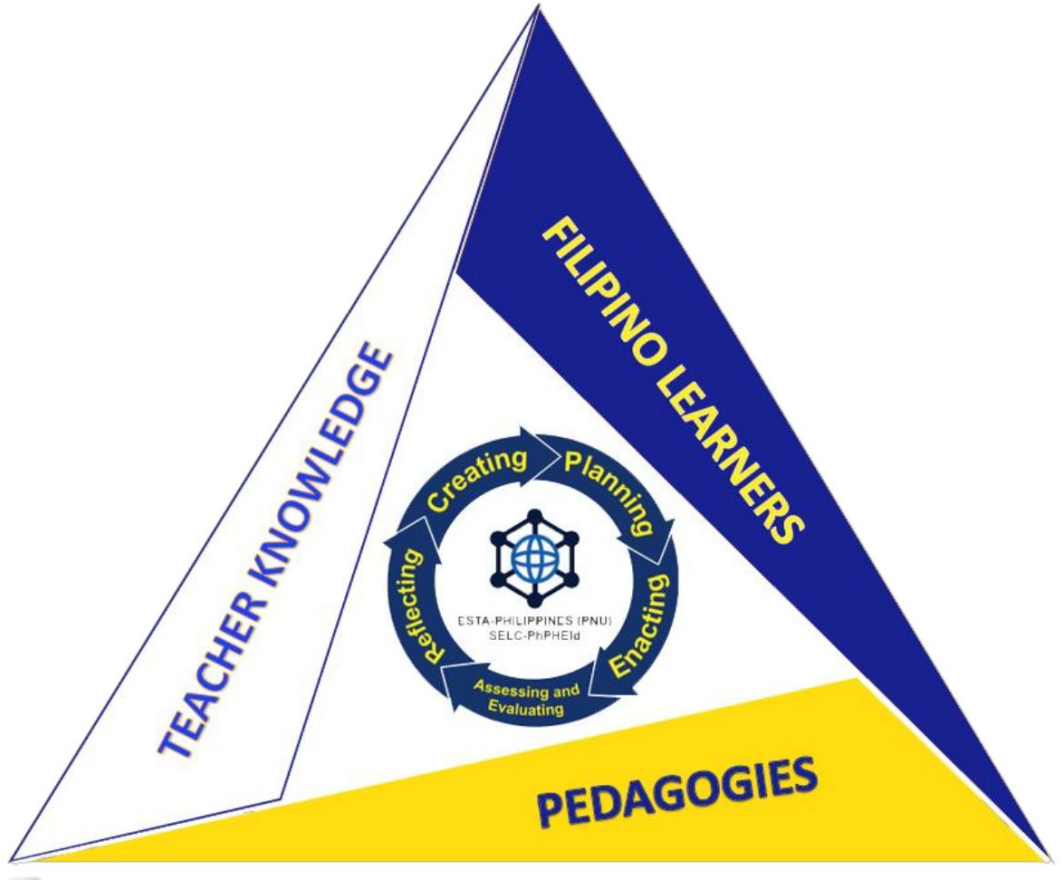
The Framework

Science Education for Linguistic and Cultural Diversity in Philippine Public Higher Education (SELC- PhPHiEd) Framework



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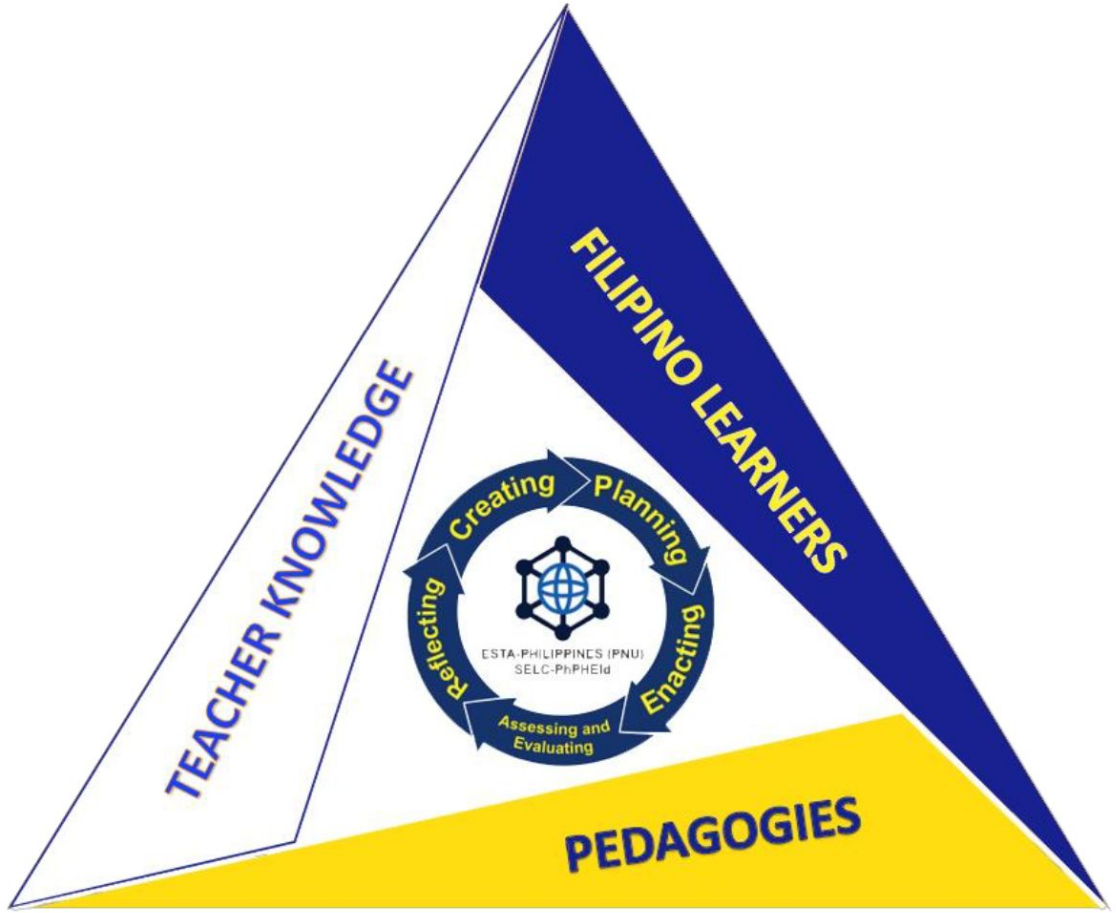
The Framework

ESTA-PH-PNU argues that learning of Science concepts, principles and skill can be achieved through deep understanding of the learners, teacher's knowledge, and of responsive and relevant pedagogies.



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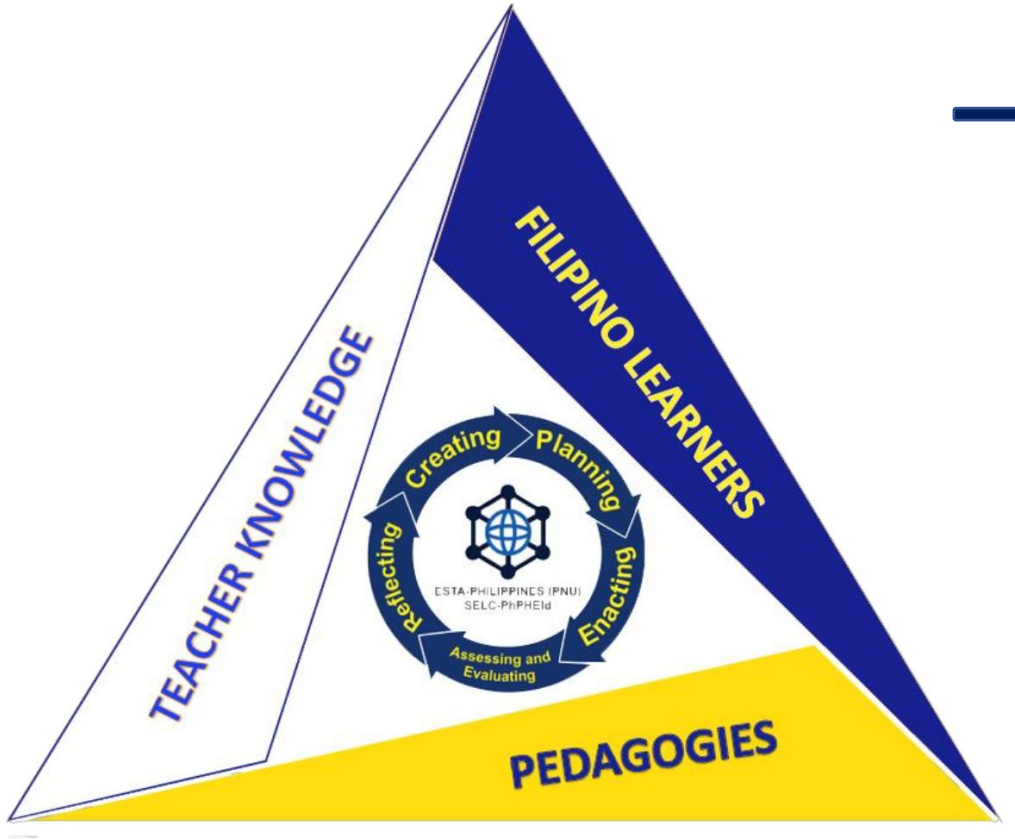

The Framework

1. STEAM approach
2. CLIL's 4Cs
3. 7Es
4. Bagong Kadawyan

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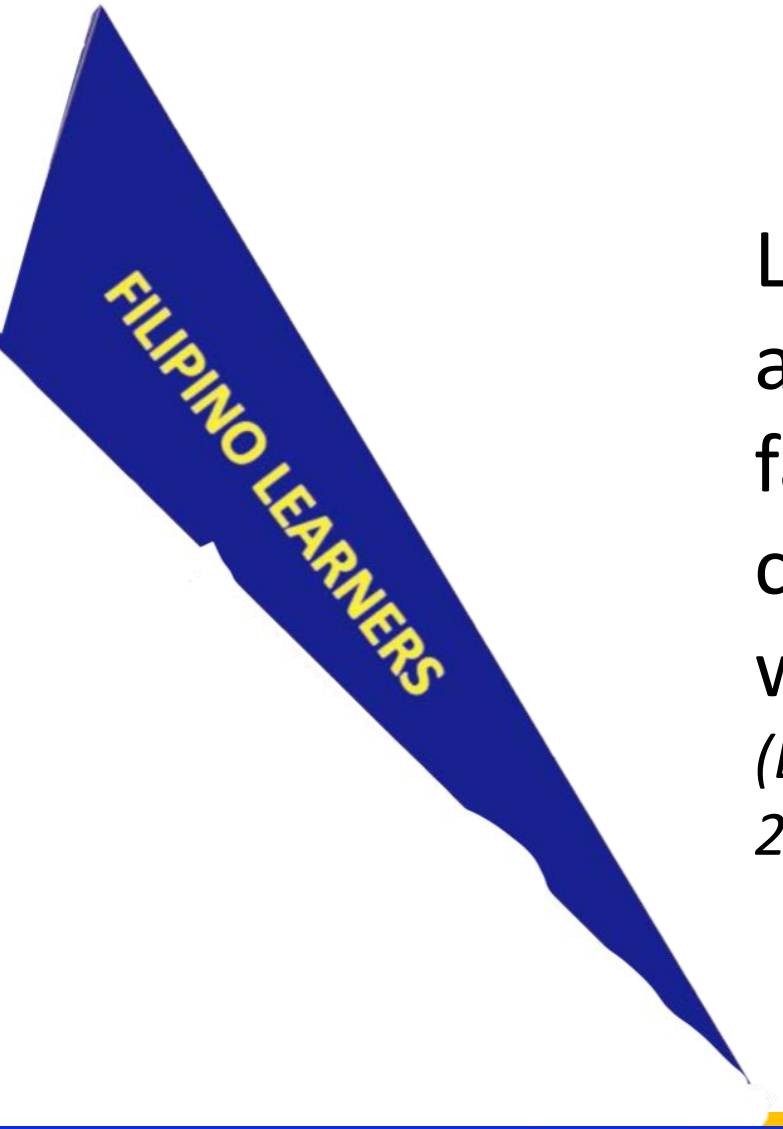

The Framework

Learner's experiences, culture, language, and the way they were socialized by their families and other social institutions are contributors to cognitive development which is central to learning

(Bruner, 1966; Demmert, 2001; Demmert & Towner, 2003; Gardner, 1985, 1995; Vygotsky, 1978)

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The Framework

The Context of the Filipino Learners' Language

- Bilingual Education policy
- The intellectualization of Filipino
- The role of Filipino for national identity and unity
- Teaching using English, Filipino and regional languages
- The MTB-MLE

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The Framework

Language

- BICS and CALP
- 2nd language learners

Cummins (2000) likewise points out that learning one language is beneficial for the learner to develop metalinguistic skills that are useful in learning additional languages

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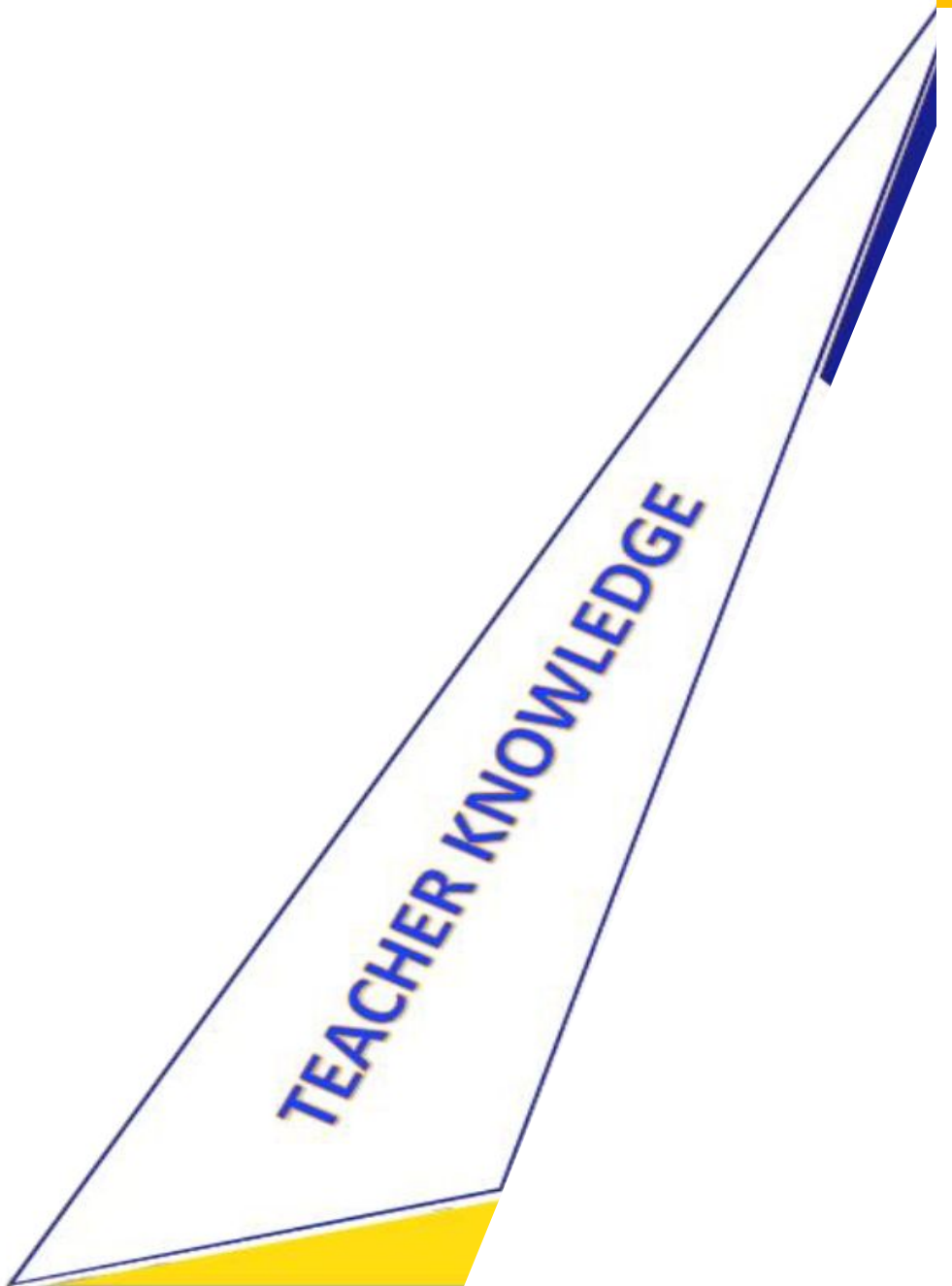
The Framework

Teacher Knowledge

- Reflective teaching
- Research
- Knowledge transformation

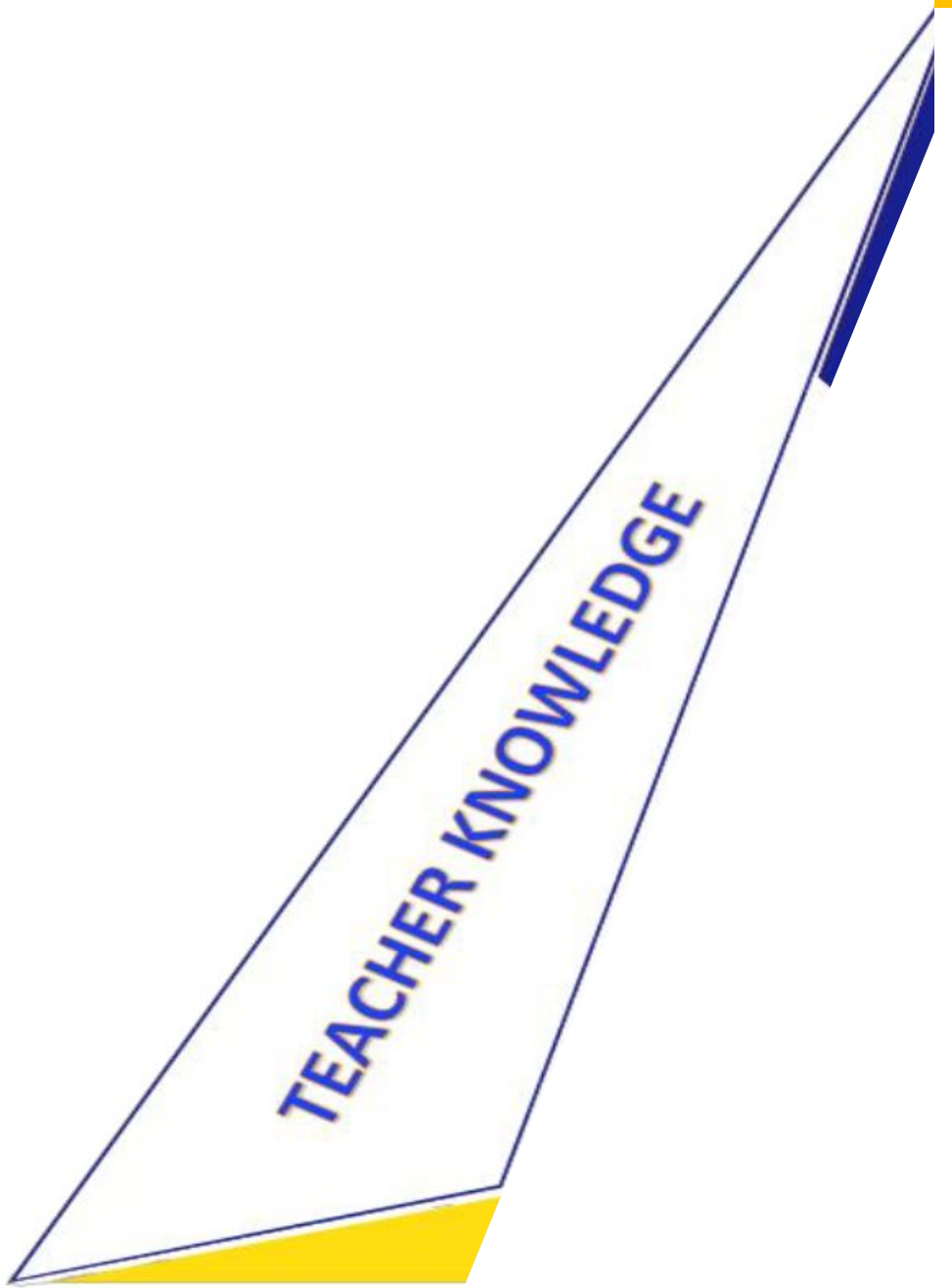


The Framework

Teacher Knowledge

- Reflective teaching
- Research
- Knowledge transformation

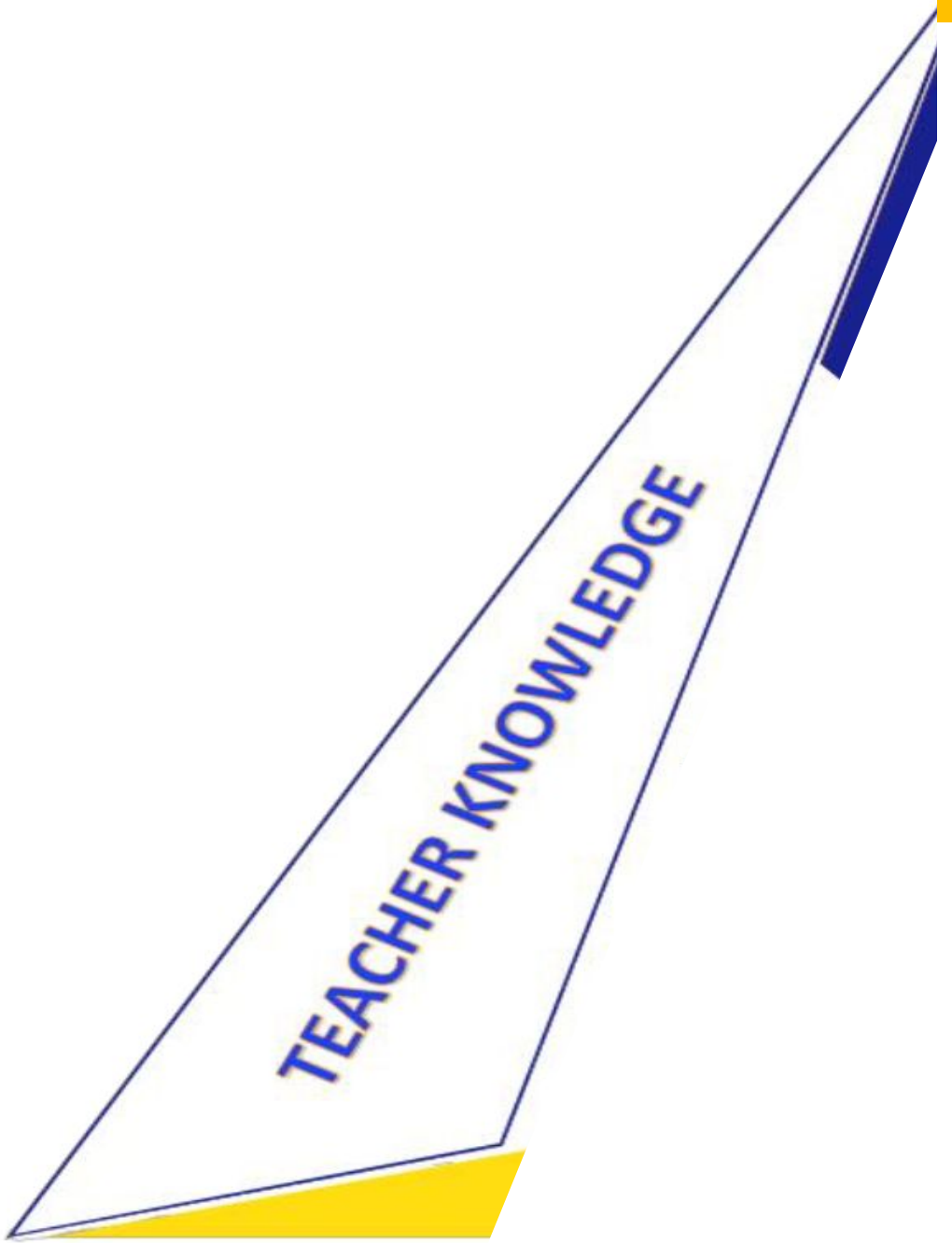
+TL and Assessment



Teacher Knowledge

+TL and Assessment

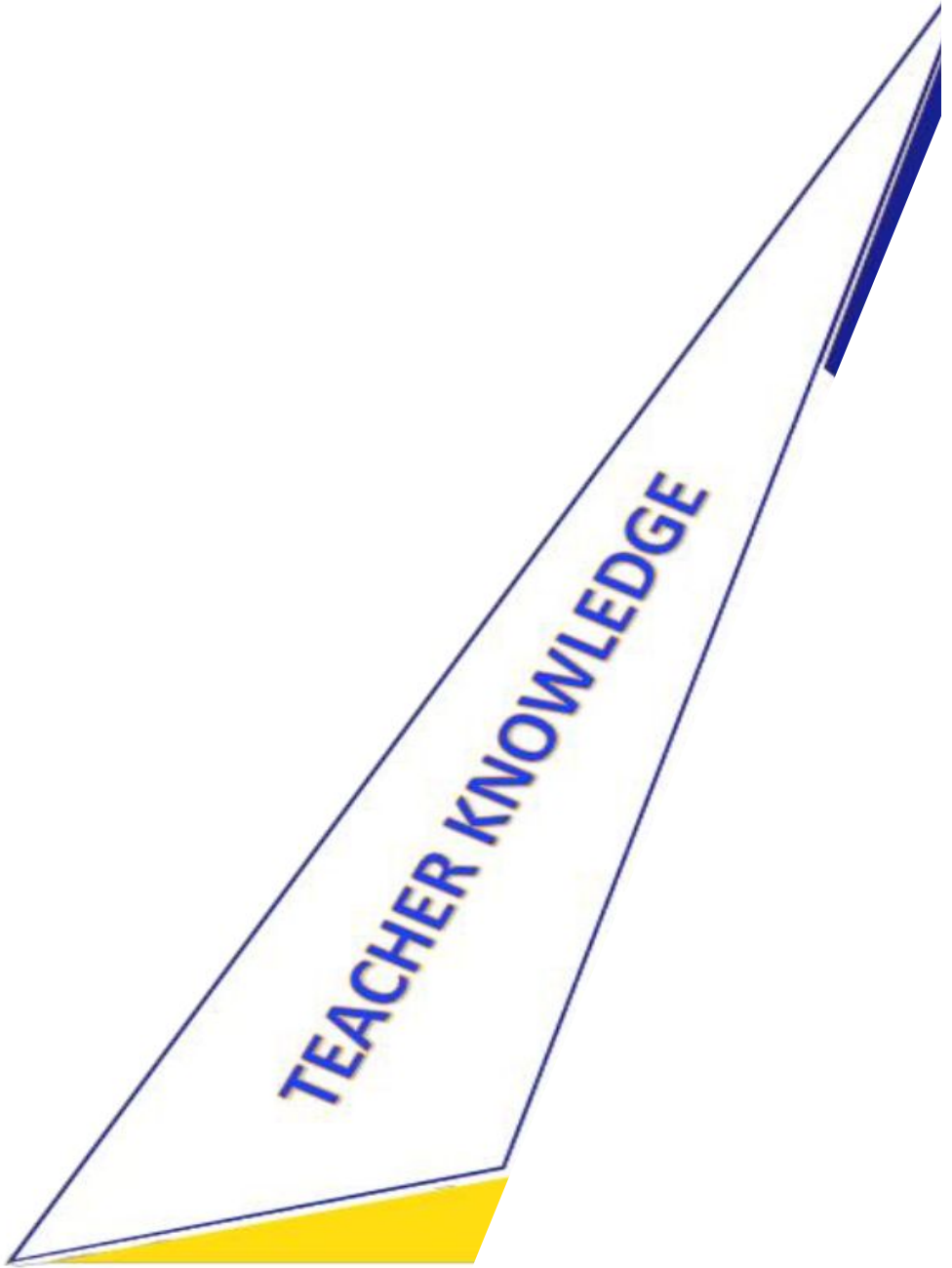
Quality of student learning



(Schunk & Rice, 1991; Glassick, Huber, Maeroff & Boyer, 1997)

The Framework

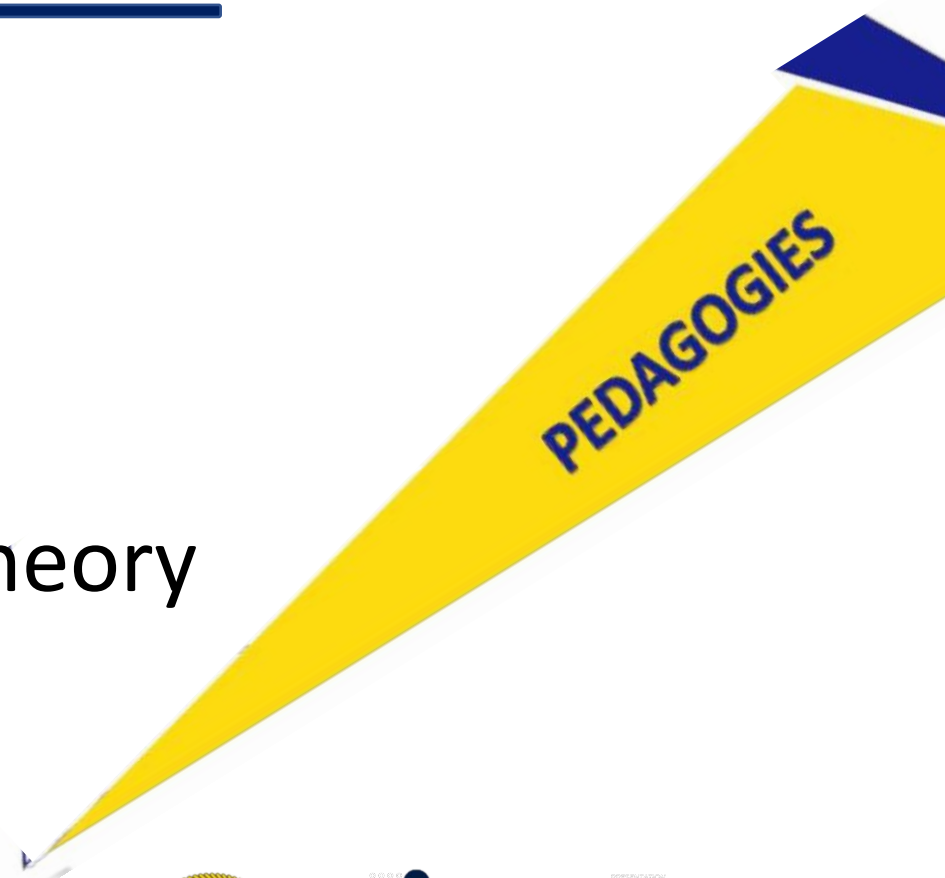
CK, PCK & TPCK



The Framework

Principles

1. Constructivism
2. Social Constructivist Theory
3. Second Language Acquisition Theory
4. TPCK
5. Experiential Learning Theory



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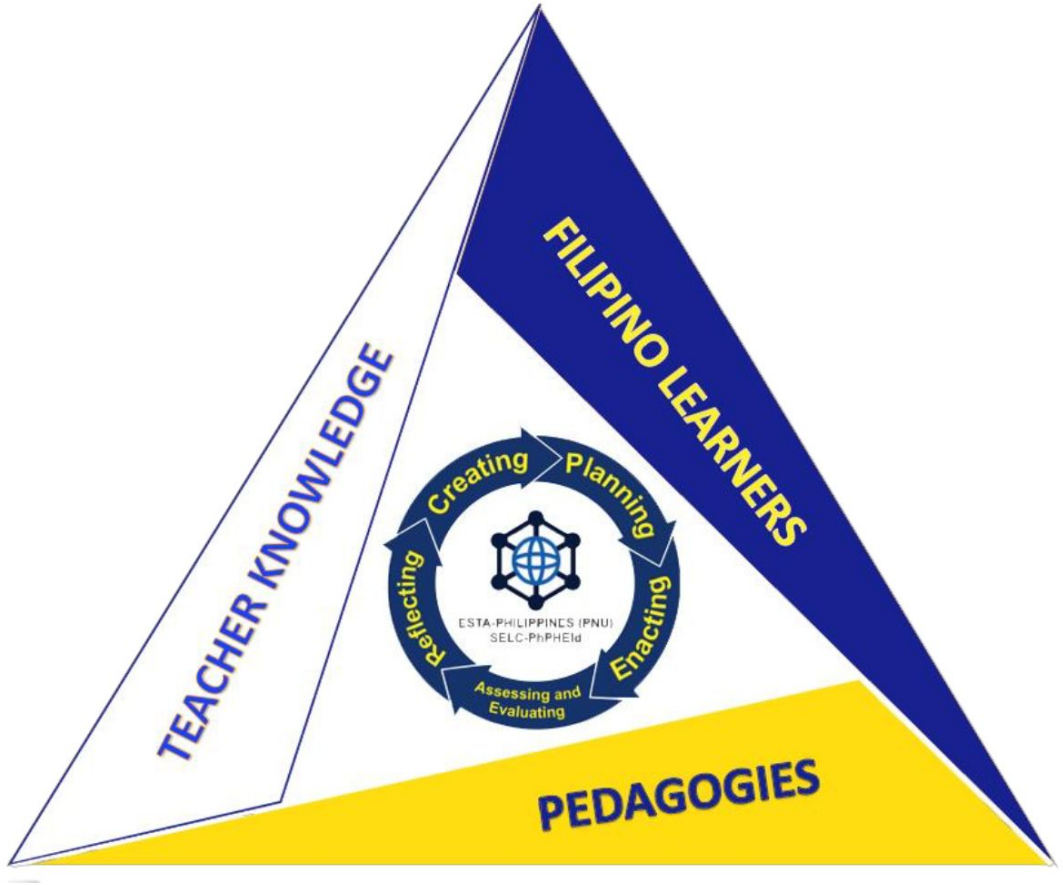
The Framework



Key Drivers

1. Culture and language diversity
2. ILSA results
3. Local and national evaluations
4. PPST
5. Geopolitics
6. Political economy

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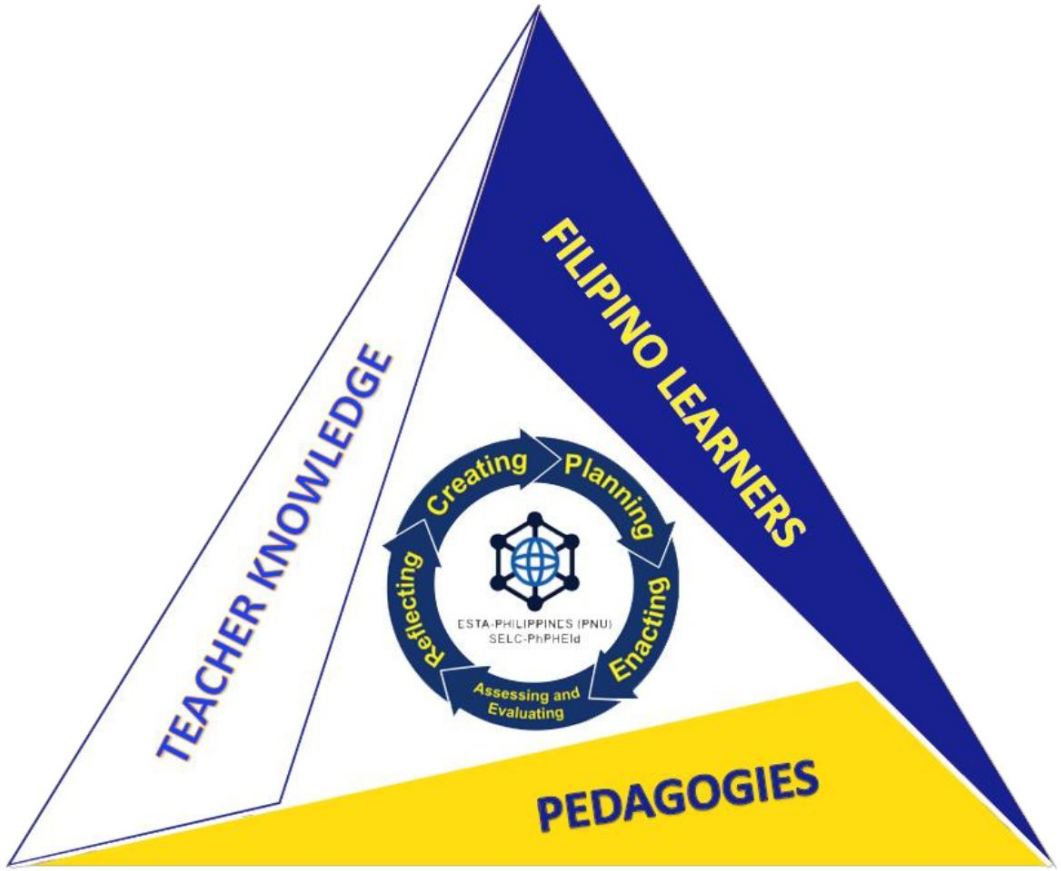

Ways Forward

Curricular modifications, enhancements, enactment

Teacher training

Development of TL products

.g. LE, Modules and assessments)

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The Framework

- Syllabi
- Flexible learning tool kits /course packs
- Lesson Exemplars
- Assessment Tools

The Framework

Integration of Framework in the Curriculum:

1. As Required Readings: Multicultural Ed., Teacher soft skills, assessment skills and language proficiency in communicating science
2. As Required Reading: STEAM Approach, CLIL etc [Pedagogies]
3. Literature Analysis/Annotated Bibliography: Filipino Learners
4. Ethnography and Feminist Research
5. Gender/Inclusivity

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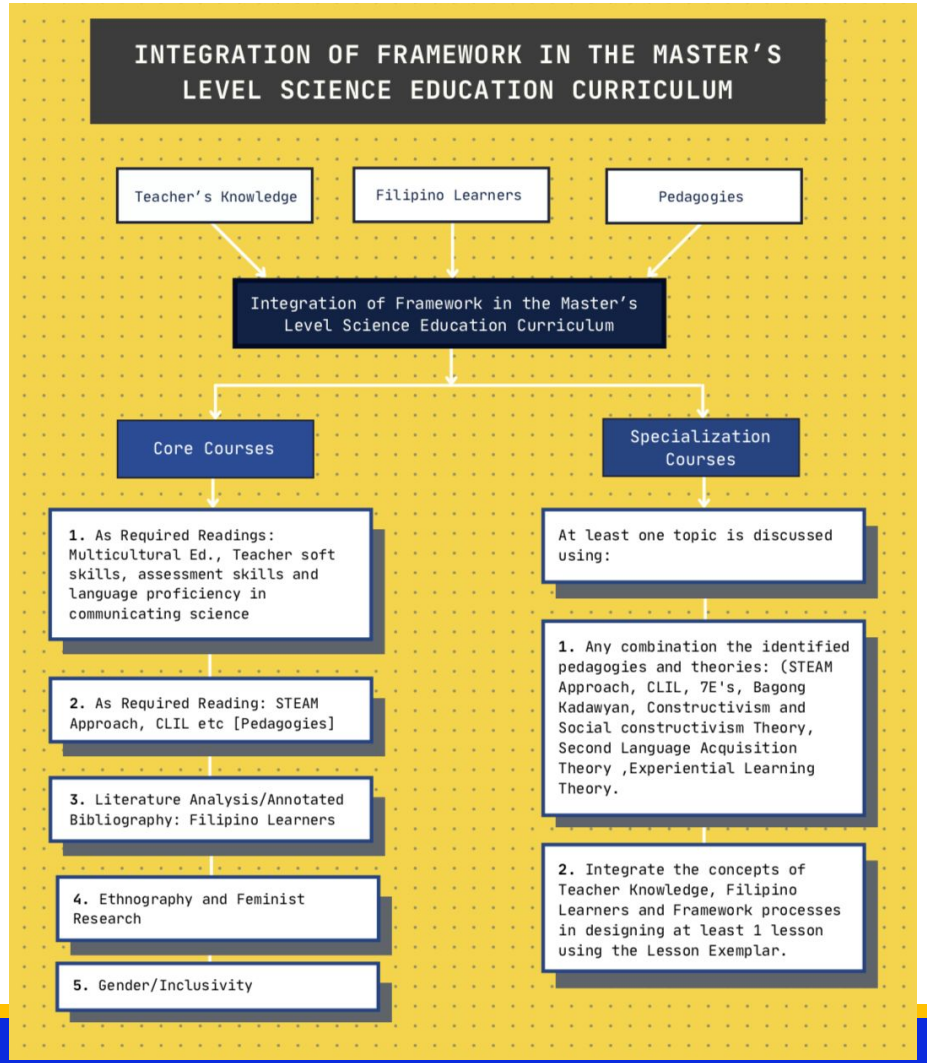
The Integration Model



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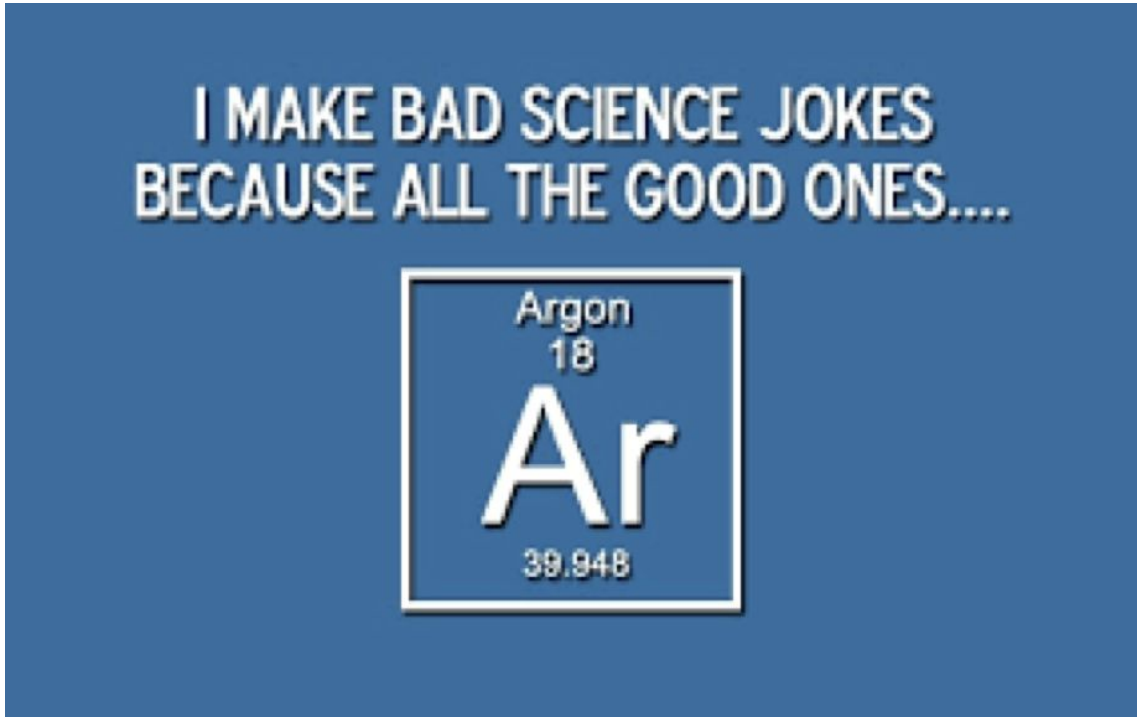
Sino ako bilang Guro ng Agham?



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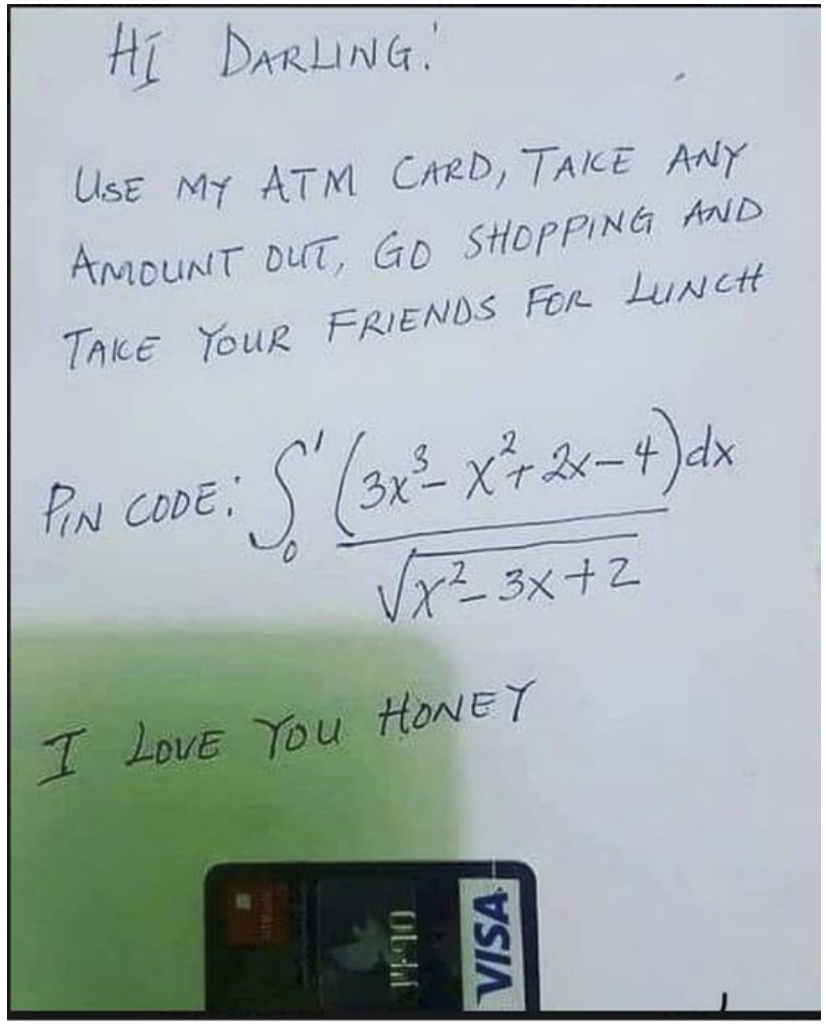

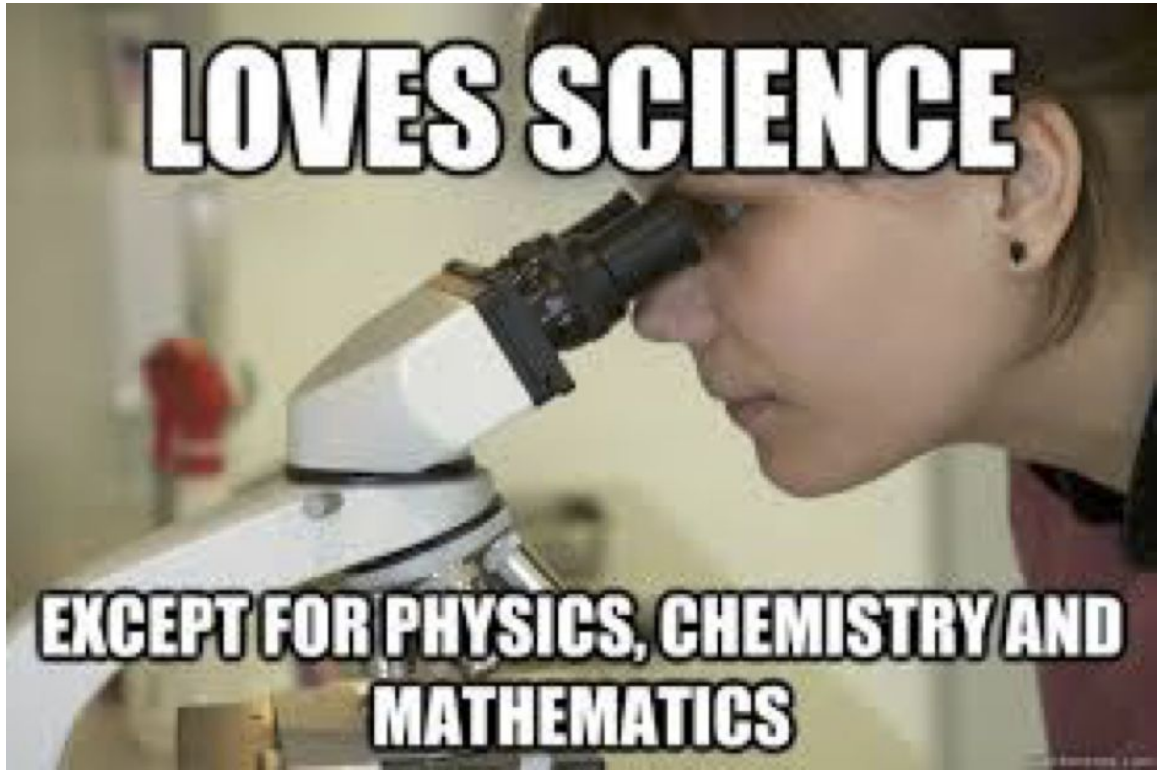

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Ikaw?
Anu ang magiging AMBAG Mo sa ESTA?

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Kaya anu na?

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