SEAMEO Congress

Southeast Asia in Transition:
Re-thinking Education, Science and Culture for Regional Integration

Science Technology Engineering and Mathematics (STEM) for Regional Growth and Integration

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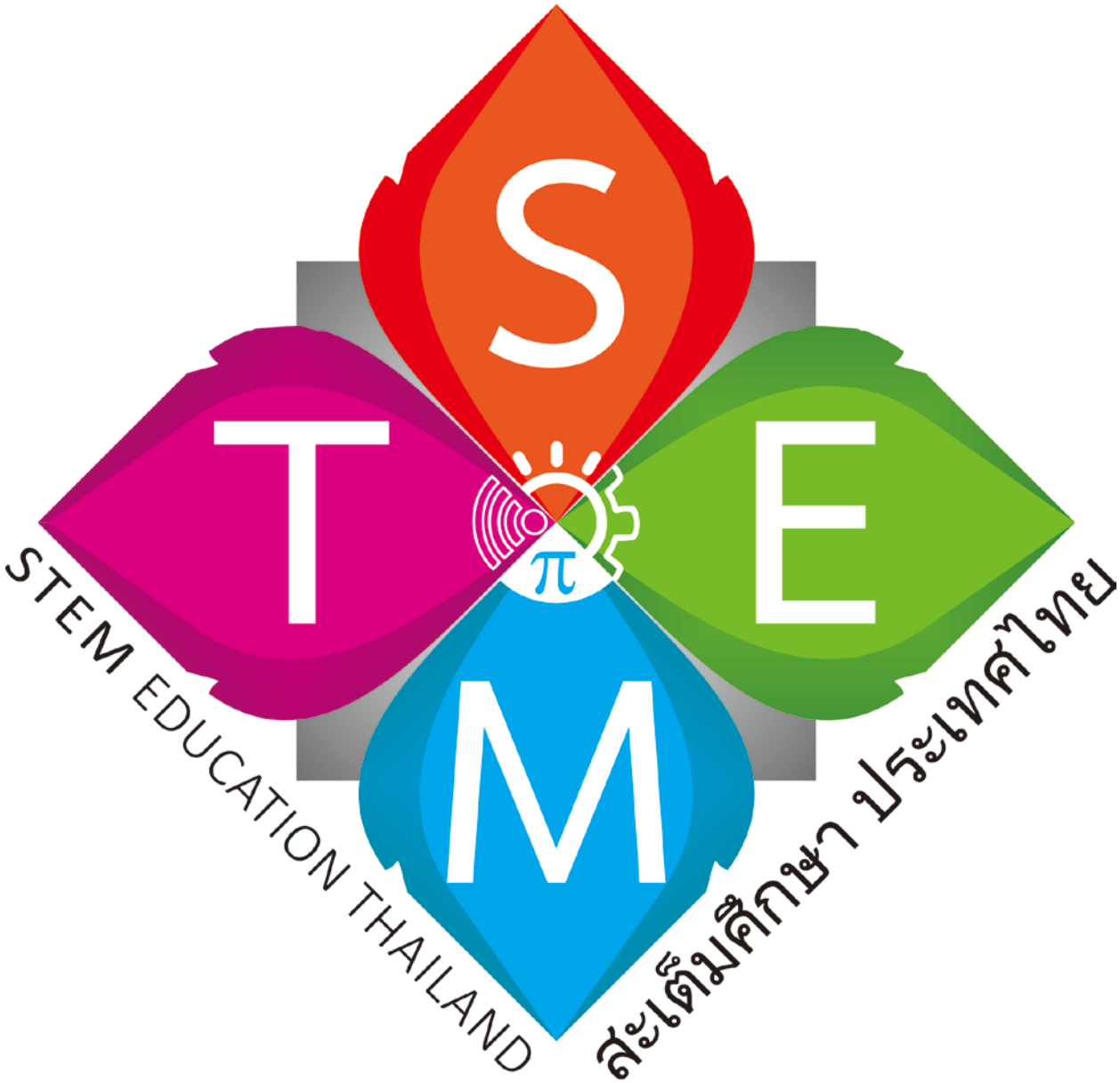
Chairman of the Governing Board, IPST

SEAMEO Congress, Bangkok, Thailand, 22/10/ 2014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STEM EDUCATION THAILAND
สะเต็มศึกษา ประเทศไทย

Outline

- **STEM education. What? Why? How?**
- **STEM Education Thailand: Experiences**
- **Roles of IPST**
- **STEM education and SEAMEO.**

“Communication initiates cooperation.”

What?

STEM Education

= New way to teach & to learn S&T:

Fun, inspiring; learn more, teach less;

& enrich innovative experiences

STEM graduates:

- **Better jobs & income**
- **Higher education**
- **Ready for the future**

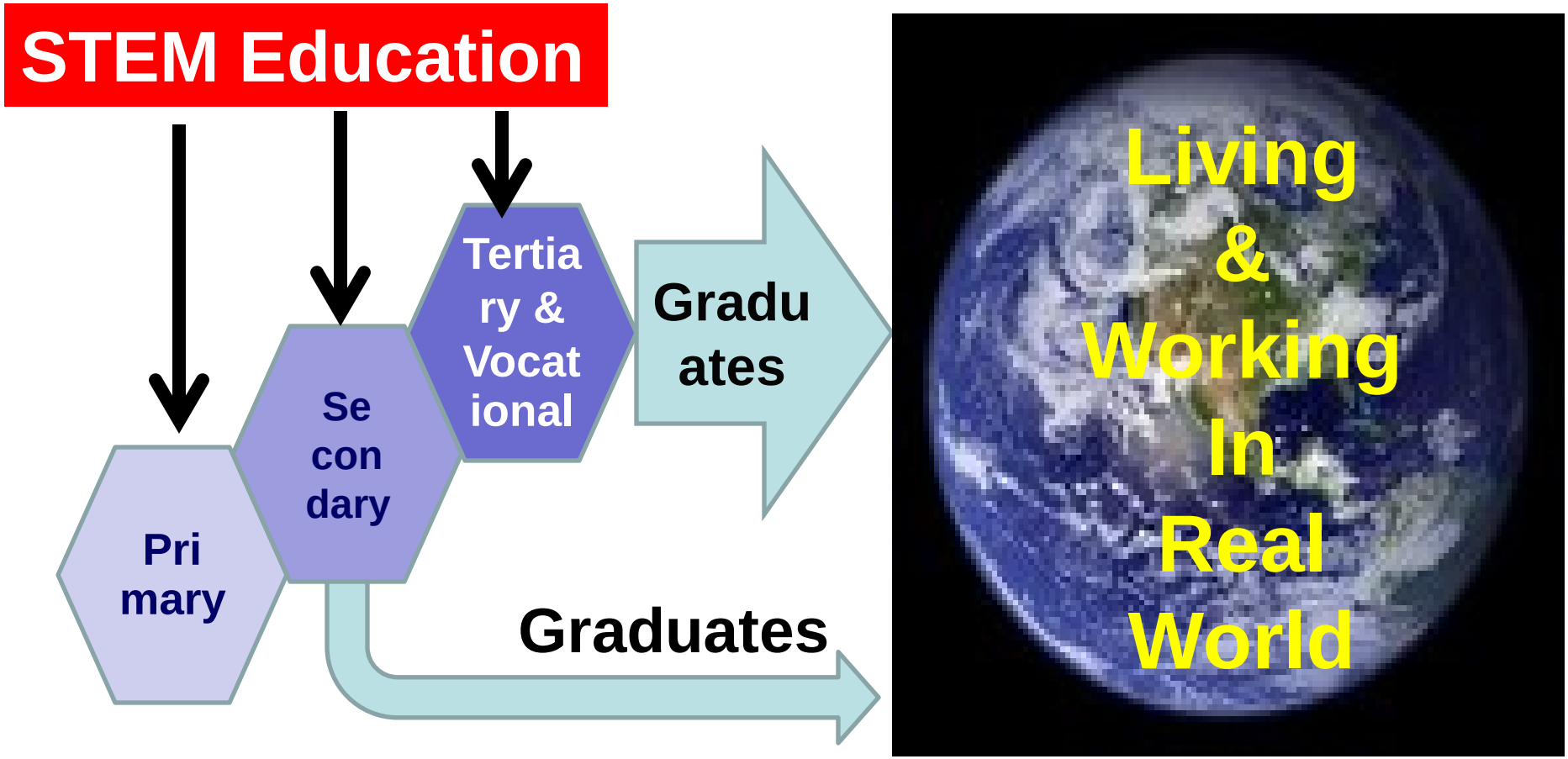
National benefits:

- **Education for Real World**
- **Quality STEM workforce**
- **Improved competitiveness**

Why?

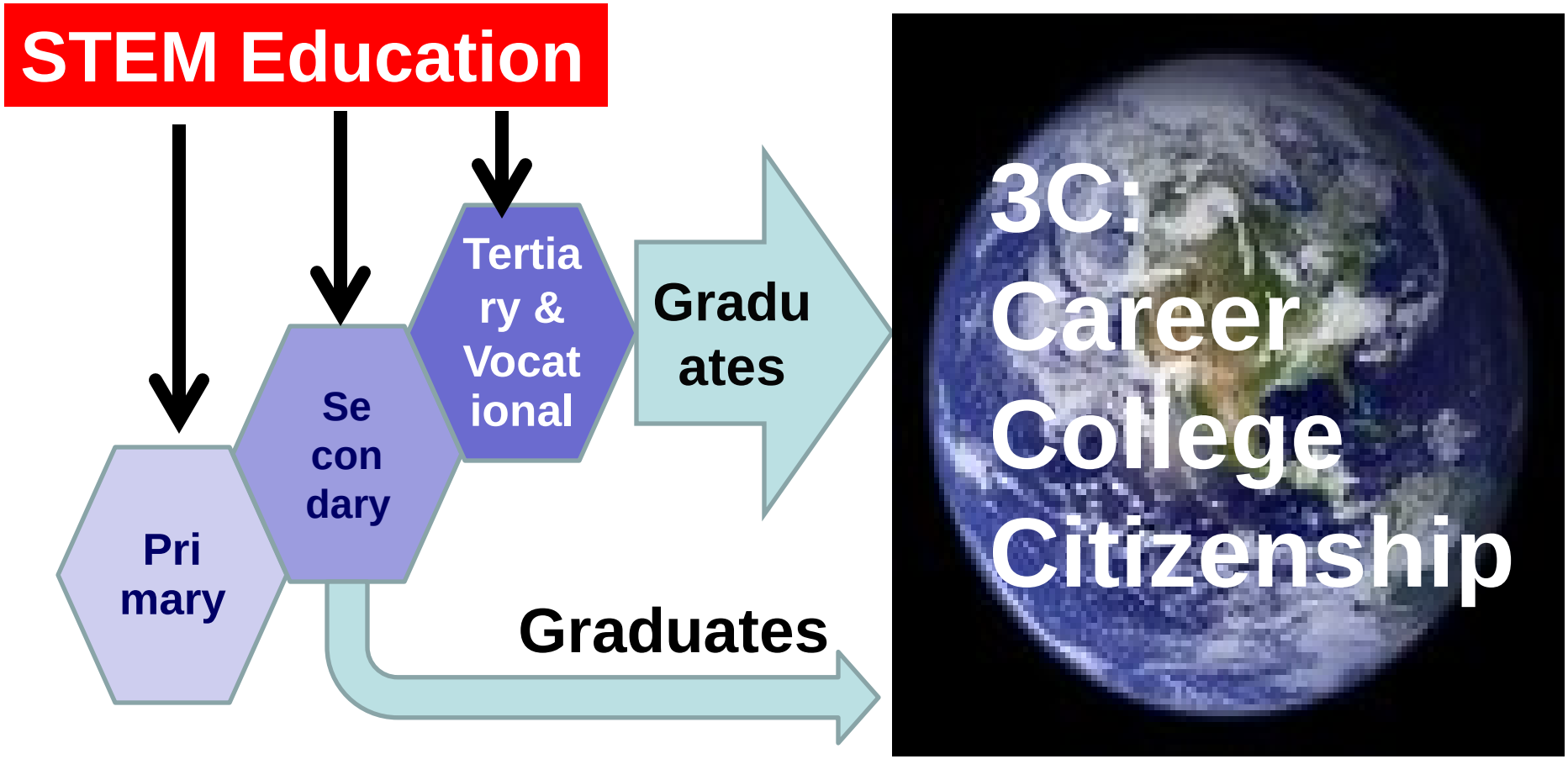
STEM Education

Links Education to Living & Working



Why? STEM Education

Links Education to Living & Working



Why Thailand needs STEM education now?

- **Overcoming middle-income trap & creating new competitiveness.**
- **AEC free flow of 6 STEM workforces in 2015**
- **Fewer students in science & technology.**
- **Low test scores in S&T: PISA, TIMSS, O-NET**

กำลังคนไทย (Thai workforce)

ที่มา: สวทน (Source: STI)

กำลังคนด้านสะเต็ม

STEM workforce =

3 millions

or 9% of total workfoce.

In 2011, total workforce = 39 millions

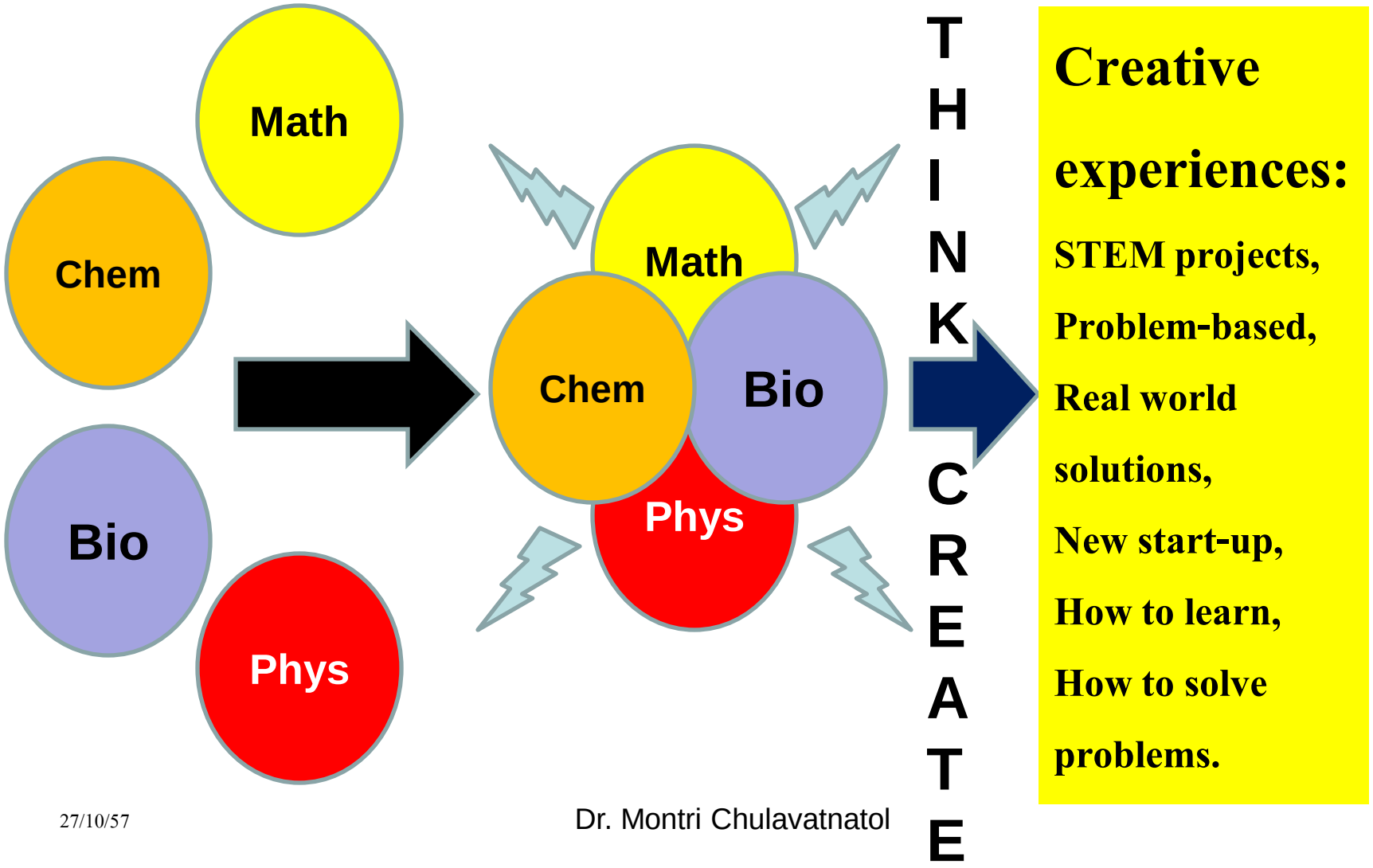
กำลังคนไทย (Thai workforce)

ที่มา: สวทน

Source: STI

How? STEM Education

Integrates Science and Mathematics for Innovation



Creative experiences:

STEM projects,

Problem-based,

Real world solutions,

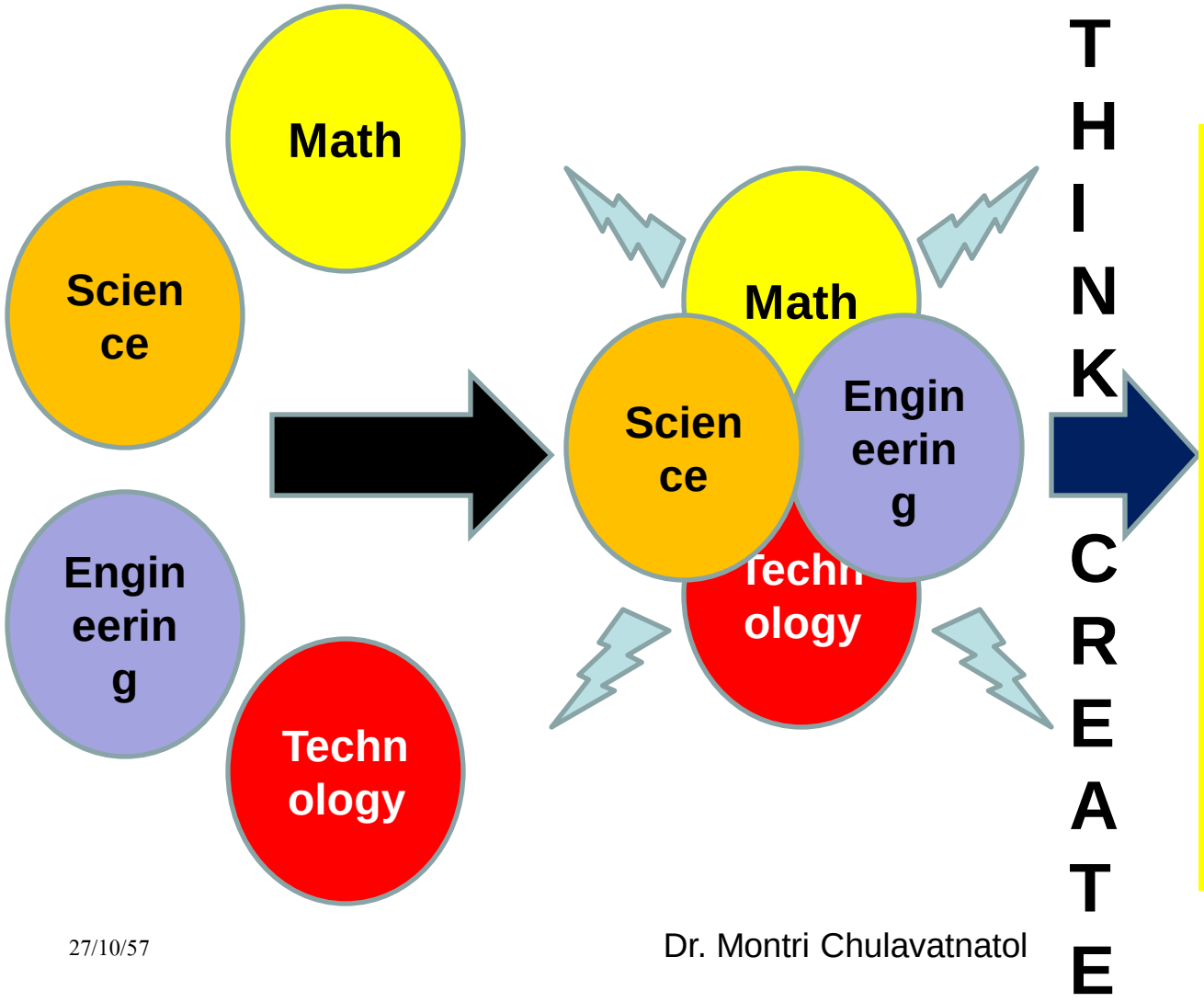
New start-up,

How to learn,

How to solve problems.

How? STEM Education

Integrates Science and Mathematics for Innovation



Innovation:

New products

New services

New careers

New entrepreneurs

New businesses

New societies

THAILAND

STEM Education

WEF GCR 2014

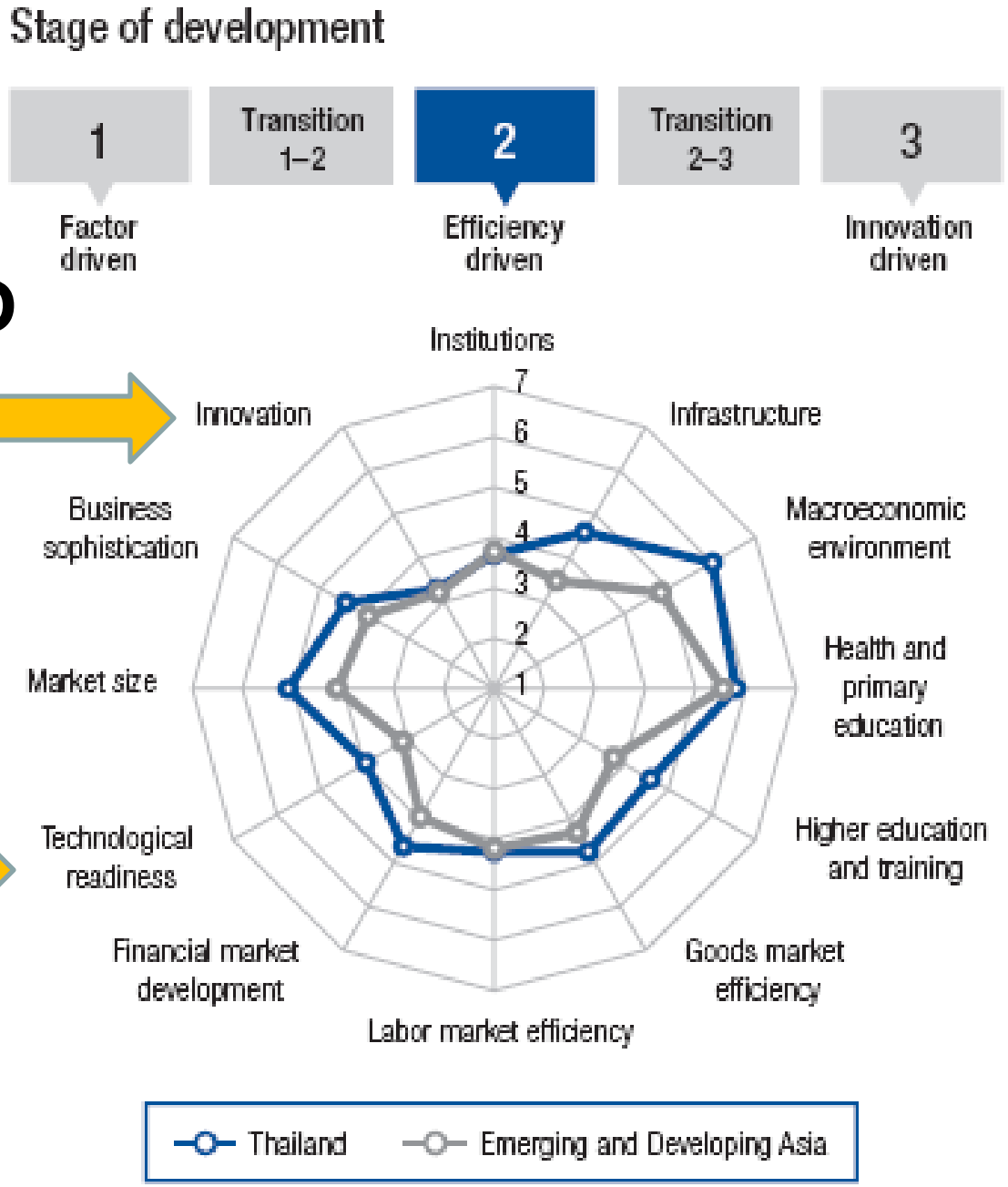
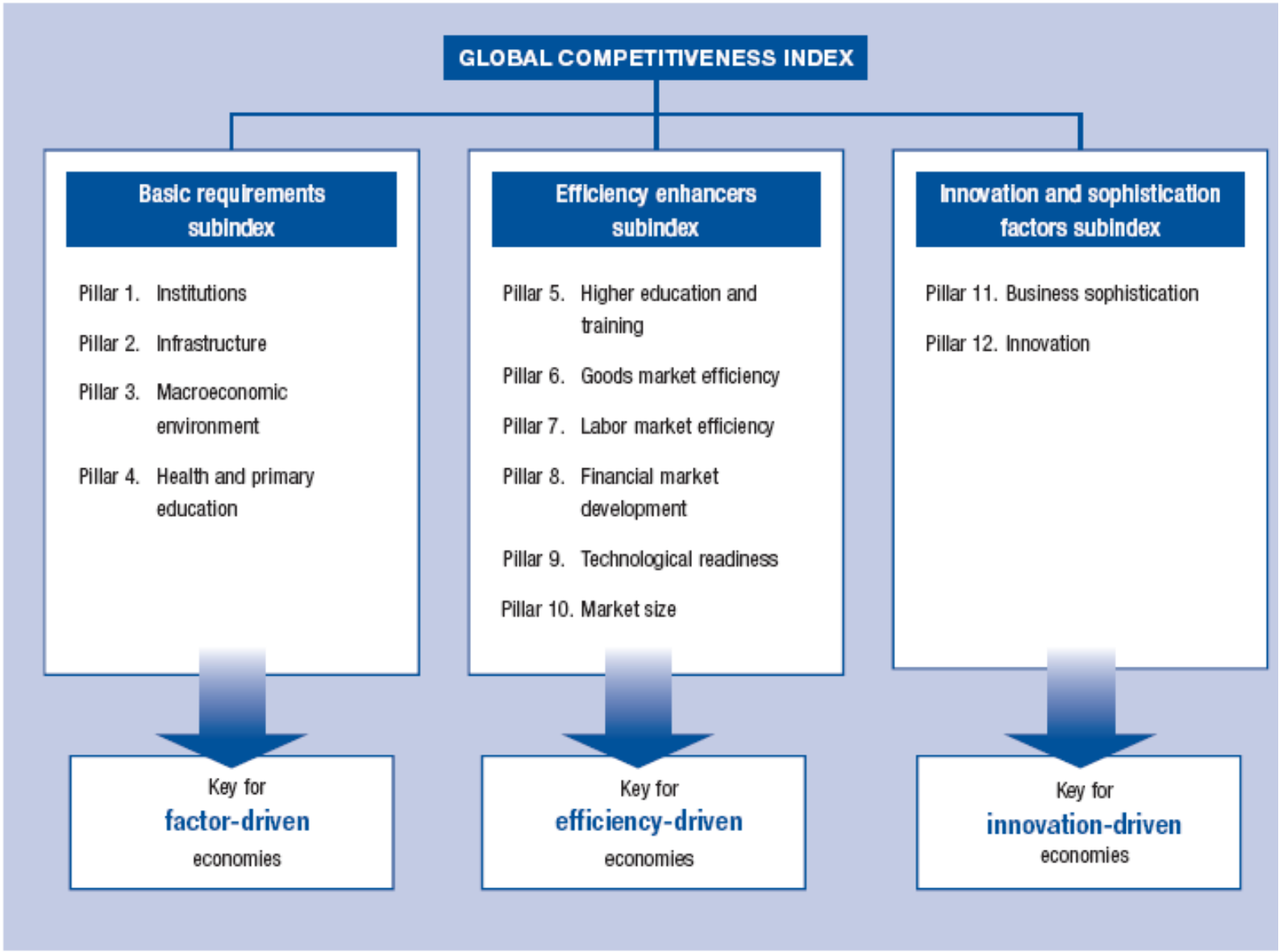


Figure 1: The Global Competitiveness Index framework



Note: See the appendix for the detailed structure of the GCI.

WEF GCR 2014

ASEAN Competitiveness in 2014

GLOBAL COMPETITIVENESS RANKING	STAGE OF DEVELOPMENT
2 Singapore	3
20 Malaysia	2-3
31 Thailand	2
34 Indonesia	2
52 Philippines	1-2
68 Vietnam	1
93 Lao PDR	1
95 Cambodia	1
134 Myanmar	1

WEF GCR 2014

ASEAN Education by WEF 2013

No	Quality Primary Ed	Primary Ed Enroll	Sec Ed Enroll	Tertiary Ed Enroll	Quality Ed System	Quality Math & Sci Ed	Quality School of mgmt	School Internet access
1	Singapore	Singapore	Brunei	Singapore	Singapore	Singapore	Singapore	Singapore
2	Brunei	Myanmar	Singapore	Thailand	Malaysia	Malaysia	Malaysia	Brunei
3	Malaysia	Vietnam	Philippines	Malaysia	Brunei	Brunei	Philippines	Malaysia
4	Indonesia	Cambodia	Indonesia	Philippines	Indonesia	Indonesia	Brunei	Vietnam
5	Philippines	Lao PDR	Thailand	Indonesia	Philippines	Thailand	Thailand	Indonesia
6	Lao PDR	Brunei	Vietnam	Vietnam	Lao PDR	Vietnam	Indonesia	Thailand
7	Thailand	Malaysia	Malaysia	Brunei	Cambodia	Lao PDR	Lao PDR	Philippines
8	Vietnam	Indonesia	Myanmar	Lao PDR	Thailand	Philippines	Cambodia	Lao PDR
9	Cambodia	Thailand	Lao PDR	Myanmar	Vietnam	Cambodia	Vietnam	Cambodia
10	Myanmar	Philippines	Cambodia	Cambodia	Myanmar	Myanmar	Myanmar	Myanmar

ASEAN Education: data from WEF 2014

4.09 Quality of primary education	4.10 Primary education enrollment rate	5.01 Secondary education enrollment rate	5.02 Tertiary education enrollment rate
3 Singapore	1 Singapore	16 Singapore	10 Singapore
17 Malaysia	24 Cambodia	79 Thailand	54 Thailand12
48 Indonesia	29 Vietnam	89 Philippines9	72 Malaysia11
60 Philippines	56 Lao PDR	92 Indonesia	77 Indonesia
84 Lao PDR	58 Thailand7	98 Vietnam5	82 Philippines9
90 Thailand	60 Malaysia	108 Malaysia11	88 Vietnam
91 Vietnam	85 Indonesia	122 Myanmar10	99 Lao PDR
113 Cambodia	105 Philippines7	124 Lao PDR	101 Cambodia11
137 Myanmar	111 Myanmar	125 Cambodia8	103 Myanmar11

ASEAN Education: data from WEF 2014

5.03 Quality of the education system	5.04 Quality of math and science education	5.05 Quality of management schools	5.06 Internet access in schools
4 Singapore	1 Singapore	6 Singapore	6 Singapore
10 Malaysia	16 Malaysia	25 Malaysia	34 Malaysia
29 Philippines	36 Indonesia	40 Philippines	47 Vietnam
32 Indonesia	70 Philippines	49 Indonesia	48 Indonesia
60 Lao PDR	81 Thailand	79 Lao PDR	61 Thailand
87 Thailand	82 Vietnam	81 Thailand	66 Philippines
94 Vietnam	83 Lao PDR	119 Vietnam	88 Lao PDR
101 Cambodia	111 Cambodia	123 Cambodia	100 Cambodia
129 Myanmar	129 Myanmar	139 Myanmar	137 Myanmar

ASEAN STI: data from WEF 2014

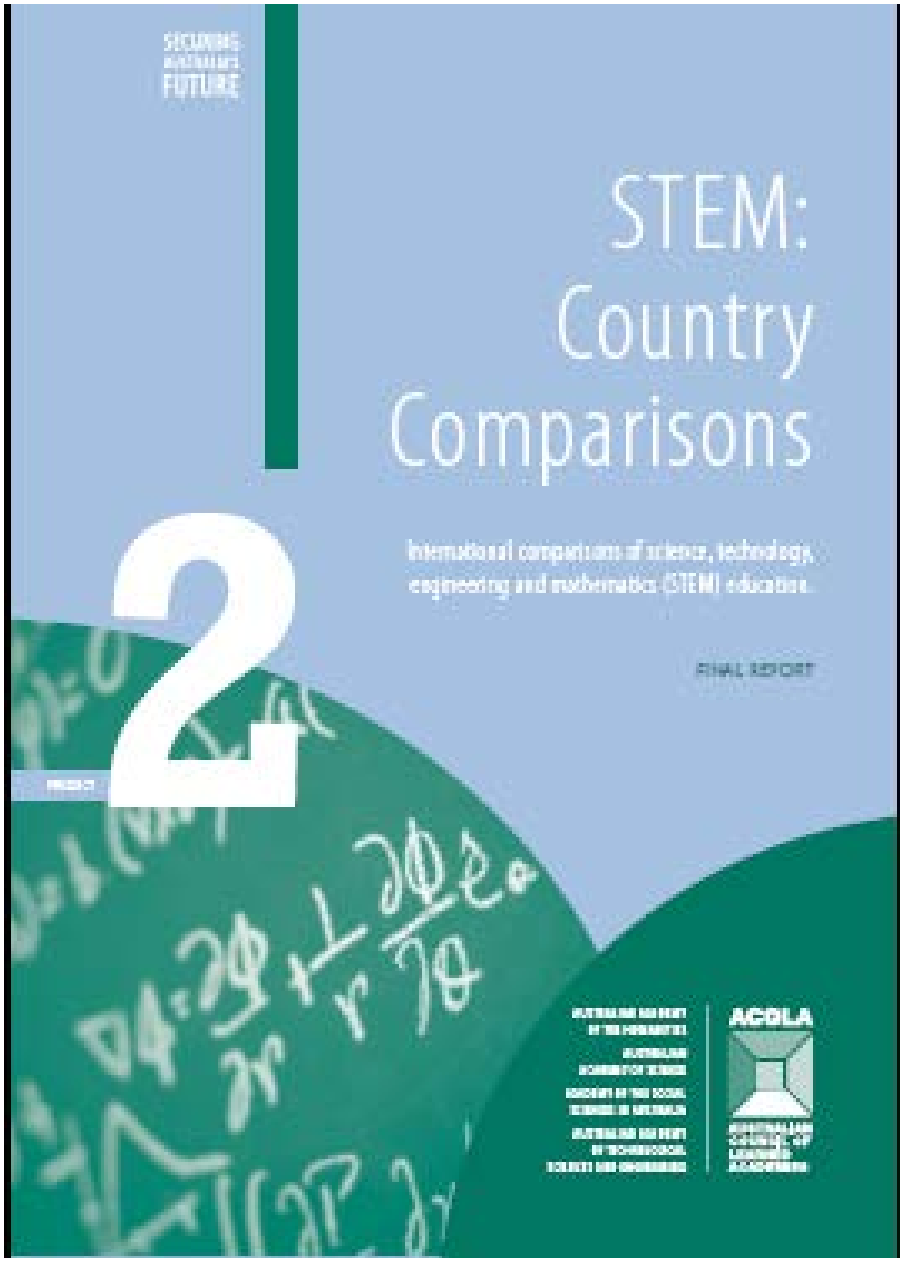
1.02 Intellectual property protection	5.07 Local availability of specialized research and training services	9.01 Availability of latest technologies	9.02 Firm-level technology absorption
2 Singapore	12 Singapore	15 Singapore	16 Singapore
25 Malaysia	13 Malaysia	33 Malaysia	24 Malaysia
43 Indonesia	49 Philippines	53 Indonesia	41 Philippines
66 Philippines	50 Indonesia	58 Philippines	42 Indonesia
76 Lao PDR	69 Thailand	74 Thailand	55 Thailand
104 Thailand	83 Lao PDR	87 Cambodia	96 Lao PDR
105 Vietnam	104 Cambodia	114 Lao PDR	97 Cambodia
120 Cambodia	118 Vietnam	123 Vietnam	121 Vietnam
123 Myanmar	135 Myanmar	144 Myanmar	144 Myanmar

ASEAN STI: data from WEF 2014

9.03 FDI and technology transfer	12.01 Capacity for innovation	12.02 Quality of scientific research institutions	12.03 Company spending on R&D
2 Singapore	13 Malaysia	11 Singapore	9 Malaysia
8 Malaysia	18 Singapore	20 Malaysia	10 Singapore
15 Thailand	22 Indonesia	41 Indonesia	24 Indonesia
31 Philippines	30 Philippines	61 Thailand	42 Philippines
40 Indonesia	70 Thailand	75 Philippines	51 Lao PDR
72 Lao PDR	71 Lao PDR	86 Lao PDR	56 Thailand
93 Vietnam	95 Vietnam	96 Vietnam	63 Vietnam
132 Myanmar	101 Cambodia	118 Cambodia	79 Cambodia
	137 Myanmar	136 Myanmar	140 Myanmar

ASEAN STI: data from WEF 2014

12.04 University-industry collaboration in R&D	12.05 Government procurement of advanced technology products	12.06 Availability of scientists and engineers	12.07 PCT patent applications
5 Singapore	3 Malaysia	9 Malaysia	13 Singapore
12 Malaysia	4 Singapore	16 Singapore	32 Malaysia
30 Indonesia	13 Indonesia	31 Indonesia	67 Thailand
46 Thailand	34 Vietnam	54 Thailand	86 Philippines
55 Philippines	51 Lao PDR	71 Philippines	93 Vietnam
76 Lao PDR	51 Lao PDR	87 Vietnam	106 Indonesia
92 Vietnam	104 Cambodia	123 Cambodia	115 Lao PDR
115 Cambodia	114 Thailand	127 Lao PDR	124 Cambodia
138 Myanmar	139 Myanmar	131 Myanmar	124 Myanmar



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(26 countries)
China, Taiwan, Japan, Singapore Korea, USA, Canada, Belgium, Denmark, Germany, Netherlands, Norway, Sweden, Switzerland, Finland, France, UK, New Zealand, Russia, Brazil, Portugal, Argentina, Israel, South Africa, Australia.

IPST proposes:

Thailand needs STEM workforce development by World-Class Quality "STEM Education"

"ASEAN needs STEM workforce too!"

<u>AEC 2015: Free movement of professionals: 6 out of 8 are STEM workforce:</u> engineers, surveyors, architects, medical doctors, dentists and nurses.

STEM Education for All; All for STEM Education

Education providers: Universities; Vocational Colleges; Schools; Life Long Learning Centers

Governmental: Education; Sci & Tech; Energy; Transport; Defence; ICT; Industry; Trade; Agriculture; Health; Labor

Private sector: Corporations; Markets; SME; Banks; Logistics

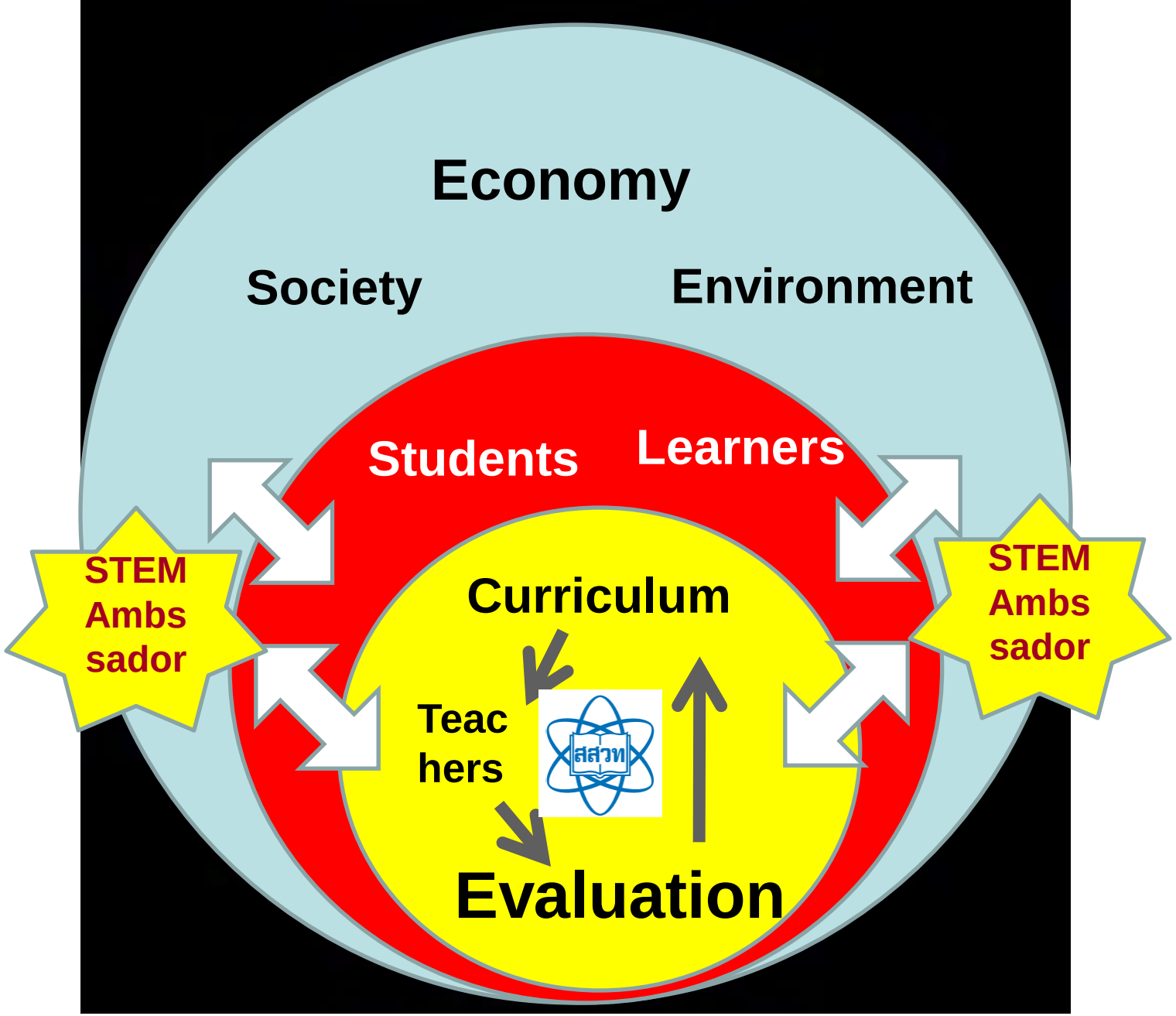
NGO: Associations; Societies; Foundations; Religions

Non-Formal Education & STEM Education

- **Museums: courses and teacher training**
- **Factories, power plants, waste treatment plants**
- **Police & military stations & camps**
- **Planetariums, TV stations,**
- **Airports, train stations, shipyards & piers**
- **Agricultural farms, healthcare centers, nursing homes, etc.**

IPST:
STEM Education needs 4 reforms

- **New Policy: Public-Private Partnership (PPP)**
- **New Curricula: integration and problem-solving**
- **New Teachers: training and teaching practices**
- **New Evaluation: learning outcomes**


Economy
Society
Environment
Students
Learners
STEM Ambs sador
Curriculum
Teac hers
Evaluation
STEM Ambs sador

Roles:

1. Visit schools: 5 days/year,
2. Meet with students, teachers, principles,
3. Advise S&T careers.

Qualifications & conditions:

1. 5-year experience in S&T careers,
2. At least, high school diploma (in S&T) or equivalent,
3. Ability to communicate with students, teachers & principles,
4. Recommended by supervisor & given leaves with full pay,
5. Report on visits & recommendations.
6. 3-year appointment, renewable.

IPST 1972- Today

6 Objectives: Promoting teaching & learning Science, Mathematics & Technology

1. **Curriculum R&D**
2. **Teacher training & development**
3. **Textbooks & media**
4. **Quality assurance & evaluation**
5. **Young talent promotion**
6. **Advice & consultation**

STEM Education in Thailand by IPST

Year One (2013) Pilot

1. Marketing
2. Networking
3. Curricular reform
4. Teacher & teaching reforms
5. Pilot projects

Year Two (2014) Expansion

1. Evaluation & Adjustments
2. Master plan
3. National policy on STEM education
4. Legislation
5. Expansion

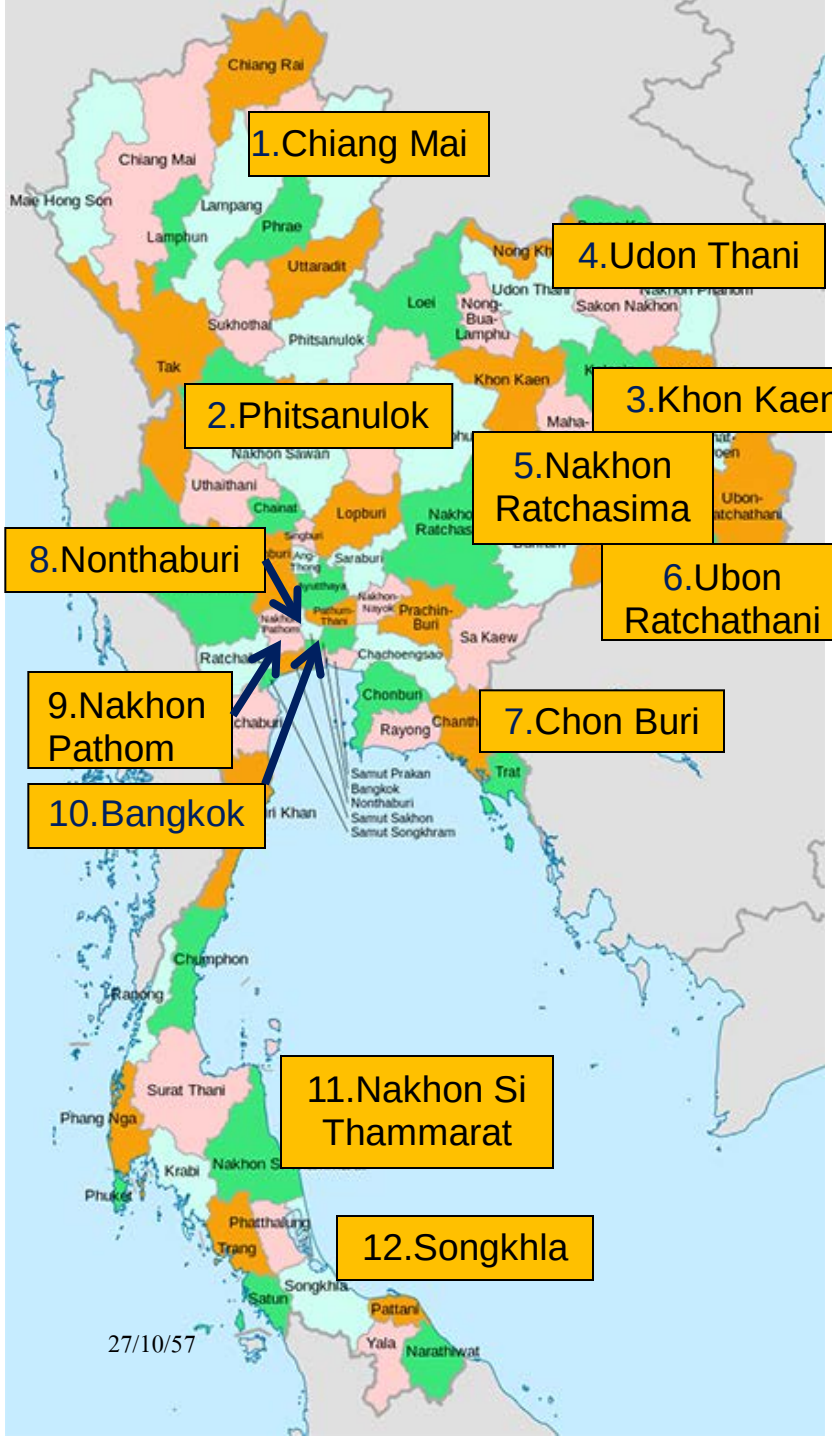
IPST Pilot Project: STEM Education 2013

12 Provinces:

Bangkok, Chiang Mai, Pitsanulok, Khon Kaen, Nakorn Rajsima, Ubolrajthani, Udonthani,Nonthaburi, Nakorn Pratom, Nakorn Srithamaraj, Songkla, and Cholburi

6 Schools in each province: Total = 72 schools

Levels: Strong, medium, weak.



STEM Centers (10 Sep 2013)

	Sector	Province
	(STEM)	STEM Center
1	Upper North	Chiang Mai
2	Lower North	Phitsanulok
3	Upper Northeast1	Khon Kaen
4	Upper Northeast2	Udon Thani
5	Lower Northeast1	Nakhon Ratchasima
6	Lower Northeast2	Ubon Ratchathani
7	Eastern	Chon Buri
8	Upper Central	Nonthaburi
9	Lower Central	Nakhon Pathom
10	Central	Bangkok
11	Upper South	Nakhon Si Thammarat
12	Lower South	Songkhla

IPST Pilot Project: STEM Education on Energy 2013-2015

Ministry of Energy – IPST : Target: 7,100 schools

- **2013: Curriculum development; preparation of digital instruction materials.**
- **2014: Teacher training and development; implementation & evaluation.**
- **2015: Review, study visits, revision & expansion**

IPST STEM Pilot Project: Science & Beauty 2013

More Areas for STEM Education 2013-2015

- Environment, Energy
- Health & Beauty
- Food, nutrition
- Agriculture – Agro-industry
- Materials, packaging

- Construction
- Communication & media
- Transportation & logistics

THE GLOBE PROGRAM

4 Strategies for STEM Education Thailand:

1. All to participate (PPP)

2. Curriculum integration

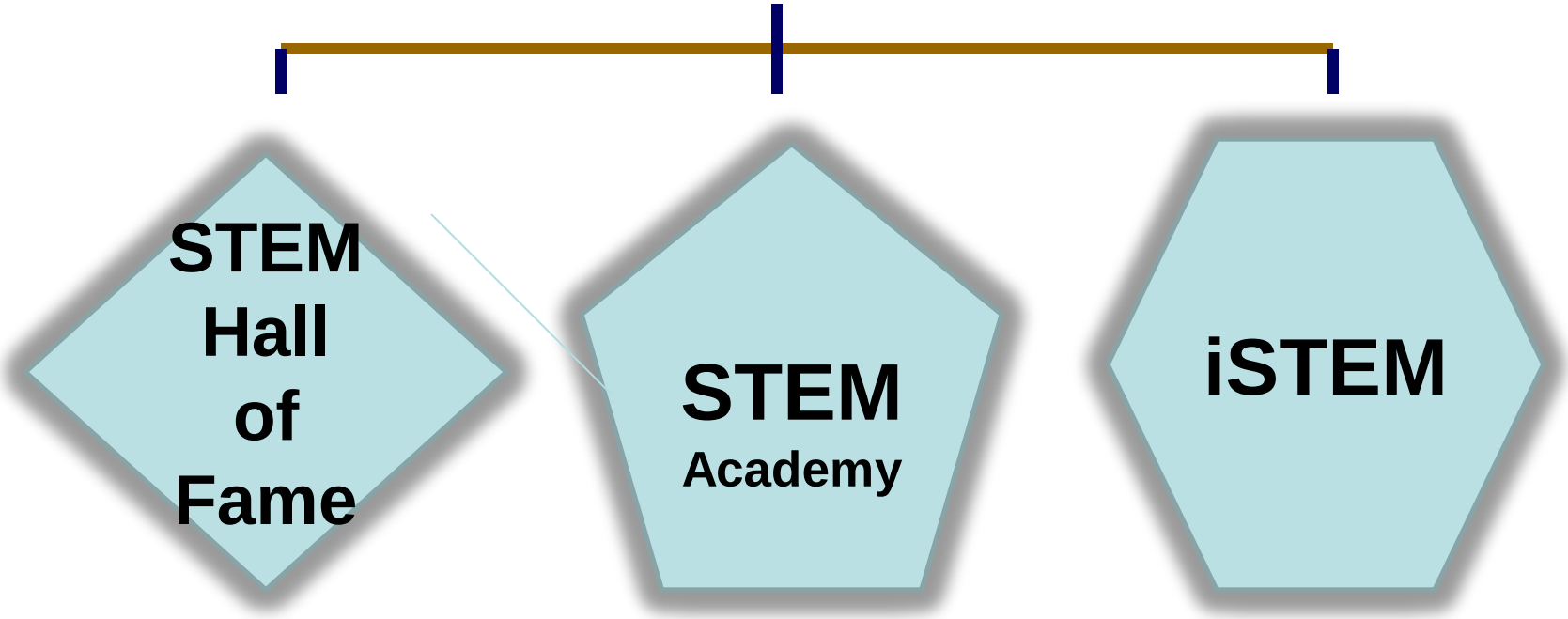
3. Active teachers & principles

4. Evaluate knowledge & skills

“Re-Brand”

STEM Education:
“Paradigm Shift& Game Changer”

IPST Global



ASEAN++ STEM Roundtable Meeting
ISMTEC2013
19th January 2013
BITEC Bangna, Bangkok THAILAND

"ASEAN adopts STEM education to strengthen innovation & competitiveness"

IPST promotes STEM education in ASEAN

STEM Education for STEM workforce in ASEAN and Beyond

Global Conference in partnership with the Education Council
Educating the next generation of workforce: ASEAN perspectives on innovation, integration and English.
24-25 June, 2013, Bangkok, Thailand.
Panel discussion: Science, Mathematics and Technology – the key factors for HR development for ASEAN

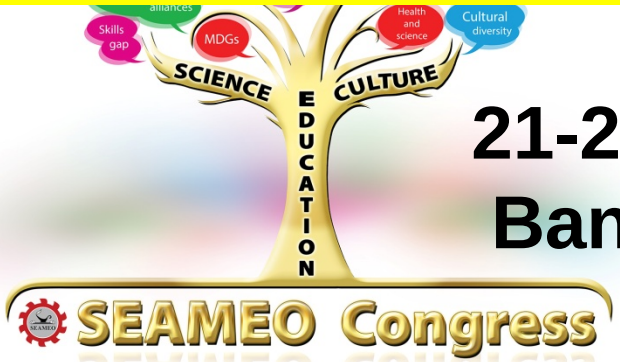
Saturday 19th January 2013

Roundtable Meeting to Promote Collaboration on Science, Technology, Engineering, and Mathematics (STEM) Education Throughout the ASEAN++ Region
Bangkok International Technology Exhibition Centre (BITEC)

Regional Instructional Leadership Workshop for ASEAN School Principals in STEM Education
10-15 September 2013 at Sampran Riverside, Nakhon Pathom

IPST promotes STEM Education in 2014

"Communication initiates cooperation"



21-22 October 2014
Bangkok, Thailand