Policy Forum
Philippine Institute for Development Studies
March 6, 2019, Bohol Tropics, Tagbilaran City

Harnessing the 4th Industrial Revolution: Securing Bohol's Future through Education and Training

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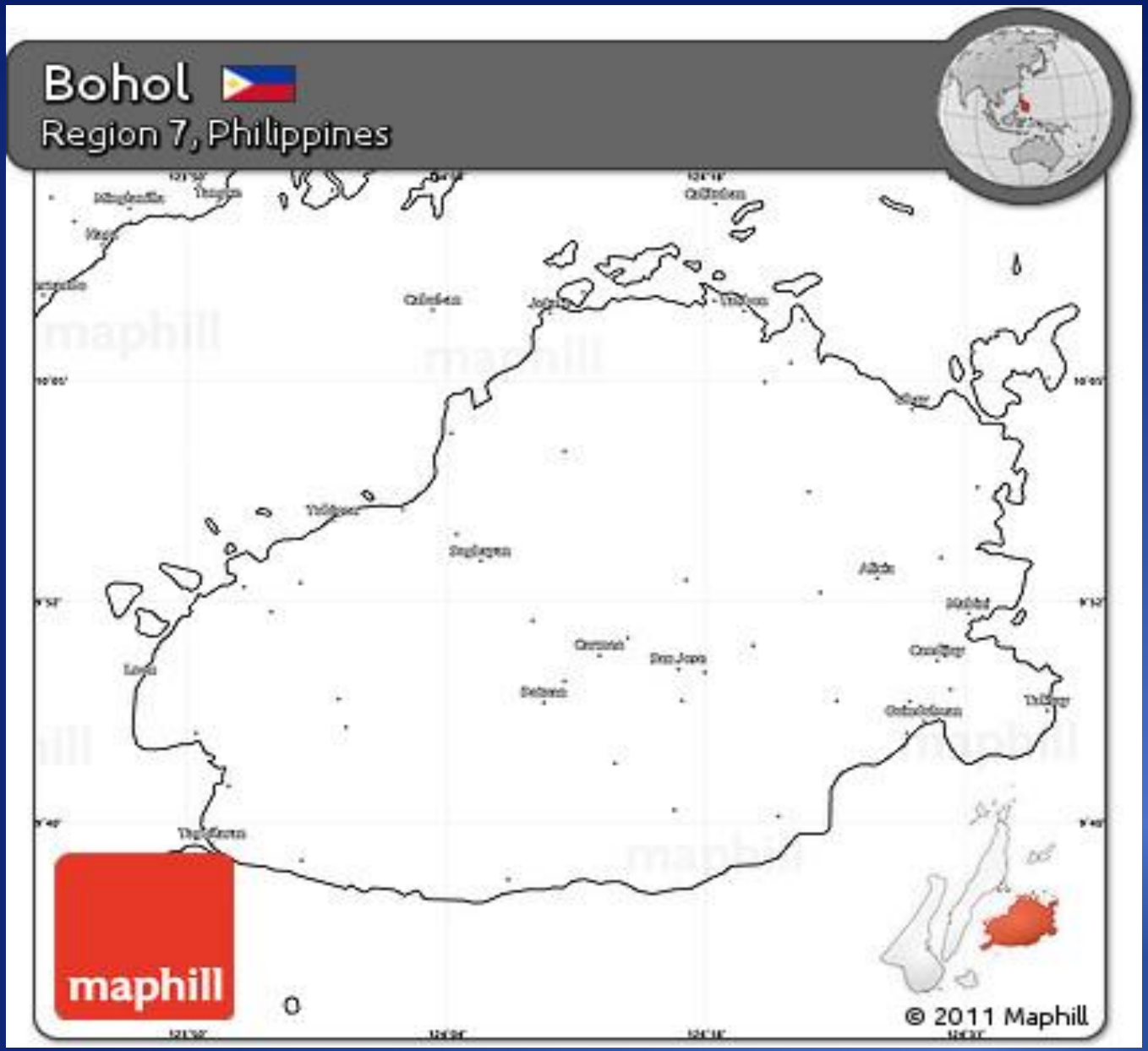
* Research Center for Theoretical Physics
Central Visayan Institute Foundation, Jagna, Bohol
* Physics Department, University of San Carlos, Cebu City
* Physics Department, Mindanao State University –
Iligan Institute of Technology, Iligan City

..\..\Bohol\Bohol - Location Map A4 Landscape.pdf



http://www.maphill.com/philippines/region-7/bohol/simple-maps/blank-map/free/

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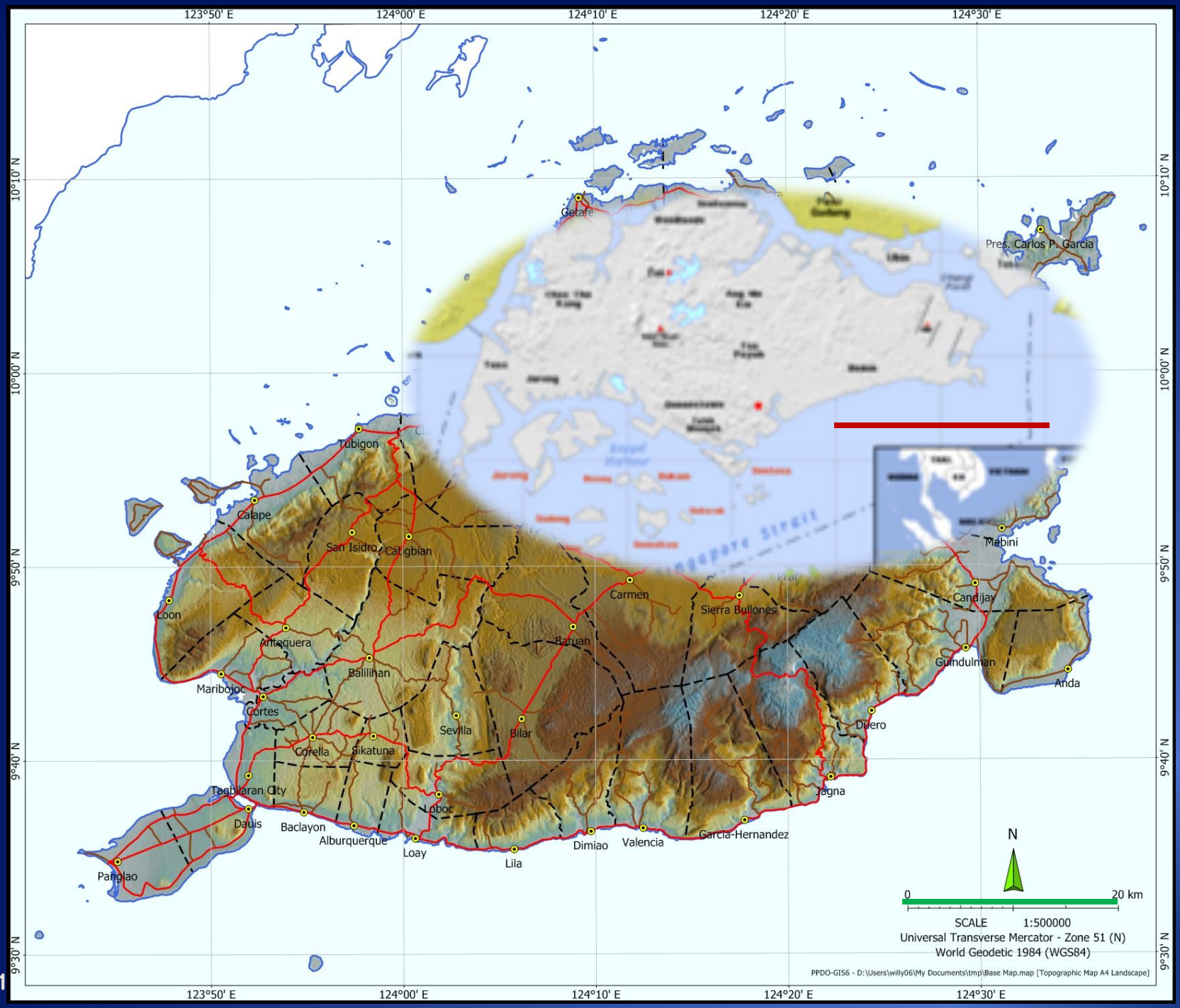
123°50' E
124°00' E
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Getafe
Pres. Carlos P. Garcia
Tubigon
Calape
San Isidro
Catigbian
Loon
Antequera
Baliliihan
Maribojoc
Cortes
Corella
Sikatuna
Tagbilaran City
Dauis
Baclayon
Alburquerque
Panglao
Loay
Loboc
Lila
Sevilla
Bilar
Dimiao
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Garcia-Hernandez
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Sierra Bullones
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Universal Transverse Mercator - Zone 51 (N)
World Geodetic 1984 (WGS84)
PPDO-GIS6 - D:\Users\willy06\My Documents\tmp\Base Map.map [Topographic Map A4 Landscape]

Tale of the tape

- Political class
- Land area
- Coordinates
- Population

Tale of the tape

Singapore	Bohol
• Island City-State	• Island province
• 722.5 sq. km.	• 4,821 sq. km.
• 1°19‘25“N	• 9°54‘N
• 5.6 M (2018)	• 1.3 M (2015)

CONTEXT *(adapted from PIDS APPC)*

People with less education and fewer skills are likely to be at a disadvantage as the 4th Industrial Revolution (FIRe) progresses…

QUESTIONS

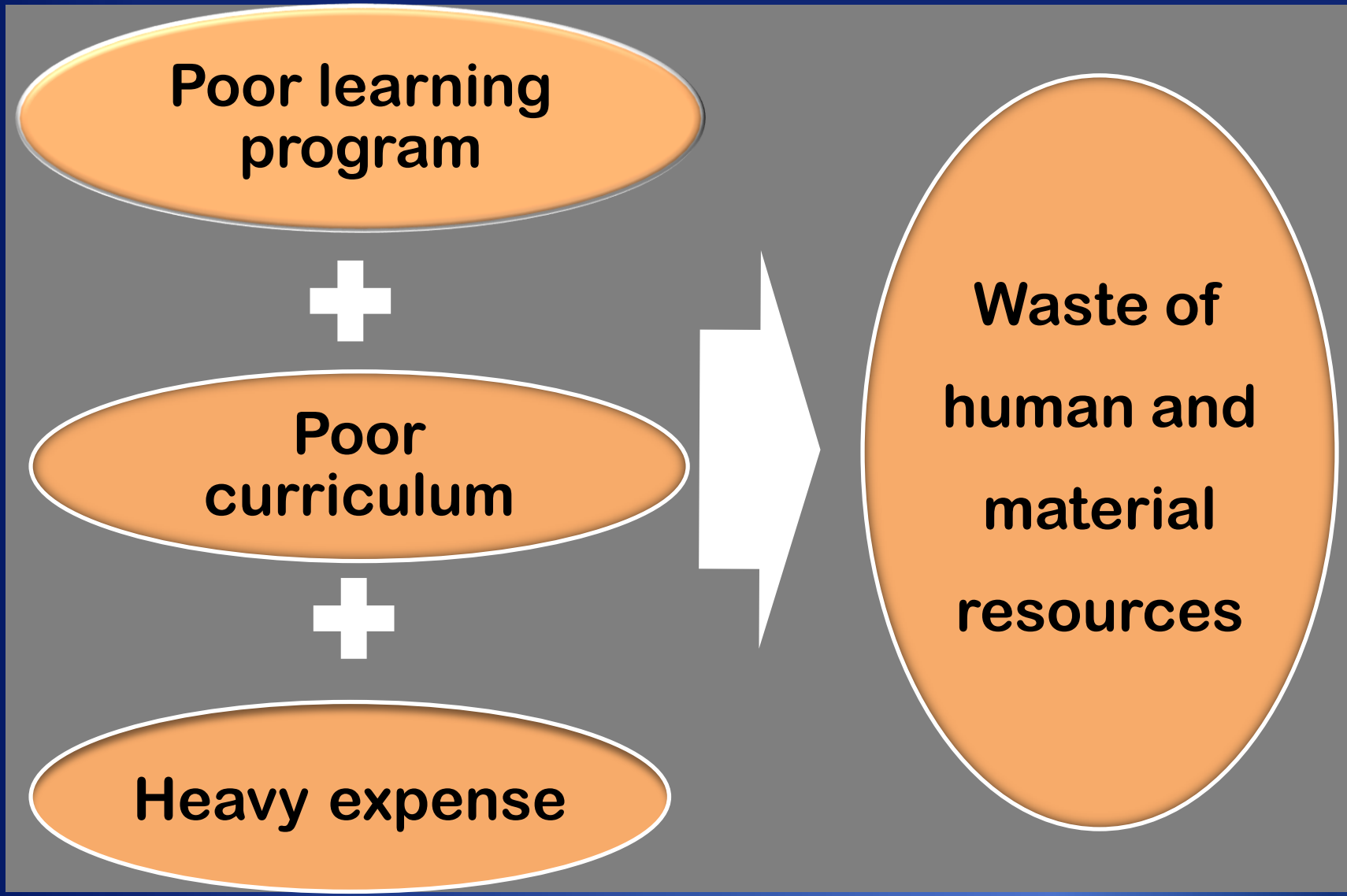
- What critical policy decisions and strategic actions should Central Visayas be taking today to get the current and future work force ready for the 4th Industrial Revolution?

Facing FIRe with WAATER

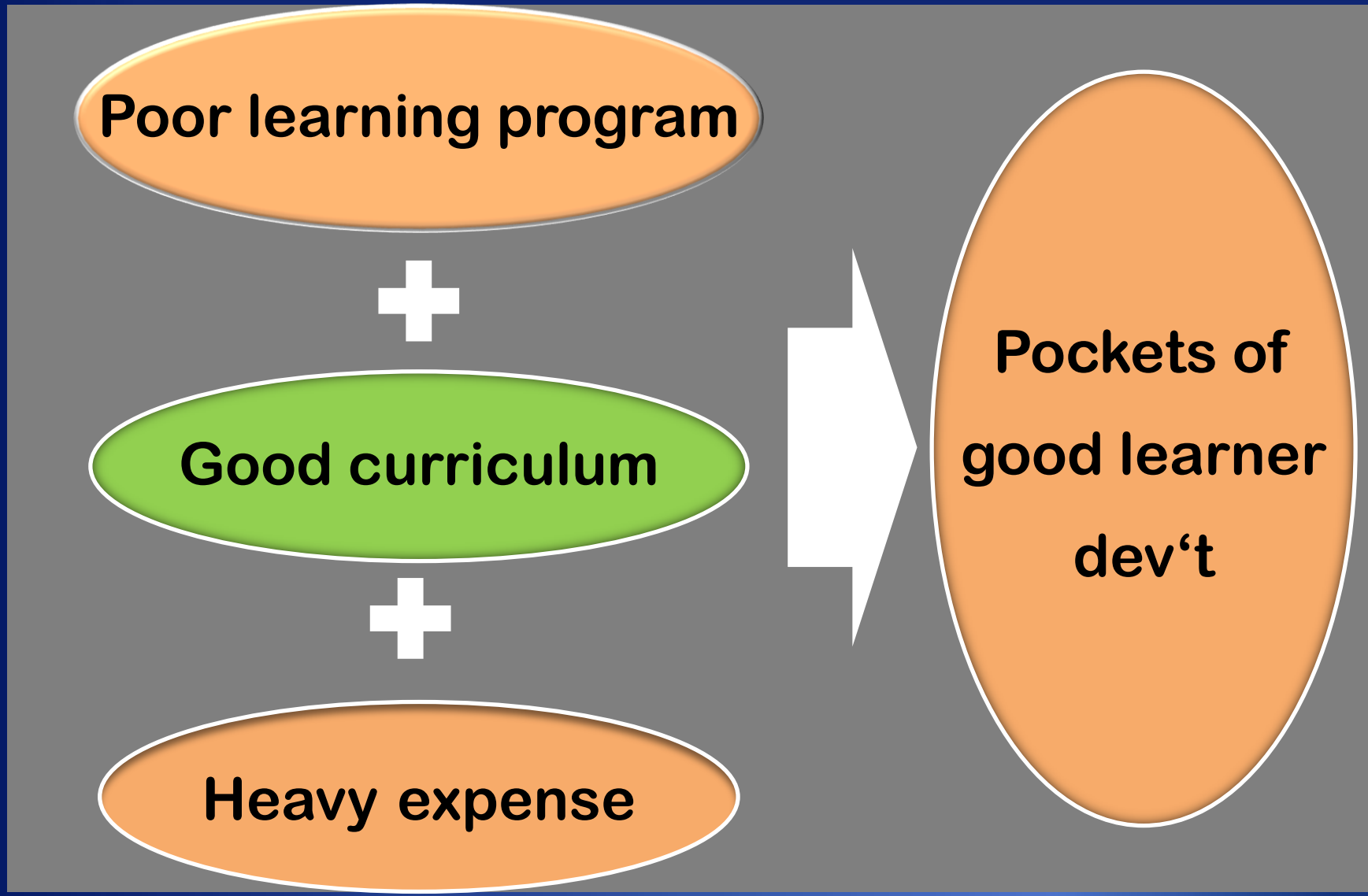
- Critical Educational Choices:
  - Curriculum content and depth
  - Learning program and materials
  - Budget optimization
- WAATER:

  Wide-ranging **A**dvanced **A**nalytics **T**raining and **E**ducation **R**einforcement
  - Prototype: The CVIF Experience

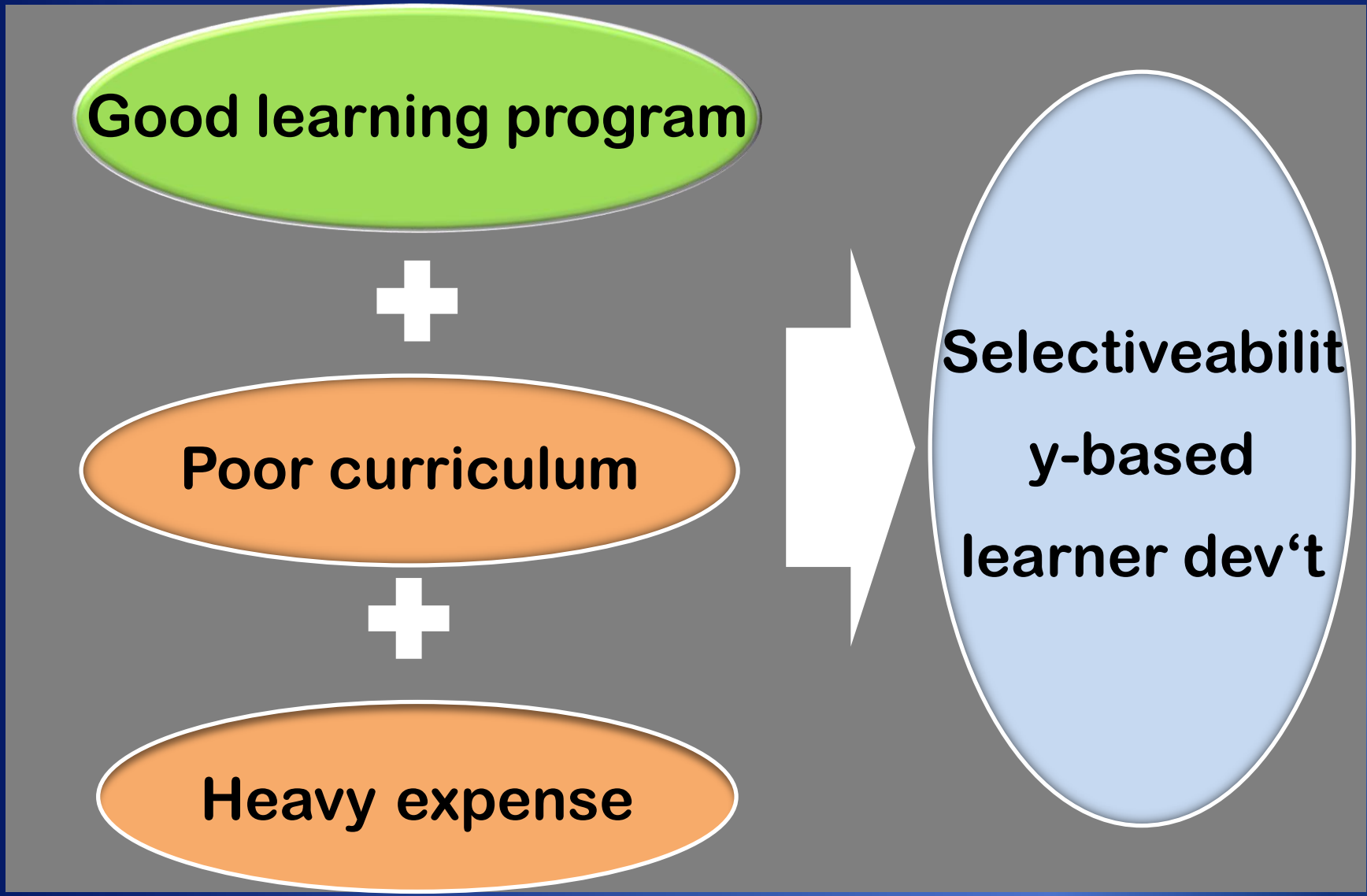
Critical choices



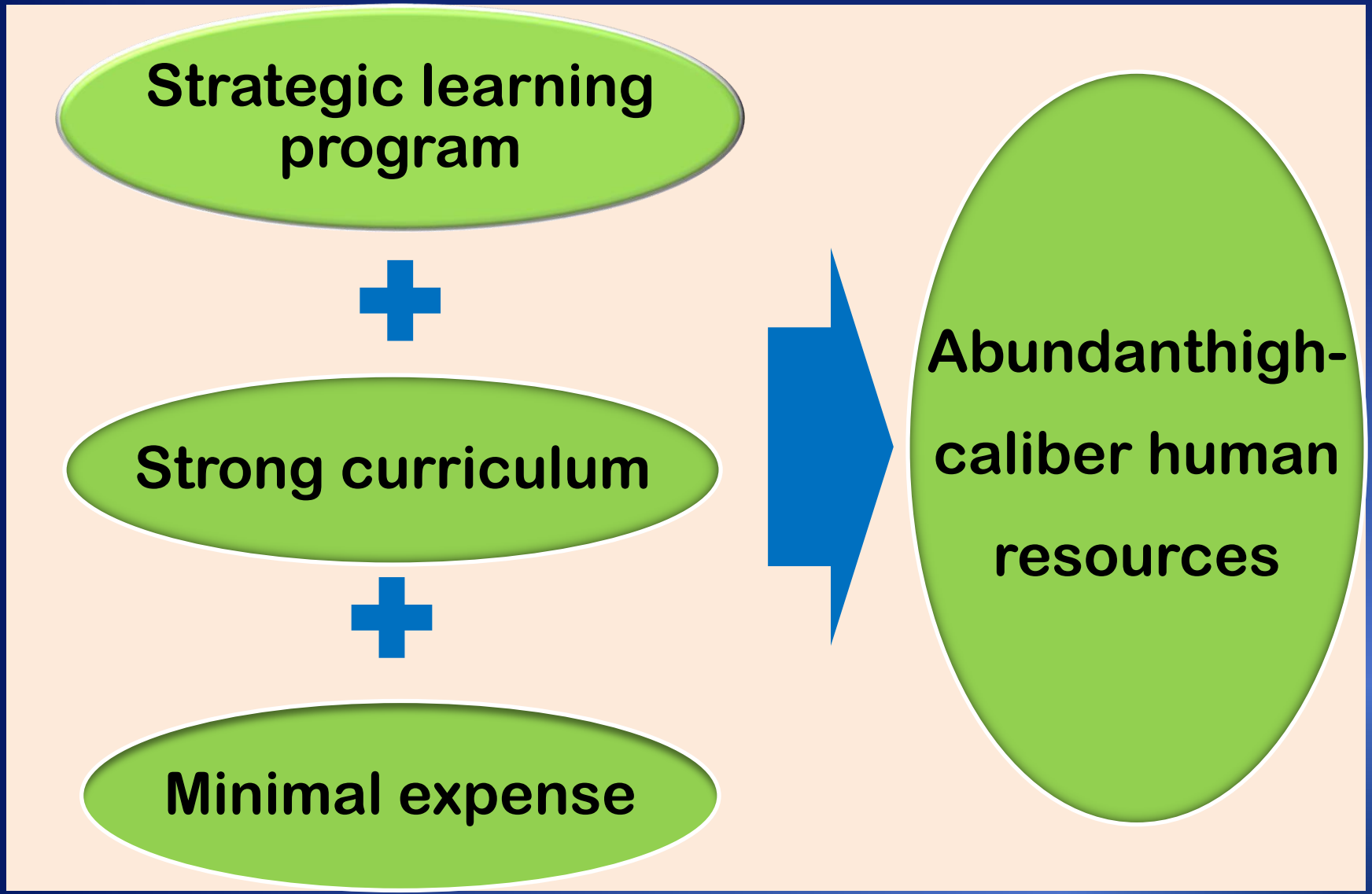
Critical choices



Critical choices



Critical choices



WAATER:

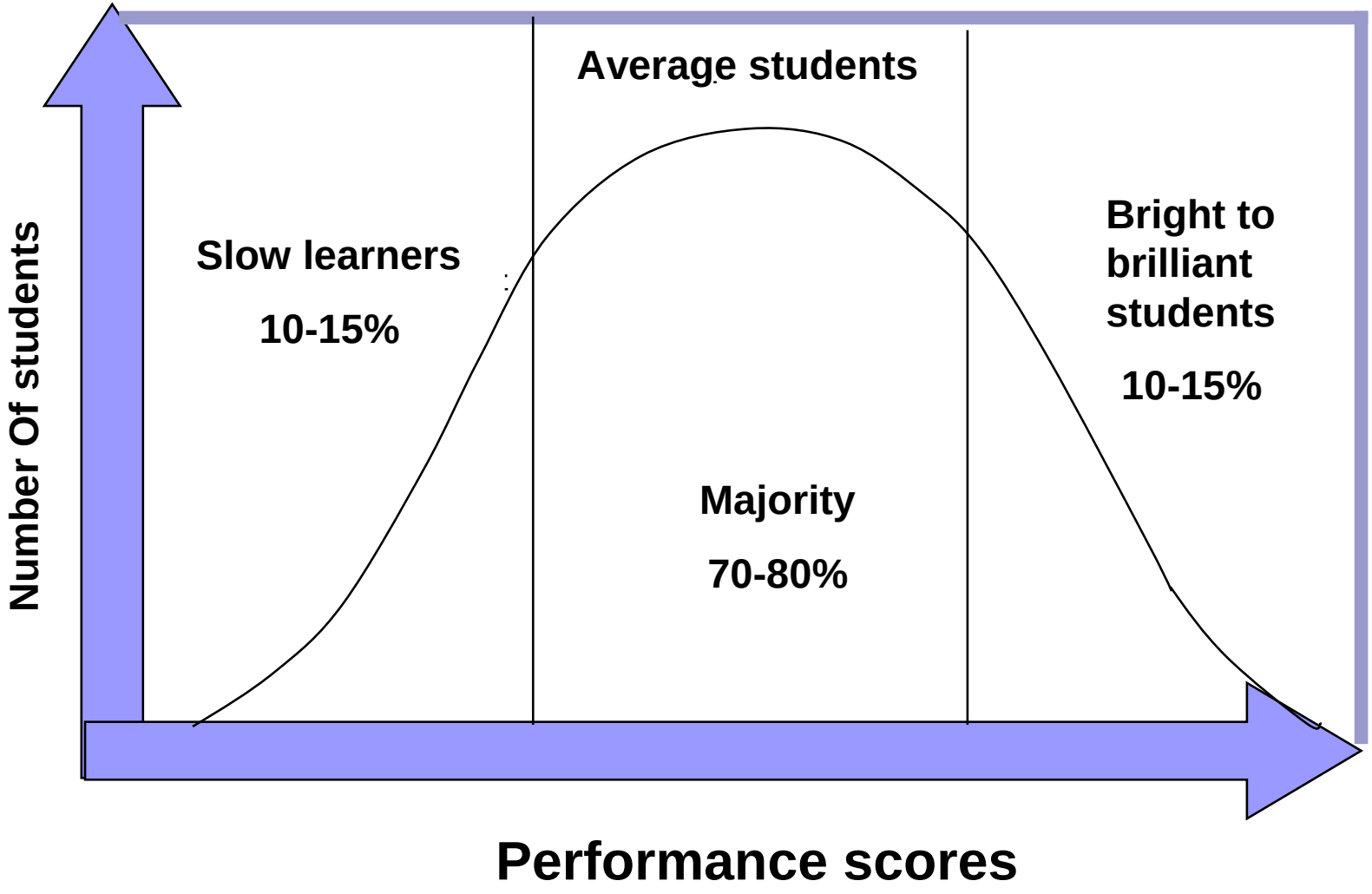
Wide-ranging Advanced Analytics Training and Education Reinforcement

Wide-ranging

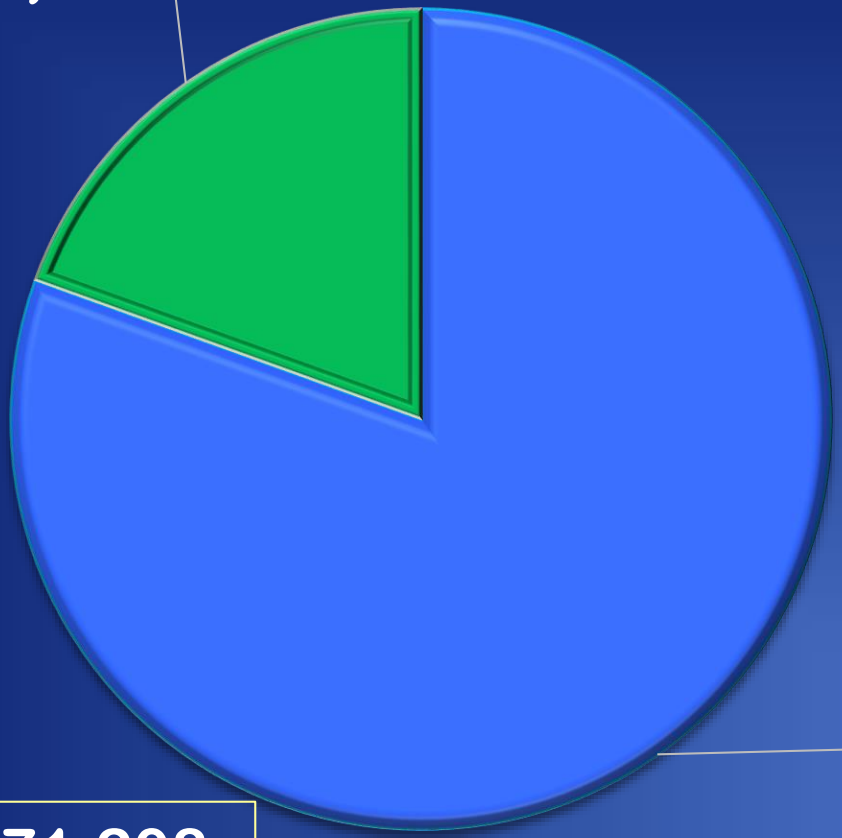
Wide-ranging

- Extensive in scope
  - Demographical and anthropological distribution
  - Disciplines for long-haul training
  - Transnational

Addressing the whole spectrum:



Secondary Schools Enrollment
SY 2013-2014



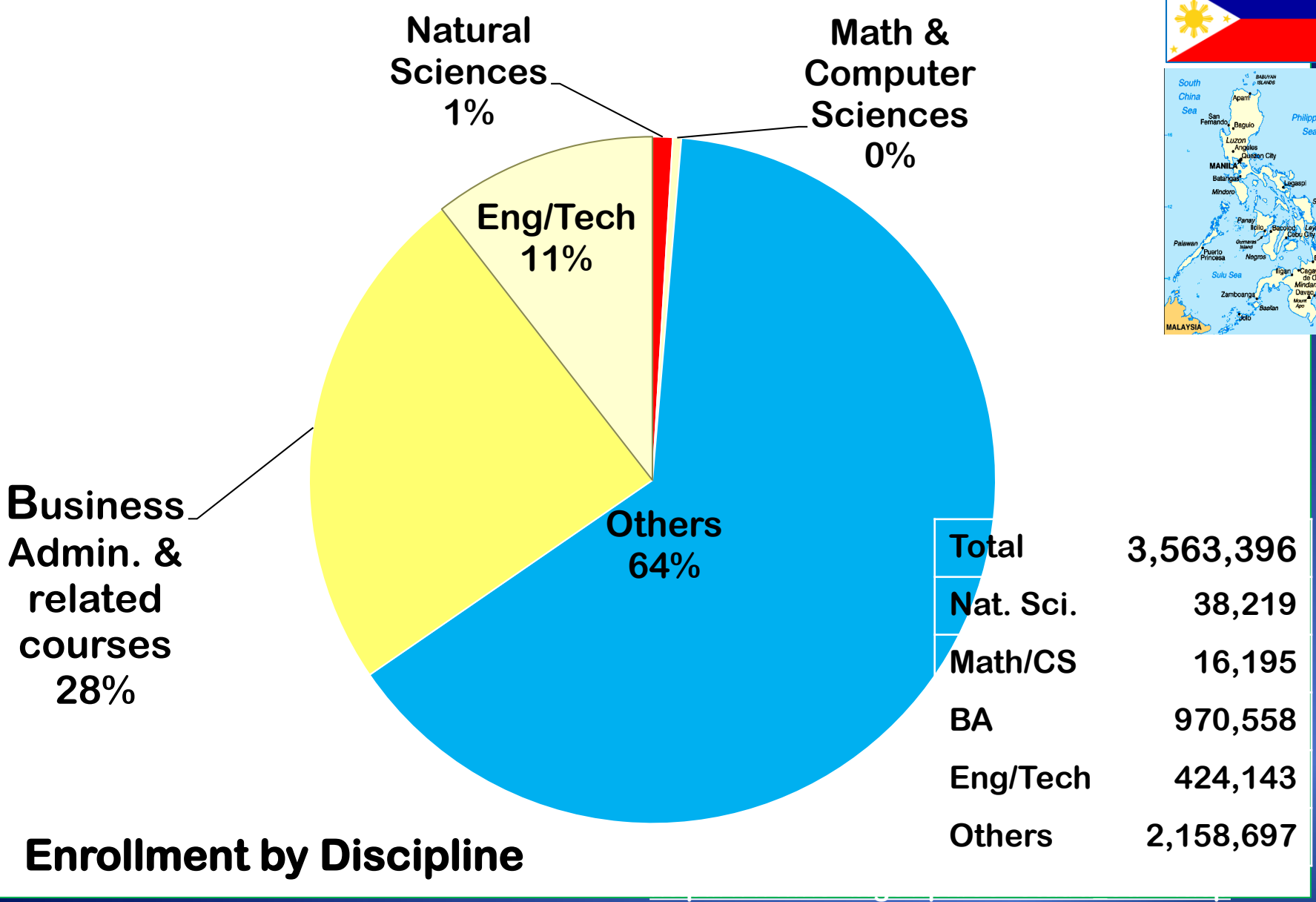
TOTAL: 7,171,208

Bohol 71,196 (2015)

http://www.nscb.gov.ph/secstat/d_educ.asp

Common problems

- Boosting interest in science, technology, engineering and math (STEM) courses
- Sustaining interest and passing grades throughout a university course
- Patching up deficiencies in mathematical preparation



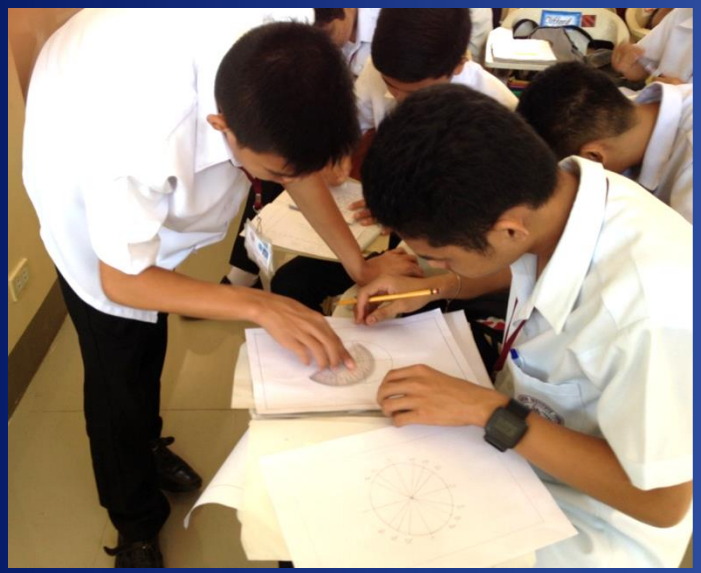
Total	3,563,396
Nat. Sci.	38,219
Math/CS	16,195
BA	970,558
Eng/Tech	424,143
Others	2,158,697

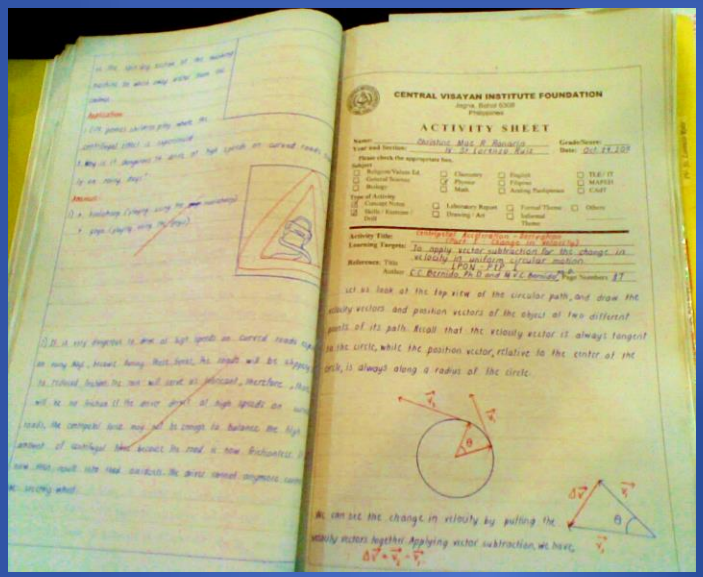
Enrollment by Discipline

Strategy

To boost and sustain interest while patching up deficiencies –

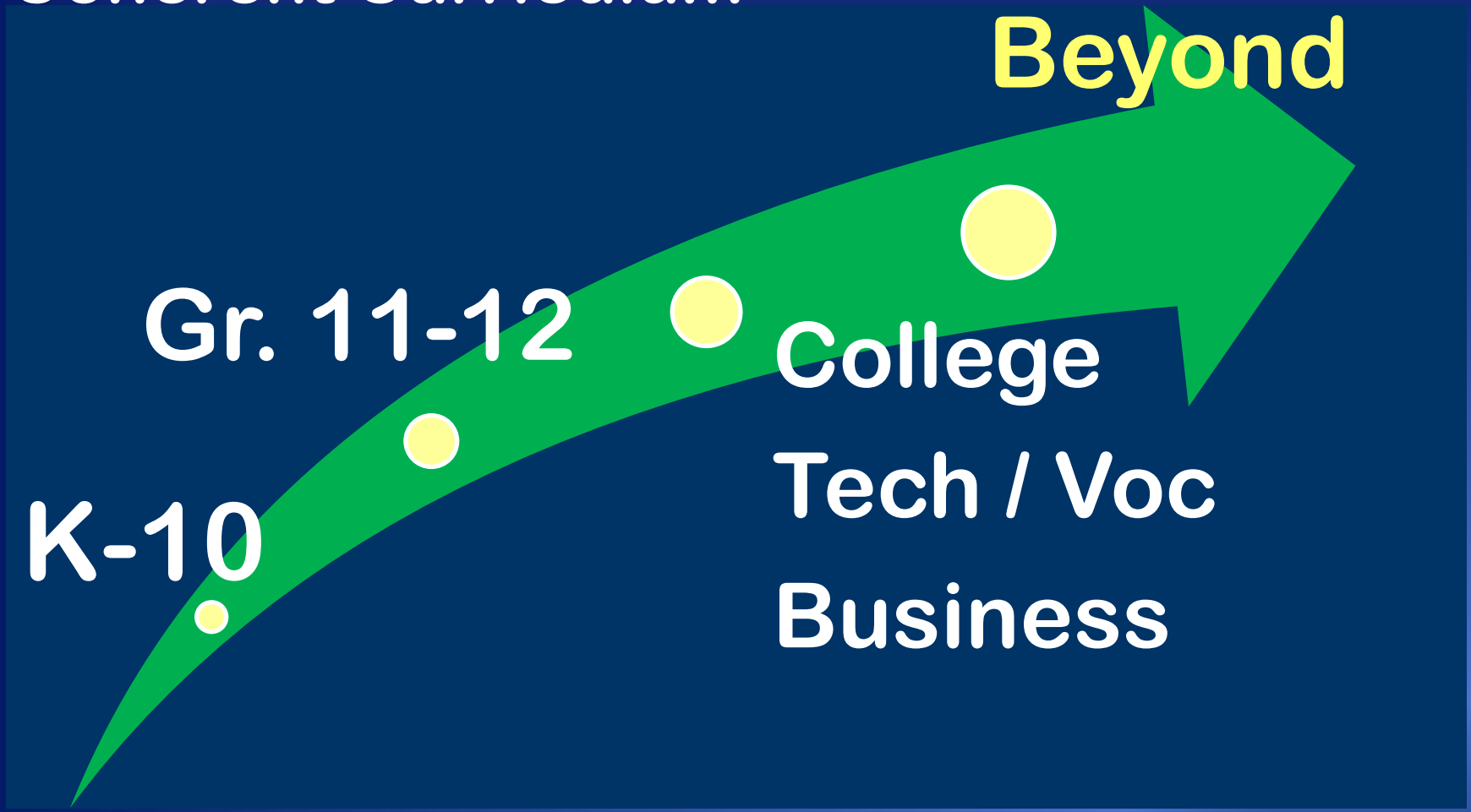
Full immersion in the analytical thinking and doing processes of the disciplines





Advanced

Coherent Curriculum



Analytics Training

Math infused disciplines

Physics, Chemistry, Biology, Earth Sciences

Economics, Political Science, Sociology,…

Humanities and Arts

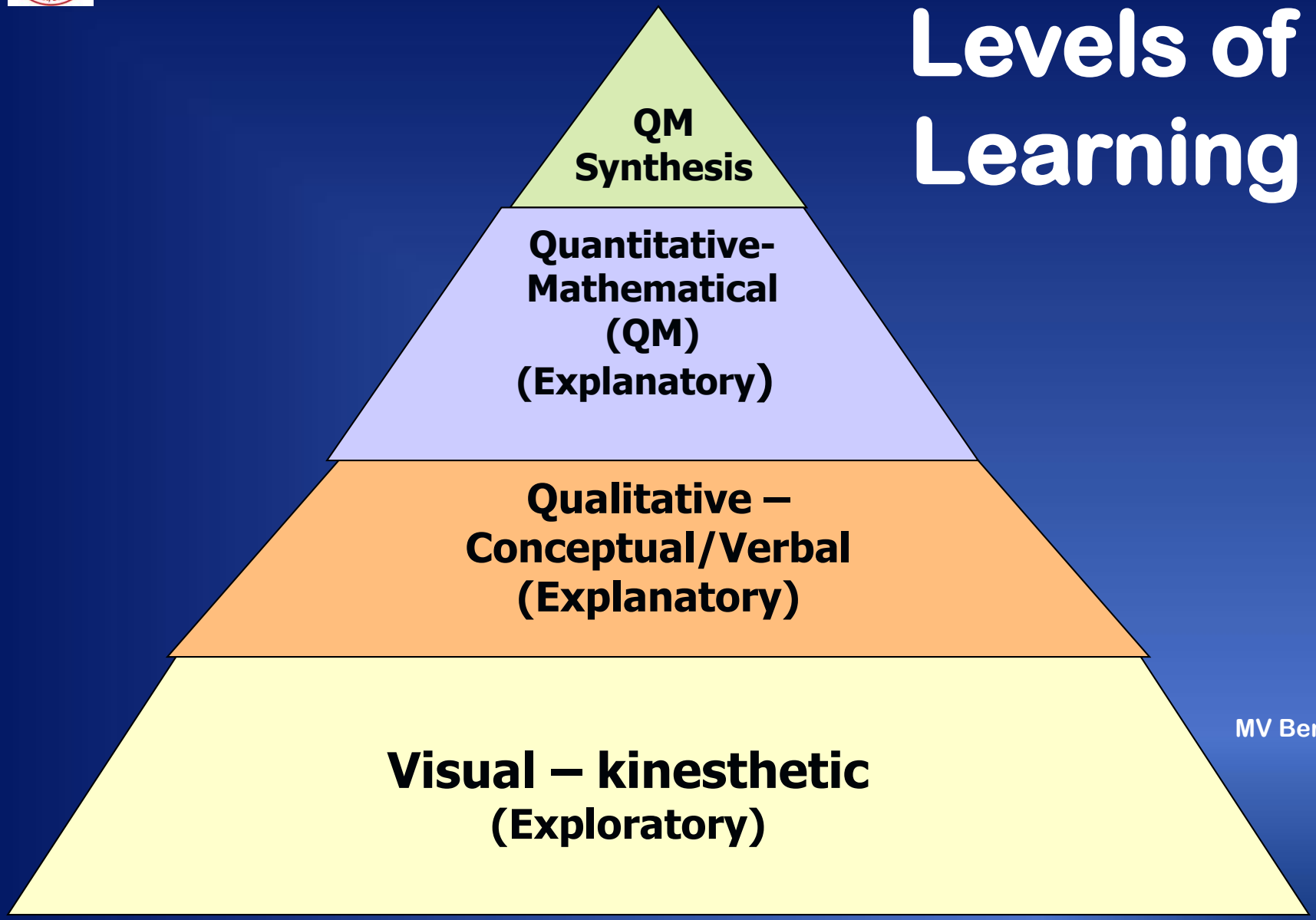
Sports and Kinetics

Computational methods

Design and engineering

Education Reinforcement

Levels of Learning



MV Bernido,
2005

WAATER:

Web **A**dapted **A**nalytics **T**raining and **E**ducation **R**einforcement

Workshop on

COMPUTATIONAL METHODS IN BIOLOGY

October 5 - 6, 2018

Central Visayan Institute Foundation

Jagna, Bohol 6308, Philippines

- Basic programming in Python and TensorFlow
- Artificial intelligence in Biology
- Using computers to study evolution
- Big data in Biology

LECTURERS (Our postdoctoral fellows who taught SHS for 1 semester using the CVIF DLP)

Dr. Hyunjin Shim (*Biotechnology and Bioengineering, École Polytechnique Fédéral de Lausanne, Switzerland*) – computational biologist at the interface of Genetics and Machine Learning, previously a researcher at the Artificial Intelligence Laboratory of Stanford University, USA.

Dr. Victor Sojo (*Evolutionary Biology and Chemistry, University College London, UK*) – fellow of the Institute for Advanced Studies in Berlin; postdoctoral work at Ludwig-Maximilian University, Germany, as Research Fellow of the European Molecular Biology Organization and at RIKEN, Tokyo, under the Japan Society for the Promotion of Science program.

The CVIF Dynamic Learning Program

- systems approach to process-induced learning
- synthesis of old and new strategies
- valid for elementary, secondary, and tertiary levels

Carpio-Bernido, M. V., Bernido, C. C. (2004) *Science Culture and Education for Change, Part I: Innovative Strategies for Secondary Education in the Philippines*. In Transactions of the National Academy of Science and Technology (NAST), Philippines, Vol. 26, No. 2; (2011) *CVIF Dynamic Learning Program: A Systems Approach to Process-Induced Learning*. In Proc. of the epiSTEME 4 (Mumbai:Homi Bhabha Center for Science Education).

9th CVIF Dynamic Learning Program (DLP) Workshop

Process-induced Deep Learning for K to G12 and Beyond

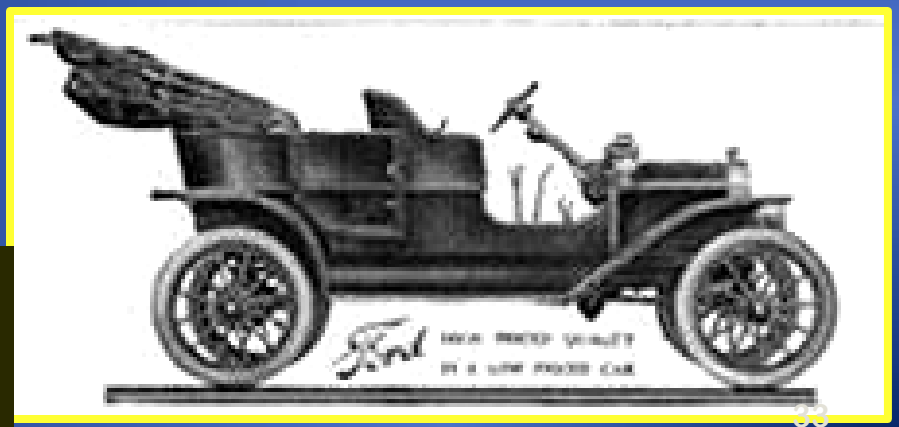
3 - 5 June 2019

Michael Richartz Hall, University of San Carlos (Talamban)
Cebu City, 6000 Philippines

CVIF Program Design Requirements

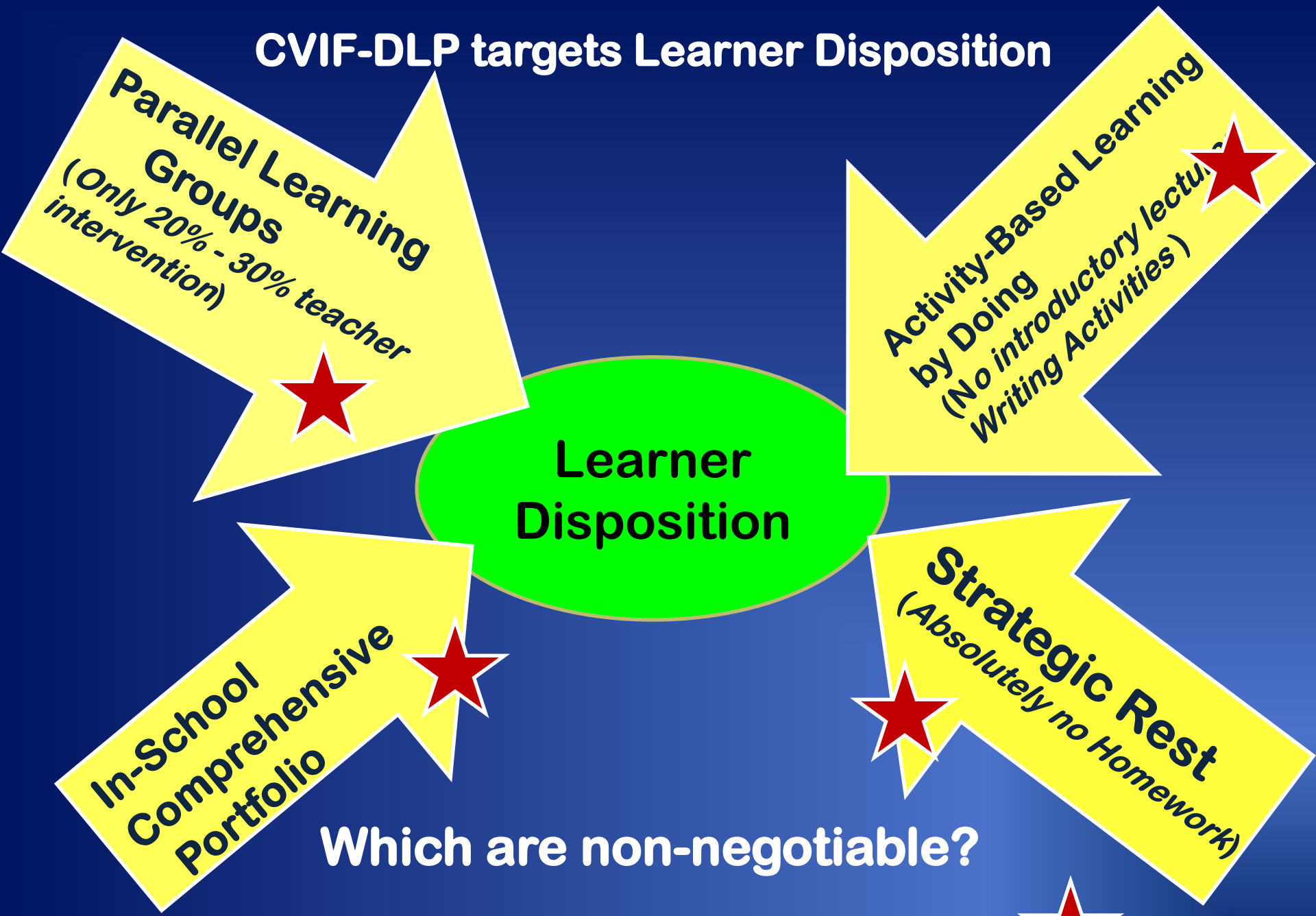
- ***large-scale*** enough for ***state school systems***, but ***individualized*** enough for ***each student in any school***
- has best ***evidence-based features***, for curriculum and didactics
- so low in ***cost*** that effective implementation is possible for ***any nation.***

Ford's Model T: iconic disruptive showcase; Key: Process Efficiency



"1908 Ford Model T" by User Rmhermen on en.wikipedia (1908 Ford Model T ad from Oct. 1, 1908 Life magazine). Licensed under Public Domain via Commons - https://commons.wikimedia.org/wiki/

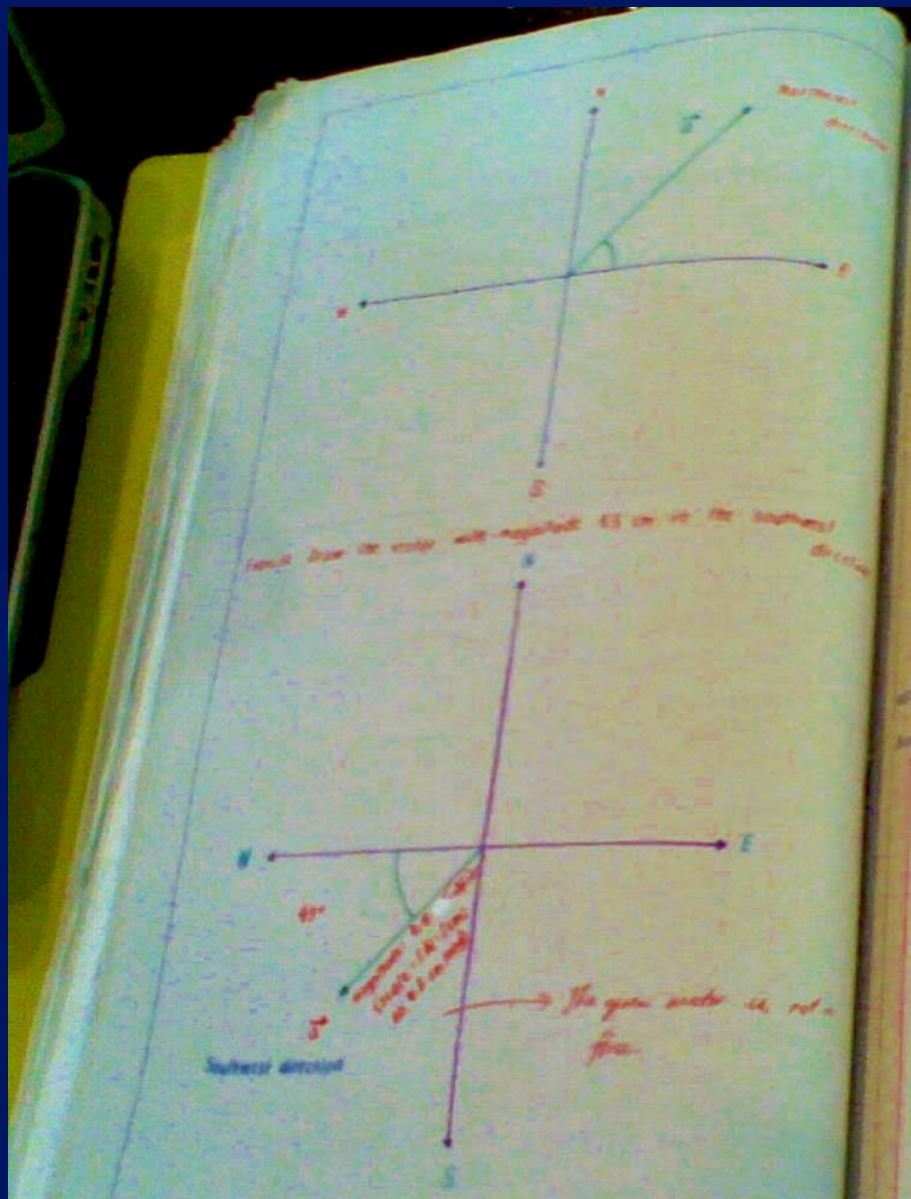
CVIF-DLP targets Learner Disposition



Which are non-negotiable?

Non-negotiable Features of DLP=

- No need for homework, assignments, required research, and projects to be done at home
- No need for tutoring after school hours
- More time for holistic development and personal creativity



CENTRAL VISAYAN INSTITUTE FOUNDATION
Jagna, Bohol 6308
Philippines

ACTIVITY SHEET

Name: Christian Mae B. Bernido
Year and Section: IV- St. Lorenzo Ruiz
Grade/Score: 66
Date: July 8, 2018

Please check the appropriate box.

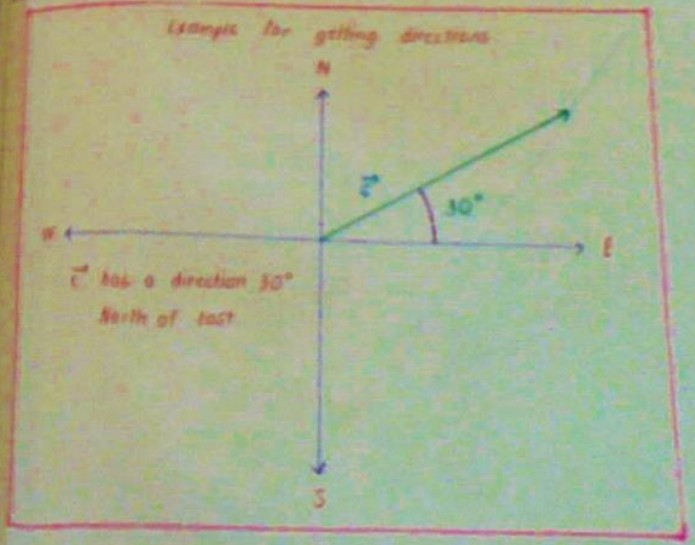
Subject: ☐ Religion/Values Ed ☐ General Science ☐ Biology ☐ Chemistry ☐ Physics ☐ Math ☐ English ☐ Filipino ☐ Araling Panlipunan ☐ TLE / IT ☐ MAPEH ☐ CAST

Type of Activity: ☐ Concept Notes ☐ Skills / Exercise / Drill ☐ Laboratory Report ☐ Drawing / Art ☐ Formal Theme ☐ Informal Theme ☐ Others

Activity Title: Exercises in Drawing Vectors I
Learning Target: To draw a vector directed at any angle between the North, South, East and Westward directions.
Reference: Title: LPDN: FIP Part I
Author: C.C Bernido, Ph.D and M.C Bernido, M.D. Page Numbers: 37

For angles of vectors between the meteorological directions, we often use a simple rule. For example, take 30° North of East. This means from the East turn 30° upward to the North.

Example for getting directions



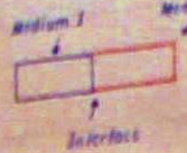
$\vec{E}$ has a direction 30° North of East

MVCBernidoCVIF DLP 2018

Application:

1. The diagram at the right shows the side view of two media and their interface. Draw and label rays for incident, reflected and transmitted waves.

SIDE VIEW



2. Give examples of different media with an interface through which a wave propagates.

ANSWERS:

1)

2) • Duplex house — Medium 1: house 1; Medium 2: house 2; Interface: wall that divides them

• Ham Sandwich — Medium 1: loaf 1; Medium 2: loaf 2; Interface: ham

CENTRAL VISAYAN INSTITUTE FOUNDATION
Jagna, Bohol 6308
Philippines

ACTIVITY SHEET

Name: Christine Mae R. Bernardo
Year and Section: IV St. Lorenzo Ruiz
Grade/Score: 9/10
Date: Feb. 17, 2012

Please check the appropriate box.

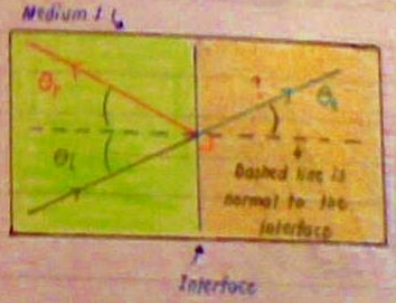
Subject
- ☐ Religion/Values Ed
- ☐ General Science
- ☐ Biology
- ☐ Chemistry
- ☑ Physics
- ☐ Math
- ☐ English
- ☐ Filipino
- ☐ Araling Panlipunan
- ☐ TLE/ H
- ☐ MAPEH
- ☐ EASE

Type of Activity
- ☑ Concept Notes
- ☑ Skills / Exercise / Drill
- ☐ Laboratory Report
- ☐ Drawing / Art
- ☐ Formal Theme
- ☐ Informal Theme
- ☐ Others

Activity Title: Reflection and Refraction at a Boundary
Learning Targets: To state and apply the law of reflection and law of refraction.

Reference: Title: LM ON - PEP II
Author: C.C. Bernido, Ph.D.; M.V.C. Bernido, Ph.D. Page Numbers: 176

SIDE VIEW

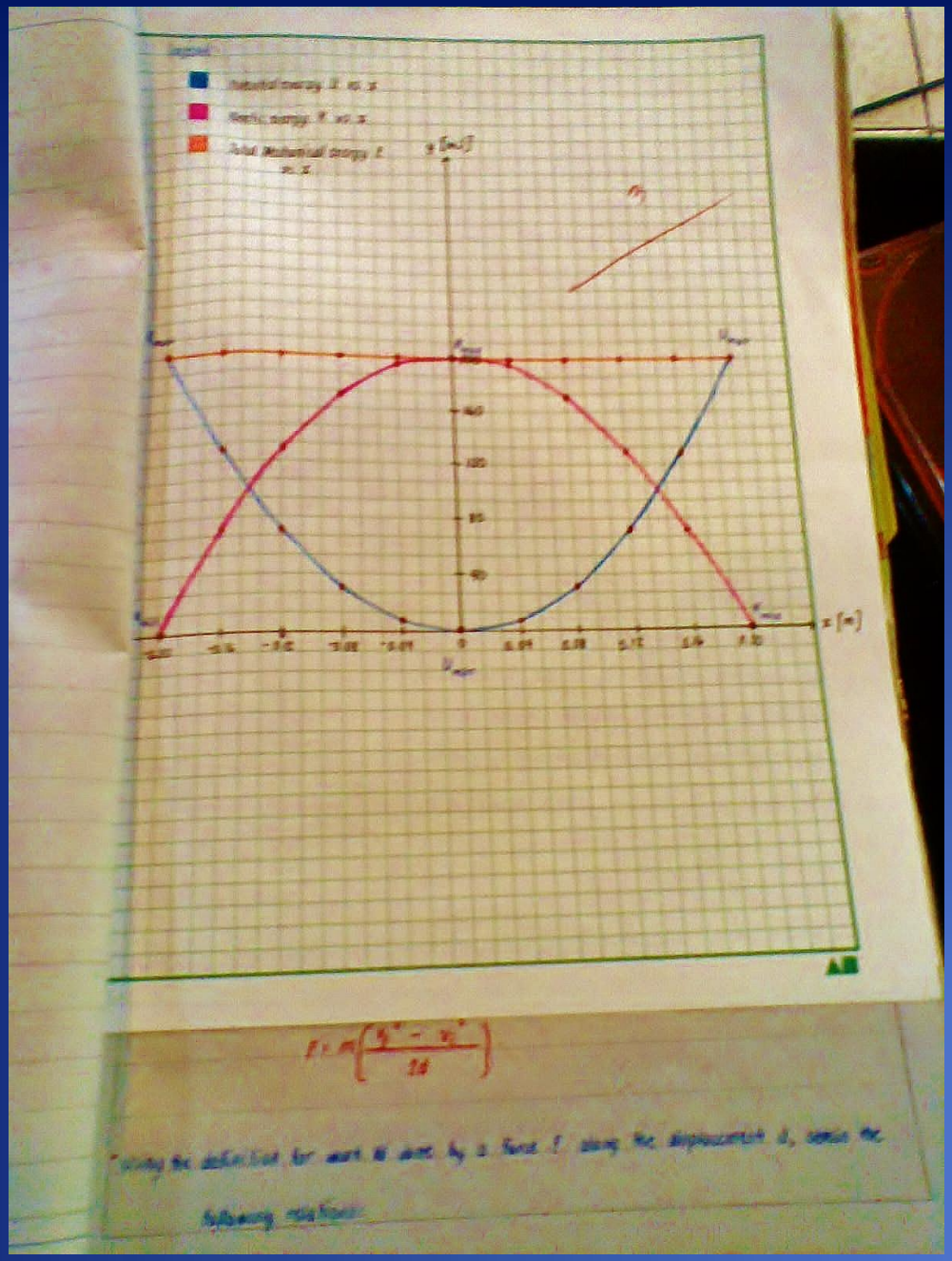


Notation:

θ_i : angle of incidence
(between the direction of the incident wave and the normal to the interface)

θ_r : angle of reflection
(between the direction of the reflected wave and the normal to the interface)

θ_t : angle of refraction
(between the direction of the transmitted wave and the normal to the interface)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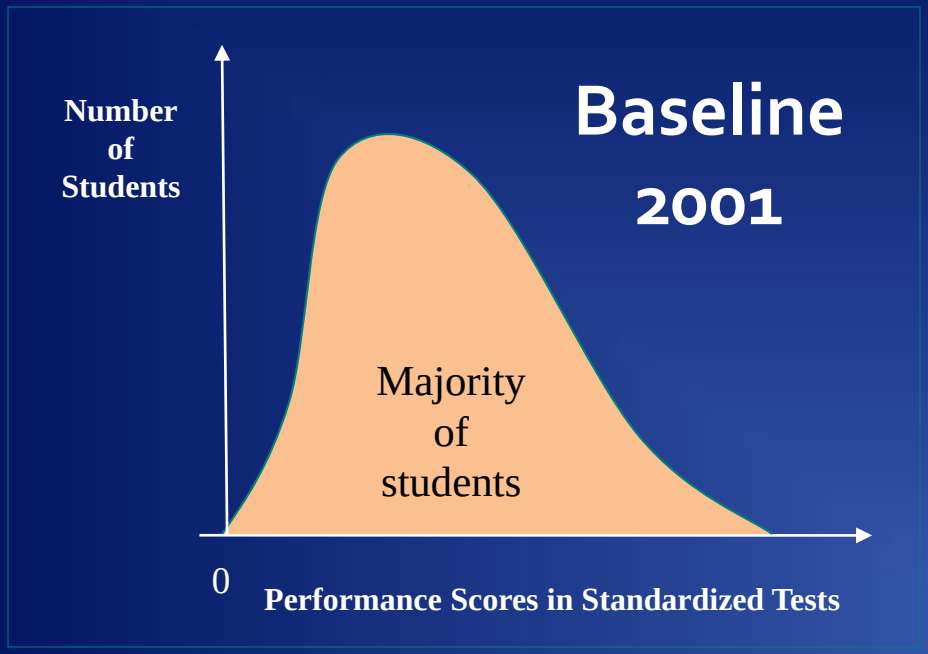
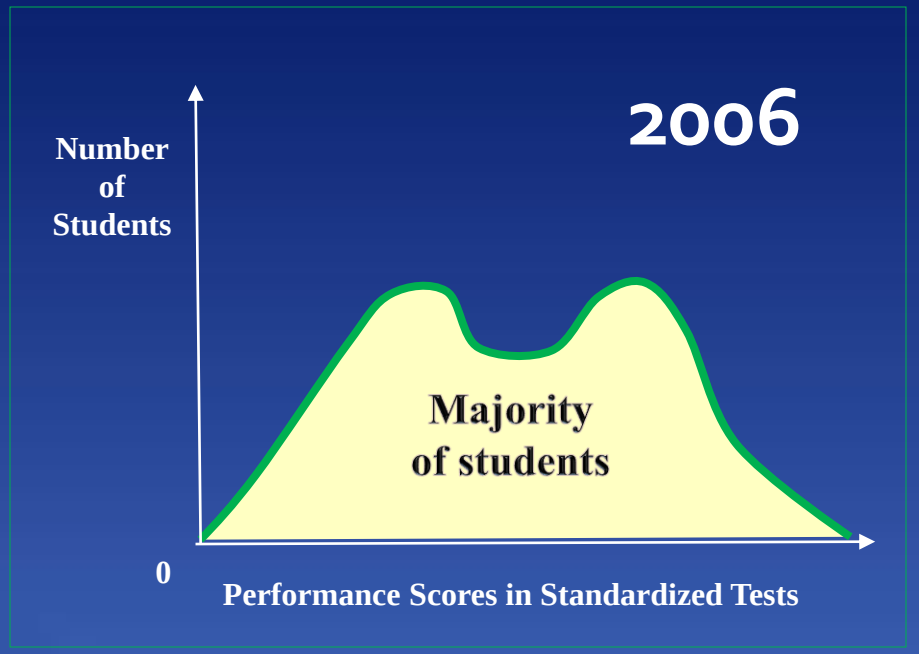
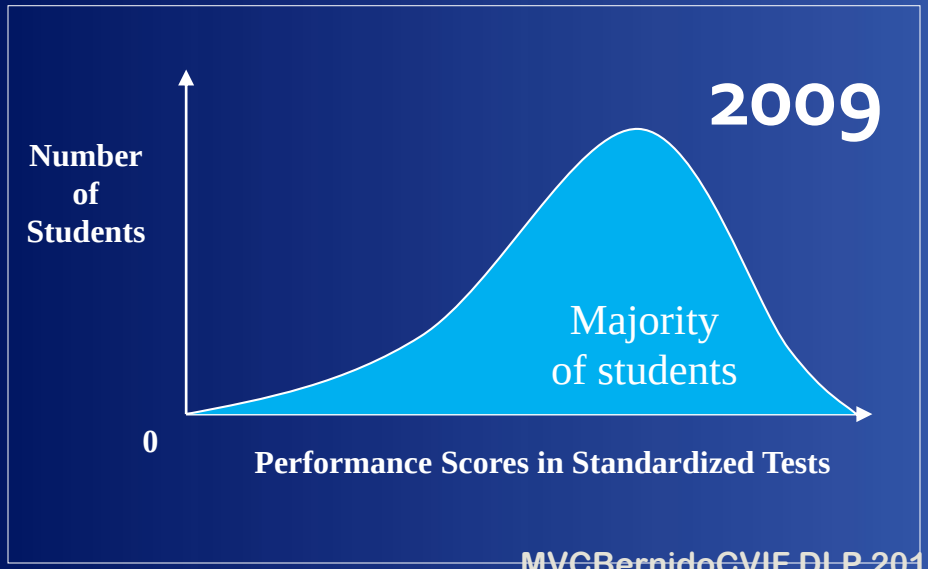
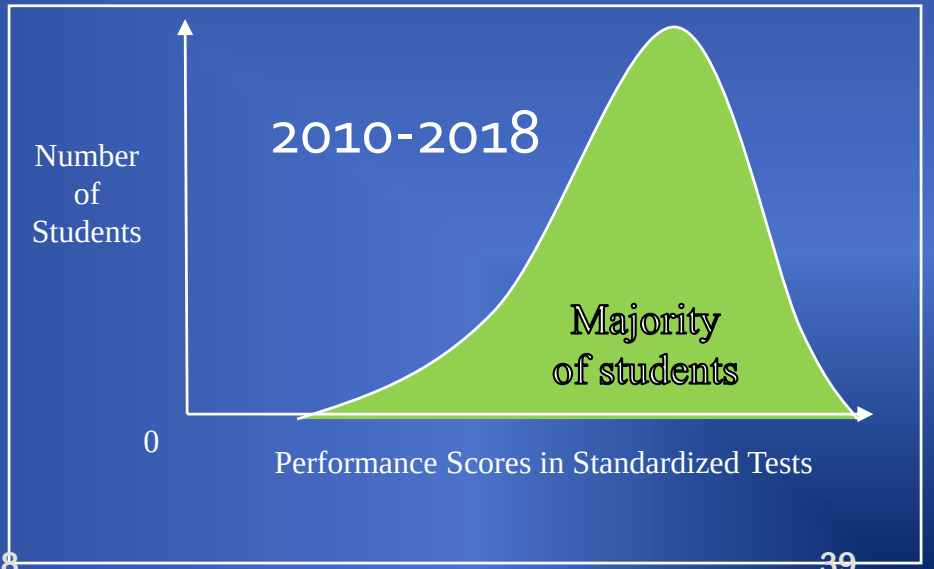
Sample Performance Indicators: NSAT/ NCAE/NAT









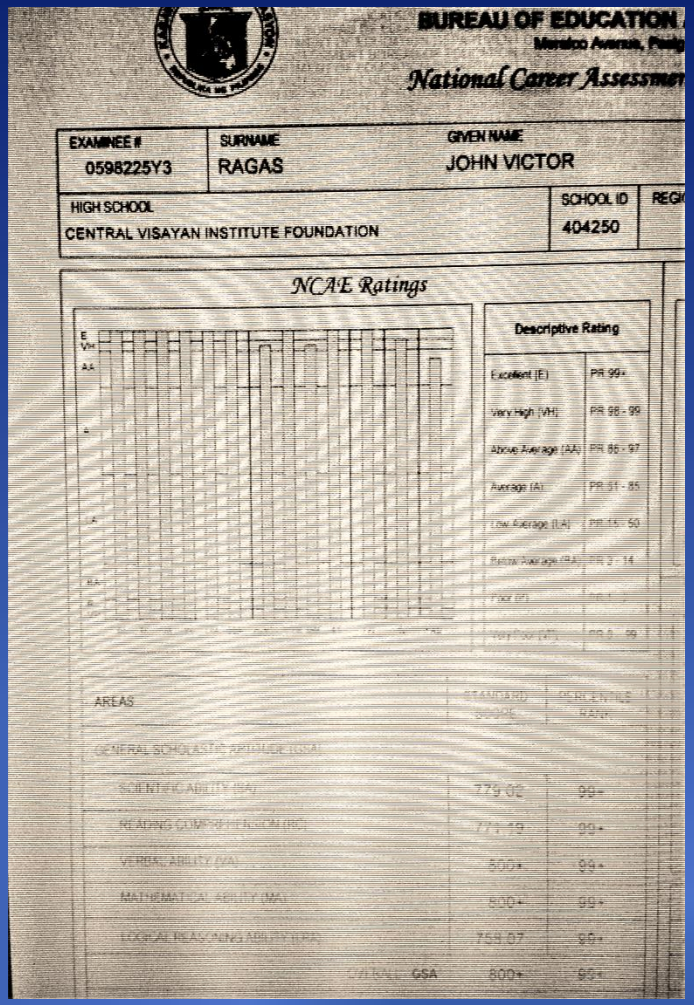
CVIF Grade 9 students, SY 2017 – 2018

99 - 99+ PR

- 32 students in MATH (14%)
- 49 students in SCIENTIFIC ABILITY (21%)
- 49 students in Overall GENERAL SCHOLASTIC APTITUDE (GSA) (21 %)

John Victor A. Ragas

	Standard Score	Percentile
Scientific Ability	779.02	99+
Reading Comprehension	771.09	99+
Verbal Ability	800+	99+
Math Ability	800+	99+
Logical Reasoning	758.07	99+
OVERALL GSA	800+	99+


BUREAU OF EDUCATION

National Career Assessment

EXAMINEE # 0598225Y3

SURNAME RAGAS

GIVEN NAME JOHN VICTOR

HIGH SCHOOL CENTRAL VISAYAN INSTITUTE FOUNDATION

SCHOOL ID 404250

NCAE Ratings

Descriptive Rating

Excellent (E) PR 99+

Very High (VH) PR 98 - 99

Above Average (AA) PR 86 - 97

Average (A) PR 51 - 85

Low Average (LA) PR 15 - 50

Below Average (BA) PR 3 - 14

AREAS

GSA 800+ 99+

NCAE 2016

25 CVIF students
(14.5 % of the batch)

qualified for admission to the University of the Philippines for AY 2018-2019

National Licensure Examination for Teachers (LET)

- 4th Place, September 2016 :

  Ma. Herna S. Macas (CVIF Batch 2012)

- 7th Place, March 2016 :

  Vincent D. Cuarteros (CVIF Batch 2010)

CVIF Alumna

Jesha Caseñas (CVIF 2005)
B.S. Anthropology
University of California
(UC), Berkeley

*Note: 22 Nobel Prizes have been awarded to **UC Berkeley** faculty.*

CVIF Alumnus

Ronald Lloren (*CVIF 2005)*: doing Ph.D. (Marine Sciences) at **ETH Zurich (Swiss Federal Institute)** .

ETH Zurich is number One in the world in Earth and Marine Sciences (2018 QS World Ranking of Universities by discipline).

Albert Einstein studied and taught at ETH.

21 Nobel Prizes so far for ETH Zurich.

CVIF Alumnus

Ronald Lloren (*CVIF 2005)* : Ph.D. (Marine Science) candidate at **ETH Zurich (Swiss Federal Institute)** .

- First year marks on written comprehensive exams: 5/6, 5/6, 6/6
- Accepted to the competitive (30/103) summer institute funded by the US National Science Foundation:

"Your application stood out as excellent because of its thoughtfulness, detail, and specificity..."

CVIF Alumna

Madelynn Nayga (CVIF 2009) – Ph.D. (Physics) joint program at **Max Planck Institute** (MPI) and University of Dresden, Germany. Max Planck Institute programs are highly competitive.

Ms. Nayga topped the 2017 Condensed Matter Physics post-masteral 10-month Diploma Class at the International Centre for Theoretical Physics, Trieste, Italy.

International Benchmarking

- SAT 2009 math scores of marker student (15 years old) within cut-off of good American universities *(Math 660)*

Stella Maris College
and the
DEPARTMENT OF EDUCATION
NATIONAL EDUCATION TESTING AND RESEARCH CENTER
S.Y. 2015-2016

National Career Assessment Exam

No. of students who are good in the following academic strands

a. STEM: 68 out of 187
(36% of the Students got 98-99+)

b. ABM: 72 out of 187
(39% of the Students got 98-99+)

c. HUMSS: 31 out of 187
(17% of the Students got 98-99+)

DAVAO SCHOOL NCAE GSA Test Scores

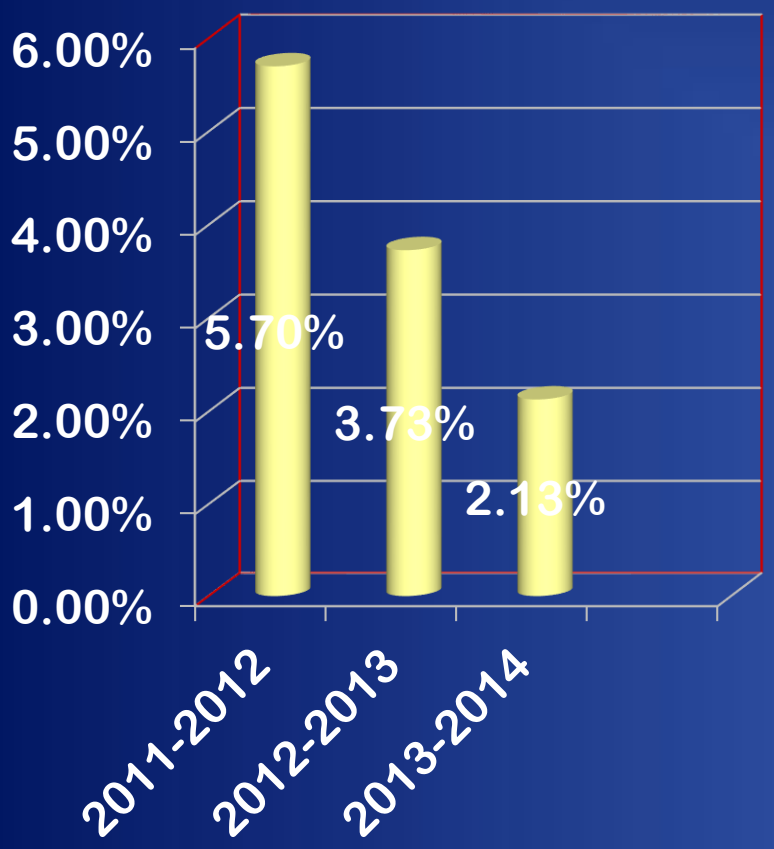
PR	2009-10	2010-11	2011-12	2012-13	2014-15	2015-16	2016-17
99+	5%	22%	19%	49%	39%	44%	46%
98-99	17%	34%	24%	15%	24%	27%	35%
86-97	59%	33%	42%	29%	27%	17%	16%
51-85	20%	10%	13%	4%	9%	7%	2%
Others			2%	3%	1%	5%	1%

Success Indicators of CVIF-DLP in Davao Christian High School

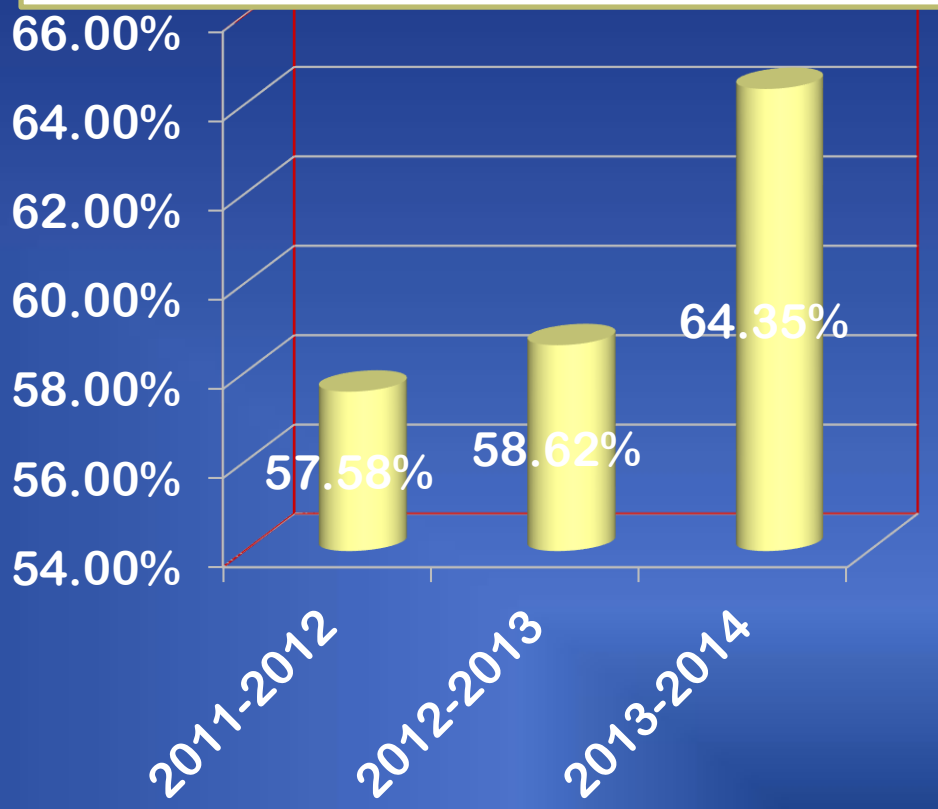
Impact of CVIF-DLP in Bohol, Philippines

Department of Education (Province of Bohol)
(162 Public High Schools)

Failure Rate



National Achievement Test Results



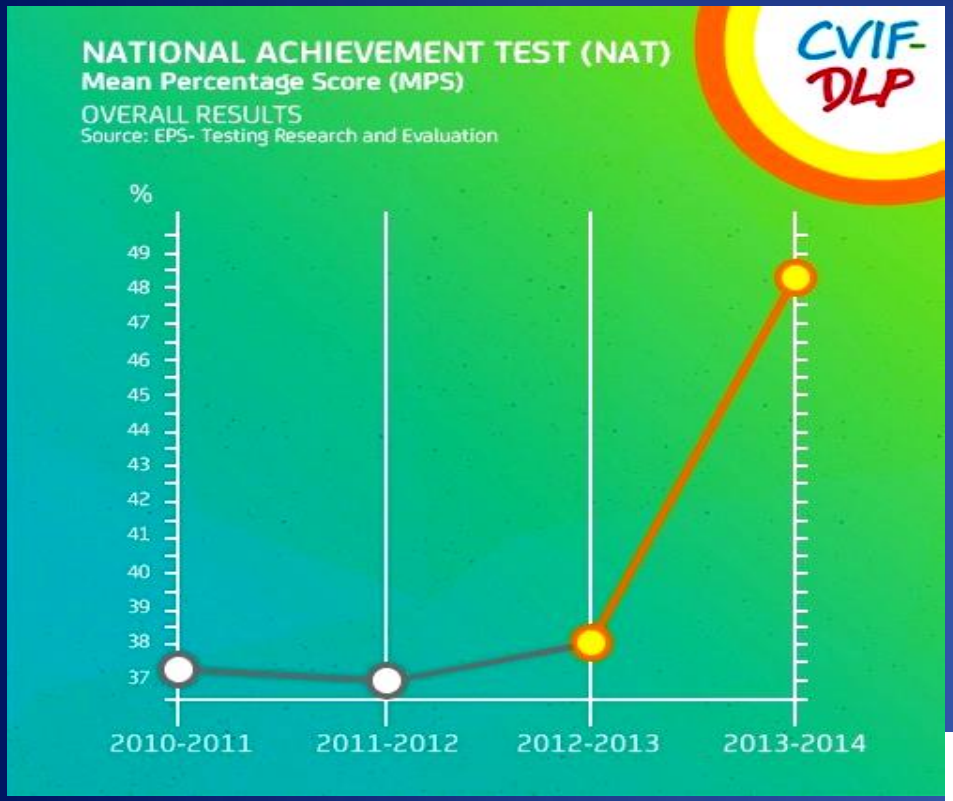
Marites M. Cimeni, PhD dissertation, Univ. of Bohol 2014: Assessment on the DLP in the Department of Education Division of Bohol

- **Remarkable improvement in academic performance in all five subject areas – English, Math, Science, Filipino and Araling Panlipunan – of the National Achievement Test (NAT) of 137 secondary schools**

Impact of CVIF-DLP in Basilan, Philippines

Department of Education (Basilan, Mindanao)

19 Secondary Schools



Partners:

Local Government

SMART

PLDT SMART FOUNDATION

The critical choice of a **good educational policy** allows large cohorts of students to reach globally competitive levels of achievement.