Working Paper on SEAMEO Basic Education Standards (SEA-BES)-Common Core Regional Learning Standards (CCRLS) in Science:

Executive Summary

Background and Purpose

The goal of regional integration in the development of an 'ASEAN Community' provides the opportunity for the development of an educational policy framework for all SEAMEO Member countries in order to enhance access to educational opportunities, to support the development of quality basic education and to encourage regional mobility. Such a framework will support all Governments as the main providers of basic education to meet the learning needs of all students.

Indeed the SEAMEO Education Agenda #7 "Adopting a 21st Century Curriculum" states to pursue a radical reform through systematic analysis of knowledge, skills, and values needed to effectively respond to changing global contexts, particularly to the ever-increasing complexity of the Southeast Asian economic, socio-cultural, and political environment, developing teacher imbued with ASEAN ideals in building ASEAN community within 20 years (2015-2035).

As an initiative effort we establish SEA-BES project. In envisage to face the challenges of the future, 21st century skills and competencies (OECD, 1997) are emphasized in the proposed curriculum. 21st century skills encompass learning skills, literacy skills and life skills. Other than knowledge and well-cultivated values, a competent learner should be able to use tools such as language and technology to convey ideas and thoughts, can act autonomously based on rational decisions and ability to interact well with others in the community.

A well-designed and balanced curriculum will support the aim of producing children who will are brave to face complex demands in their daily lives. The learner will grow and develop with knowledge and skills that enable them to find jobs, being responsible, self-reliant and contributing to society.

Purposes

The SEAMEO Basic Education Standards (SEA-BES) initiative would support SEAMEO Member Countries in the following respects:

a) to use it as an analytical tool to support future development of regional integrated curriculum necessary for ASEAN integration with emphasis on 21st century skills;
b) to strengthen ASEAN collaboration on curriculum standards and learning assessment across different educational systems to effectively respond to the changing global context and complexity of ASEAN ;
c) to promote in every member country the establishment of best practices to overcome differences in curriculum;
d) to produce systematic discussion process for the establishment of the regional integrated curriculum and assessment;
e) to use as a platform for curriculum development and professional development for all stakeholders developing teachers imbued with ASEAN ideals in building ASEAN community;
f) to serve as a platform for the Southeast Asia Primary Learning Metrics (SEA-PLM).

Definition of SEAMEO Basic Education Standards

SEAMEO defines basic education standards as the *competency in teaching and learning of science and mathematics that are achieved through engagement in education in order to function successfully in society taking into account cultural differences and the importance of ASEAN values.*

Nature and Characteristics

SEA-BES is a regional curriculum project the purpose of which is to develop standards. It envisions to developing standards in learning and teaching of science and mathematics. Initially, SEA-BES will develop learning standards in Science and Mathematics based on a curriculum review of SEAMEO Member Countries' National curriculum. The SEA-BES aims to improve curriculum quality, efficiency and equity in SEAMEO Member Countries.

The diagram in Figure 1 below shows the conceptual framework.

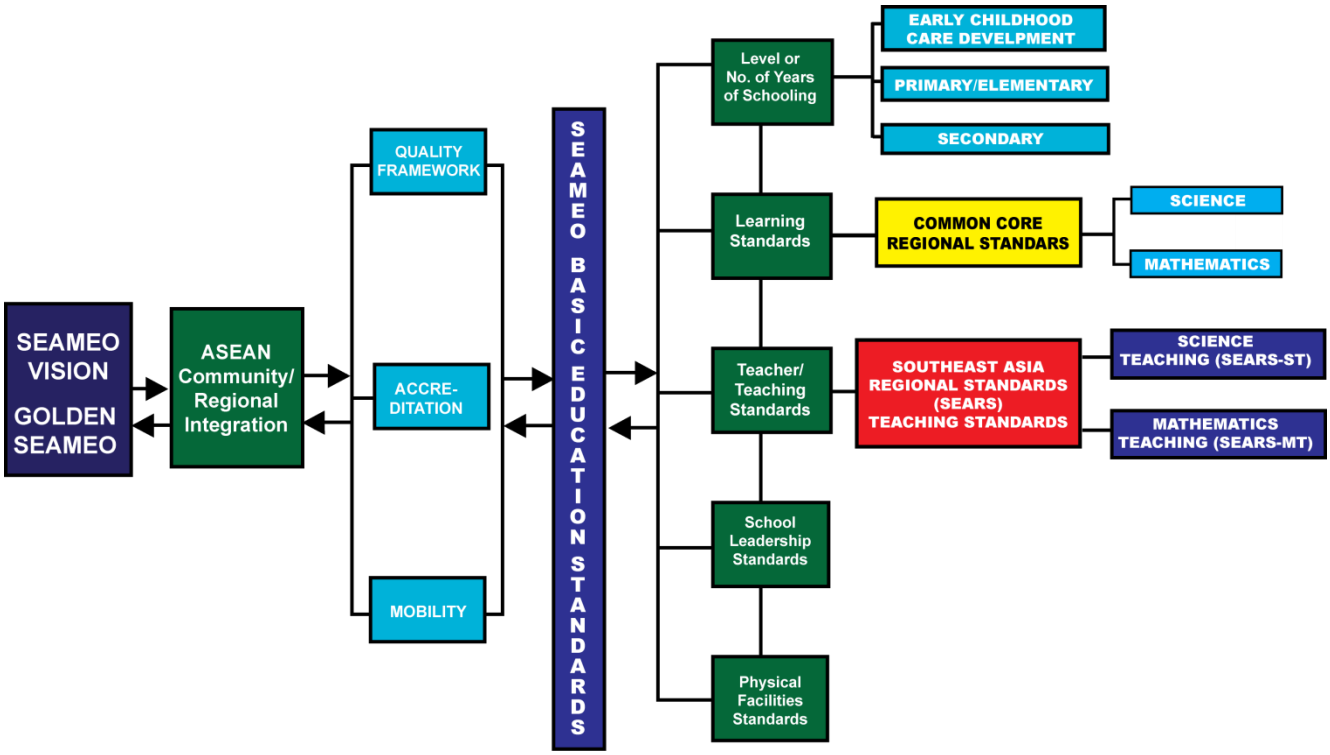

Figure 1. SEA-BES conceptual framework

Definition of Terms

Common- means the shared and agreed standards that can be related to national curriculum context of SEAMEO Member Countries.

Core – means those aspects of curriculum (i.e. knowledge, skills, and attitudes) to which all students will have access and expected to learn.

Learning Standards – are written descriptions of what students are expected to know and be able to do at a specific stage of their education. Learning standards describe educational objectives – i.e., what students should have learned by end of a grade or grade span – but they do not describe any particular teaching practice, curriculum or assessment method.

Regional Standards – are those standards that have been adopted by SEAMEO Member Countries to be applied to national curriculum.

Key Stages - means the blocks of years covering the period of basic education, namely; Key Stage 1 covers Grades 1, 2 and 3; Key Stage 2 covers Grades 4, 5 and 6; and Key Stage 3 covers Grades 7, 8 and 9.

Development Process of the Common Core Regional Learning Standards

The CCRLS in Science were developed based from the strengths of the existing national education standards of the SEAMEO Member Countries. The various activities undertaken in the development of the draft (Working Paper) CCRLS in Science and Mathematics include:

- Comparing of the national education curriculum of the seven SEAMEO Member Countries in Science and Mathematics, namely Brunei Darussalam, Cambodia, Indonesia, Malaysia, Philippines, Singapore and Thailand;
  - identifying similarities and differences in terms of content/domain/topics/strand by country;
  - mapping/tracking of content/domain/topics/strands across grade levels from the primary to secondary level; and
  - Consolidating of content standards and performance standards by subject and by grade levels from primary to secondary levels.
- Benchmarking with the learning standards of high-performing countries in international student assessments such as Hong Kong, Japan, Australia, United Kingdom and US; relative documents such as 2015 TIMSS Framework and NCTM as well as research studies and literature available on what students need to know and be able to do to be successful in college, career, and life

Figure 2 shows the process flow of the development of the common core regional learning standards in science and mathematics.

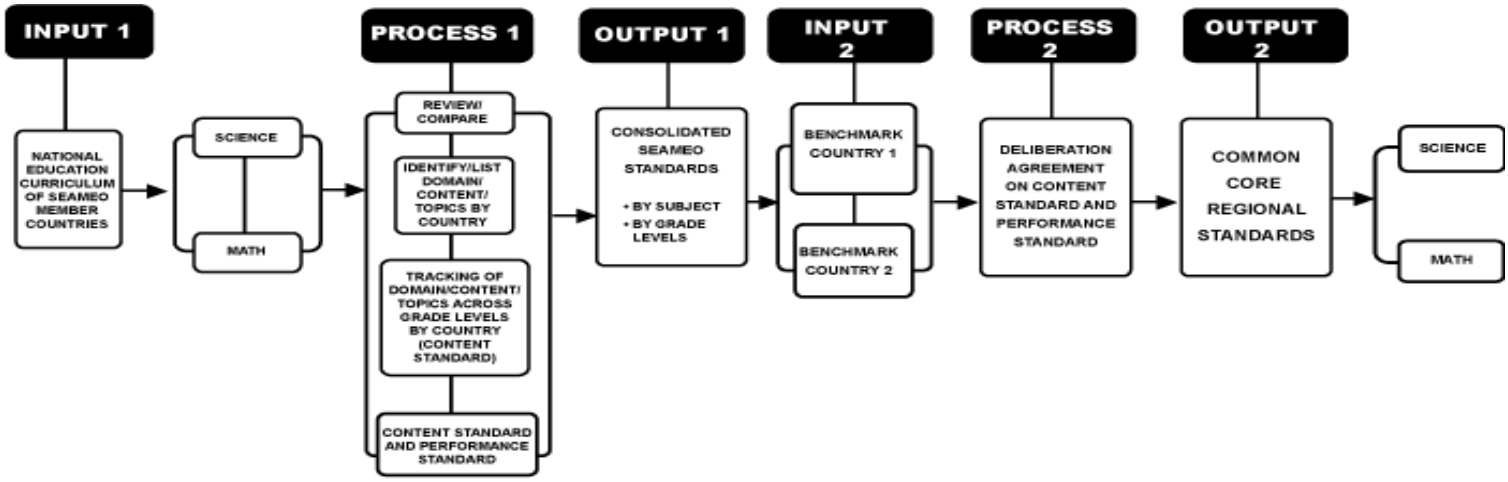

Figure 2. Framework in developing the CCRLS in Science and Mathematics for SEA-BES (Mangao, D., Tahir, S., and Zakaria, M.J., 2015)

Series of SEA-BES Workshops

A series of workshops which aims to develop the draft of the Common Core Regional Learning Standards (CCRLS) in Science and Mathematics were conducted on the different levels, dates and venues as follows:

A. **National Level (RECSAM in Penang, Malaysia)**

- 2 April 2015 (25 participants)
- 11 May 2015 (23 participants)
- 21-22 May 2015 (23 participants)
- 23 July 2015 (22 participants)
- 27 August 2015 (28 participants)
- 17 September 2015 (25 participants)
- 27-28 January 2016 (30 participants)
- 24-25 March 2016 (35 participants)

B. **Regional Level**

- 4-5 November 2014 (SEAMEO RECSAM, Malaysia)
- 20-22 October 2015 (61 participants at SEAMEO RECSAM, Malaysia)
- 15-18 February 2016 (14 participants at University of Tsukuba, Tokyo, Japan – for Mathematics Standards only participated in by MOE Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore and IPST Thailand and RECSAM specialists
- 5-12, 13-20 and 19-25 June 2016 (three RECSAM Mathematics Specialists at University of Tsukuba, Tokyo, Japan)
- 13-20 June 2016 (two RECSAM Science Specialists at Toho University, Shizuoka University, and Chiba University as well as National institute for Educational Policy Research (NIER, MEXT), Tokyo, Japan

Participation and Involvement of Experts and Educators

Maximum participation and involvement of experts and teachers across the Southeast Asian region and beyond were solicited in the development of the draft CCRLS. Their tasks include being a member of curriculum working group giving inputs and providing specific, constructive feedback on the draft Standards. The following groups were involved:

- Consultants (Dr. Mark Windale, Centre for Science Education, Sheffield Hallam University, United Kingdom; Professor Masami Isoda, Center of Research on International Cooperation in Educational Development, University of Tsukuba, Japan; and Professor Kerry J. Kennedy, Hong Kong Institute of Education, Hong Kong)
- curriculum experts in science and mathematics from the 11 Ministries of Education of SEAMEO Member Countries
- SEAMEO Secretariat
- science and mathematics specialists from SEAMEO centers (i.e., RECSAM, QITEP in Science, QITEP in Mathematics, SEAMOLEC)
- science and mathematics lecturers from Malaysian educational institutions (i.e., Universiti Sains Malaysia, Teacher Education Institutes (IPGs)
- science and mathematics specialists from the National Science and Mathematics Centers (i.e., Institute for the Promotion of Teaching Science and Technology (IPST), University of the Philippines –National Institute for Science and Mathematics Education Development (UPNISMED)
- elementary and secondary science and mathematics master/experienced teachers from Penang State

.

Aim of SEA-BES CCRLS in Science and Mathematics

SEA-BES is a regional project designed to produce learning standards that can support the SEAMEO Member Countries to provide world-class curriculum for all students. SEA-BES will develop two learning standards namely; Common Core Regional Learning Standards (CCRLS) in Science and Common Core Regional Learning Standards (CCRLS) in Mathematics.

Basically, the aim of the SEA-BES CCRLS in Science and CCRLS in Mathematics states

> **"**To provide world-class learning standards in Science and Mathematics, including 21st century skills that can be used as benchmarks in SEAMEO Member Countries to ensure all students have access to fundamental knowledge, skills and values in order to be socially responsible, globally competitive and sustainable."

Aim of Science Education

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Through building up a body of key foundational knowledge and concepts, methods, processes and uses of science, students should be encouraged to recognize the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave and analyse the causes.

School science education provides learning experiences through which students acquire scientific and technological literacy as well as environmental literacy. Students develop the necessary scientific knowledge and understanding, process skills and values and attitudes for their personal development, for participating actively in a dynamically changing society, and for contributing towards a scientific and technological world.

The purposes of scientific investigation and discovery are to satisfy mankind's quest for knowledge and understanding and to preserve and enhance the quality of human experience. Therefore, as a result of science education, students will be able to achieve the following aims:

- Develop and use an experimental design in scientific inquiry;
- Use the language of science and be equipped with the 21st century skills to communicate ideas in science and technology-related contexts;
- Acquire basic scientific knowledge and conceptual understanding for living in and contributing to a scientific and technological world;
- Develop understanding of the nature, processes and methods of science through different types of science enquiries;
- Investigate phenomena using technology;
- Recognize the usefulness and limitations of science to society and the interconnections of science with technology, engineering and mathematics;

- Develop an understanding of the interrelationship of science with technology, engineering, and mathematics;
- Make informed decisions regarding contemporary issues, taking into account public policy and legislation, economic costs and benefits, validation from scientific data and use of scientific reasoning and logic, respect for living things, personal responsibility, and history of scientific discovery;
- Develop scientific dispositions and habits of mind including curiosity, demand for verification, respect for logic and rational thinking, consideration of premises and consequences, respect for historical contributions, attention to accuracy and precision, and patience and persistence; and
- Be prepared for further studies or enter careers in scientific and technological fields.

SEA-BES COMMON CORE REGIONAL LEARNING STANDARDS in SCIENCE FRAMEWORK

The development of an understanding of science is important for students in today's world if they are to become citizens who can make informed decisions about themselves and the world in which they live. Students are faced with a myriad of information, and sifting fact from fiction and understanding the scientific basis of important social, economic, and environmental issues is possible only if they have the tools to accomplish this. Students' understanding of science should build throughout their schooling so that when they become adults they are able to act from a sound basis decisions when faced with diverse issues such as treatment of diseases, climate change, and the applications of technology. Across the world, there is an increased demand for those qualified to pursue the careers in science, technology, and engineering that dive the innovation and invention necessary for economic growth and improving the quality of life. To meet this demand, the SEA-BES Common Core Regional Learning Standards in Science Framework is developed under the analysis of national curriculum in SEAMEO Member Countries.

The Standards emphasize a balanced approach towards the acquisition of scientific knowledge, attitudes and skills through carefully organized activities. It covers the major aspects of science, as well as the social and technological implications of science. The inquiry approach is emphasized. Such investigations would enhance the acquisition of knowledge and skills as well as contribute towards other educational goals such as cultivation of citizenship, development of appropriate social and personal values and appreciation and respect for life. In achieving these ends, it is necessary to relate science education to technological applications, social issues and the daily life experiences of students.

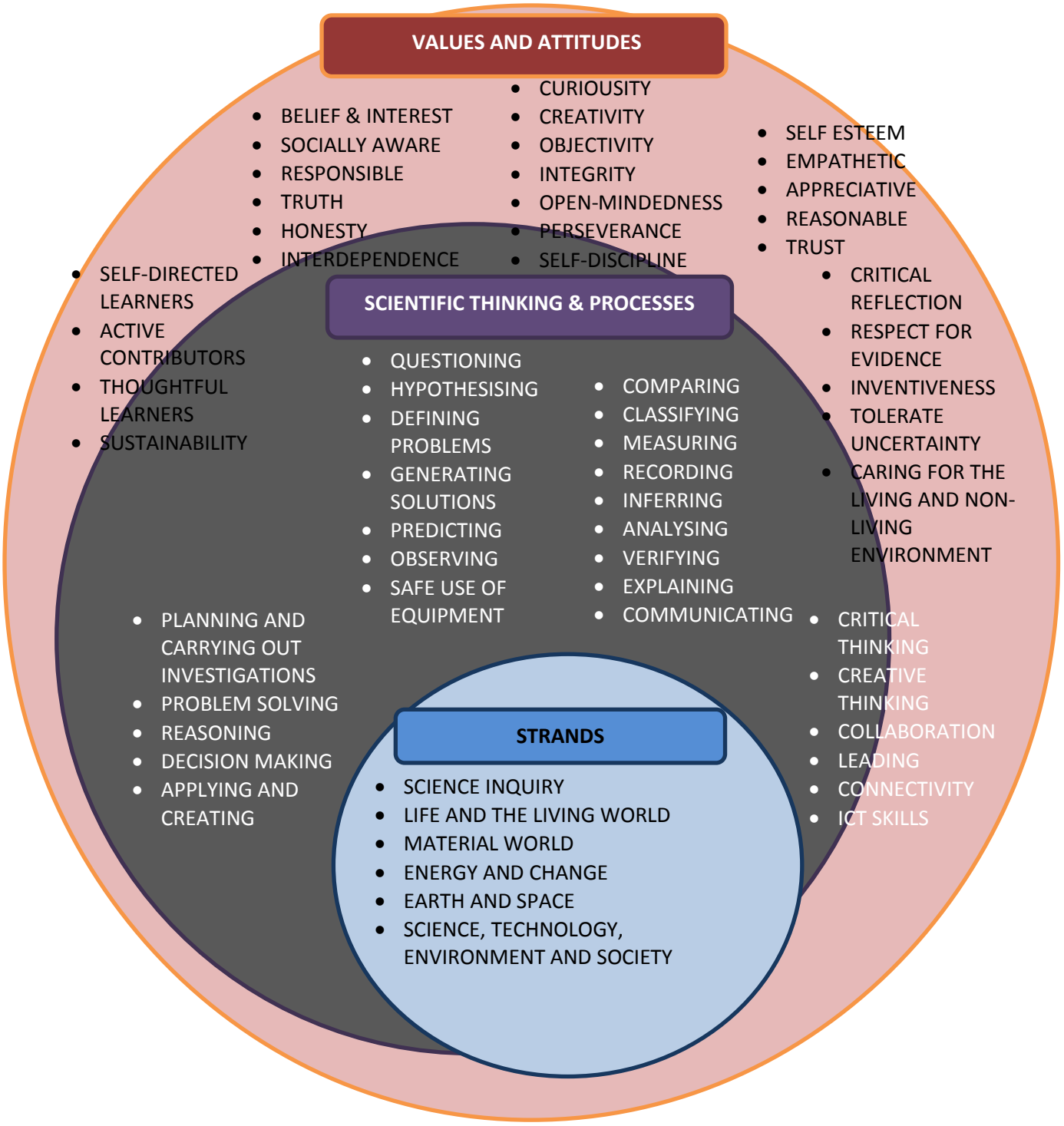

Figure 3. SEA-BES Common Core Regional Learning Standards in Science Framework for 21st Century

The Descriptions of the Three Key Learning Stages

The Common Core Regional Learning Standards in Science is comprised of Primary/ Elementary Level and Junior Secondary Level or by Key Learning Stage (i.e. Lower Primary- Key Stage 1- Grades 1, 2 and 3; Upper Primary- Key Stage 2- Grades 4, 5 and 6; and Junior Secondary – Key Stage 3 – Grades 7, 8 and 9).

Key Stage 1 serves as the foundation of knowledge covering the basic facts and skills developed through simple hands-on activities and manipulation of concrete objects. This stage focuses on arousing interest, enjoyment and curiosity in the subject through exploration of the immediate natural environment, observed phenomena and experienced daily life experiences. The objective of this stage is for learners to use daily language and science vocabulary and terminologies.

Key Stage 2 builds from the competencies acquired by learners from the first stage. This stage provides experiences for learners to deepen their understanding and allows them to use scientific and mathematical vocabulary, perform scientific investigations and experiments which cultivate scientific processes, scientific thinking and higher order thinking skills as well as development of scientific attitudes and values.

Key Stage 3 presents higher cognitive demands as learners deal with abstract ideas and concepts that enhances critical thinking, creative thinking through the application of knowledge and understanding of scientific concepts and principles in daily life and in participating in discussions, dialogue, arguments pertaining to contemporary societal, economic, technological, political, moral, cultural and environmental issues.

The Descriptions of the Frameworks of CCRLS in Science

The framework is the overall structure for organizing learning and teaching for the science subjects. The framework comprises a set of interwoven components including:

- Subject knowledge and skills (expressed in Strands)
- Scientific Thinking and processes
- Values and attitudes

The framework sets the direction for and provides guidance in the teaching and learning. It reflects also the 21st Century Skills. SEA-BES Common Core Regional Learning Standards in Mathematics Framework is developed for regional integration of mathematics curriculum would support SEAMEO Member countries through the following activities: a) analytical tool, b) collaboration, c) best practices d) systematic discussion e) a platform for curriculum development and professional development, and f) assessment.

The Strands, Science Processes and Values and Attitudes

The content of the Standards has been carefully chosen to ensure continuity and progression of science education across the primary and secondary levels. Students are presented with aspects of science that are interesting and best contribute to their general education. To help students keep up with the advances in science and technology, teachers should incorporate current issues that are relevant and interesting into their lessons.

It is important to note that the sequencing of strands and topics in this Standard does not suggest a teaching order. Schemes of work and assessment should be drawn by teachers in a manner commensurate with the needs, interest and abilities of their students. Teachers are advised to adopt a variety of approaches in their teaching and incorporate ideas as well as materials from the everyday life experience of their students.

The Strands

The major learning elements in science are arranged into six strands yet the strands should not be viewed as compartmentalized blocks of knowledge. In order that students can have a coherent understanding of the world around them, the diversity and multiplicity of scientific facts and concepts should be learned as interrelated “bigger ideas” in a conceptual scheme. The six strands are described as follows:

Science Inquiry:

This strand aims to develop science process skills and understanding of nature of science and inquiry. It involves science process and thinking skills as well as general inquiry processes such as creative problem-solving, logical reasoning, decision-making and values clarification. It also includes proper handling of laboratory apparatus and specimens, laboratory safety, scientific ethics, attitudes and noble values, introduction to science and planning and conducting experimental skills and investigation, analyses, evaluation and measurement.

This strand is not a stand-alone component but should be integrated with other 5 strands. It provides for the development of skills and hands-on activities that are the heart of doing science.

Life and the Living World:

This strand aims to develop understanding of scientific concepts and principles related to the content of Biology. It includes; living things and non- living things; personal health and healthy lifestyle; human body/organ systems; animals; plants; gas exchange systems, photosynthesis, cellular respiration, relationships in an ecosystem and

biodiversity; environment; microorganisms; cells and organization; inheritance, chromosome, DNA and genes, biodiversity; and biotechnology.

The Material World:

This strand aims to develop understanding of scientific concepts and principles related to the content of Chemistry. It includes properties of matter, classification of matter, water as matter and water cycle, particulate nature of matter, atoms, elements and compounds, periodic table, pure and impure substances, solutions and suspensions, mixture, acids, and alkalis, physical changes in matter, chemical reactions, energetics, and materials such as metals, ceramics, polymers and composites.

Energy and Change:

This strand aims to develop understanding of scientific concepts and principles related to the content of Physics. It includes energy changes and transfers, energy calculation of fuel uses and costs, energy changes in systems, observed waves, sound waves, energy and waves, light waves, use of lenses, heat, stability, describing forces, motion, pressure in fluids, balanced forces, forces and motion, simple machines, current electricity, static electricity, magnetism, electromagnetism, particle model of matter, energy in matter, space and nuclear physics.

Earth and Space*:*

This strand aims to develop understanding of scientific concepts and principles related to the Earth, Space and Universe. It covers earth science and space science which includes earth's structure and physical features, earth's atmosphere and atmospheric conditions, weather and climate, earth's processes, earthquakes and volcanic eruptions cycles and history, earth's resources, their use and conservation, earth in the solar system; features of earth, moon and other planets, the universe and astronomy.
.

Science, Technology, Environment and Society:

This strand aims to develop understanding of the interconnections between science and technology, environment and society. This strand covers environment and environment management emphasizing conservation of nature and natural resources. Humans and environment are closely interrelated, so humans have to be responsible in sustaining a healthy and conducive environment to work and live in. The well-being of mankind is of utmost importance and everyone should practice a healthy lifestyle and manage their health wisely. In the developing world, science and technology provides the solution to improve and enhance the quality of life.

Scientific Thinking and Processes

Scientific inquiry involves science process and thinking skills as well as general inquiry processes such as problem-solving, logical reasoning, decision-making and values clarification. Science process skills are those employed by scientists to make sense of the natural world.

Science process skills include questioning, hypothesizing, defining problems, generating solutions, predicting, observing, safe use of equipment, comparing, classifying, measuring, recording, inferring, analyzing, verifying, explaining, reasoning, communicating, applying and creating, evaluating and integrated science process skills of planning and carrying-out investigations.

Other generic skills which are fundamental in helping students to learn to acquire knowledge, to construct knowledge and to apply knowledge to solve new problems include decision-making skills, collaboration skills, communication skills, creative thinking skills, critical thinking skills, Information and Communications Technology, leadership skills and connectivity.

Values and Attitudes

The development of values and attitudes are essential elements of the school curriculum. Values and attitudes should be permeated in the learning and teaching of science to foster the scientific ways of thinking and working, and these include curiosity, creativity, objectivity, integrity, perseverance, self-discipline, truth, honesty, trust, interdependence and sustainability.

Attitudes include creative, critical, open-minded, responsible, appreciative, empathetic, self-directed learners, active contributors, thoughtful learners, belief and interest, caring and concern, socially aware, self-awareness, concerned citizen, respect for evidence, inventiveness, tolerate uncertainty, caring for the living and non-living environment.

Remarks

The SEA-BES Common Core Regional Learning Standards in Science and Mathematics are works in progress. Both Standards are constantly developing and evolving as current issues and trends are being accommodated. Though substantial work has been accomplished, yet much more need to be done. For this Working Paper of the SE-BES CCRLS to be considered of world-class quality and truly reflect ASEAN values, more opportunities for in-depth discussion and seeking agreement from all SEAMEO Member Countries has to be provided to show ownership and unity of purpose. Relative to this, technical and financial support should be extended by all SEAMEO Member Countries. Likewise, the much-needed financial assistance and

technical expertise should be availed of from donor agencies and international organizations and other local, regional and international institutions. It is hoped that the SEA-BES CCRLS in Science and Mathematics could truly be a significant instrument to achieve the goals of ASEAN Community in the near future.

SEAMEO BASIC EDUCATION STANDARDS (SEA-BES): DEVELOMENT OF THE COMMON CORE REGIONAL LEARNING STANDARDS IN SCIENCE

Project Management Team and Members

SEAMEO RECSAM Project Management

Dr. Hj Mohd Johan bin Zakaria (Centre Director)
Dr. Nur Jahan Ahmad (Deputy Director, R & D – from March 16, 2016 to present)
Dr. Suhaidah Tahir (Deputy Director, R & D – until February 29, 2016)
Dr. Koay Suan See (Deputy Director, TPD until April 1, 2016)
Ms Khor Sim Suan (Acting Deputy Director, TPD from April 1, 2016)
Mr. Shamsul Azha B.MD Yusuf (Deputy Director, Administration)
Ms Rashihah Hj Othman (Accountant)
Mr. Dominador Dizon Mangao (Specialist, R & D, Project Leader and Coordinator for Science Standards)

Consultants

Science Education: Dr. Mark Windale, Principal Lecturer in Science Education and Director of International Programme, Centre for Science Education, Sheffield Hallam University, United Kingdom

Mathematics Education: Prof Masami Isoda, Professor, Faculty of Human Science and Director of the Centre on International Cooperation in Educational Development (CRICED), University of Tsukuba, Tokyo, Japan.

Curriculum Development: Prof Kerry J Kennedy, Research Chair Professor of Curriculum Studies and Director, Centre for Governance and Citizenship, Hong Kong Institute of Education, Hong Kong

First Regional Consultative Meeting on SEAMEO Basic Education Standards and SEA-Primary Learning Metrics (4-5 November 2014)

No	Name of Delegate	Position, Office/ Institution and Country
1.	Dr. Witaya Jeradechakul	Director, SEAMEO Secretariat, Bangkok, Thailand
2.	Dr. Handoko	Deputy Director, SEAMEO Secretariat, Bangkok, Thailand
3.	Dr. Jim Ackers	Regional Education Adviser, UNICEF EAPRO, Bangkok, Thailand
4.	Ms Camille Woeldike	Project Coordinator, , UNICEF EAPRO, Bangkok, Thailand
5.	Dr. Jimin Cho	Head, Office of Global Cooperation, KICE, Seoul, Korea
6.	Dr. Miyoung Hong	Senior Research Fellow, KICE, Seoul, Korea
7.	Dr. Mioko Saito	Programme Specialist, UNESCO-IIEP, Paris, France
8.	Dr. Gwang-Chol Chang	Chief, Education Policy and Reform Unit, UNESCO, Bangkok

9.	Dr. Emma Claire Pearson	Senior Lecturer, Sultan Hassanal Bolkiah Institute of Education. UBD, Brunei Darussalam
10.	Ms Jeaniene Spink	Principal Research Fellow, ACER, Melbourne Office
11.	Dr. John Cresswell	Principal Research Fellow, ACER Perth Office
12.	Dr. Annie Brown	Principal Research Fellow, ACER Melbourne Office
13.	Dr. Ghazala Rafique	Interim Director, Human Development Programme, Aga Khan University, Pakistan
14.	Dr. Asmah Ahmad	Programme Officer (Evaluation), SEAMEO Secretariat, Bangkok, Thailand
15.	Ms Lauranne Beernnaert	SEA-PLM Project Assistant, SEAMEO Secretariat, Bangkok, Thailand
16.	Ms Elaissa Marina Mendoza	Senior Associate, Research Studies Unit, SEAMEO INNOTECH, Philippines
17.	Dr. Sandra Tempongko	Deputy Coordinator, SEAMEO TROPMED Network, Bangkok, Thailand
18.	Mrs Nursyuhaidah binti Hj Ahmad	Documentation Officer, SEAMEO VOCTECH, Brunei Darussalam
19.	Mrs Noorhayati Cynthia binti Abdullah	Specialist, SEAMEO VOCTECH, Brunei Darussalam
20.	Ms Mazmi binti Maarof	Training Coordinator, SEAMEO SEN, Melaka , Malaysia
21.	Ms Rozilawati Abd Kadir	Researcher, SEAMEO SEN, Melaka , Malaysia
22.	Asst Prof Dr Jurarat Thammaprateep	Sukhothai Thammathirat Open University (for SEAMEO SPAFA)
23.	Ms Lili Indarti	Secretary, SEAMEO QITEP in Science, Bandung, Indonesia
24.	Dr. Indarjani	Deputy Director for Programme , SEAMEO QITEP in Science, Bandung, Indonesia
25.	Mr. Reza Setiawan	Head of Programme, SEAMEO QITEP in Science, Bandung, Indonesia
26.	Mr Fadjar Shadiq	Deputy Director for Administration, SEAMEO QITEP in Mathematics, Yogyakarta, Indonesia
27.	Dr. Felicia Nuradi Utorodewo	Centre Director, SEAMEO QITEP in Language, Jakarta, Indonesia
28.	Mr Hj Shamsulbahri Hj Muhammad	Head of Science Unit, Ministry of Education, Brunei Darussalam
29.	Ms Rasidah Junaidi	Head of Mathematics Unit, Ministry of Education, Brunei Darussalam
30.	Ms Hjh Siti Raudah Huzaimah Hj Abd Wahab	Acting Head of technology Studies, Ministry of Education, Brunei Darussalam
31.	Ms Norkartini Hj Md Noor	English Language Unit, Ministry of Education, Brunei Darussalam
32.	Ms Sheila Shahar Al-Johary	SEA-PLM Focal Person, Ministry of Education, Brunei Darussalam
33.	Mr. Ung Chinna	Deputy Director, Education, Quality Assurance Department, Ministry of Education, Cambodia
34.	Mrs Siphaphone Manivanh	Deputy Director, Preschool and Primary Education Department, Ministry of Education, Lao

		PDR
35.	Datin Dr Ng Soo Boon	Deputy Director, Curriculum Development Division, Ministry of Education, Malaysia
36.	Tuan Hj Saiful Bahri bin Mohd Nor	Asst. Director of Education, Examination Syndicate, Ministry of Education, Malaysia
37.	Dr. Nelia V. Benito	Director, NETRC, Department of Education, Philippines
38.	Ms Waraporn Plukpunyakul	Director, Human Resources Development Unit Upper Secondary Education Bureau, Ministry of Education, Thailand

2nd Regional Consultative Meeting and Workshop on SEAMEO Basic Education Standards (20-22 October 2015)

No	Name of Delegate	Position, Office and Country
1.	Dr. Gatot Hari Priowirjanto	Director, SEAMEO Secretariat, Bangkok, Thailand
2.	Hj Shamsulbahri bin Hj Muhammad	Head of Science Unit, Department of Curriculum Development, Ministry of Education, Brunei Darussalam
3.	Ms Rasidah Junaidi	Head of Mathematics Unit, Department of Curriculum Development, Ministry of Education, Brunei Darussalam
4.	Mr. Soun Socheat	Chief of Science Office, Curriculum Development Department, Ministry of Education, Youth and Sports, Cambodia
5.	Mr Nguon Prum	Deputy Head of Mathematics, Curriculum Development Department, Ministry of Education, Youth and Sports, Cambodia
6.	Prof. Siti Zubaidah	Lecturer, State University of Malang, Malang, Indonesia
7.	Mr. Houmphanh Khanthavy	Head of Physics, Research Institute for Education and Science, Ministry of Education and Sports, Lao PDR
8.	Mr. Songka Keochansy	Technical Staff, Department of Secondary School, Ministry of Education and Sports, Lao PDR
9.	Mr. Azmi Harun	Science Unit, Curriculum Development Division, Ministry of Education, Malaysia
10.	Mr. Radin Muhd Imaduddin	Mathematics Unit, Curriculum Development Division, Ministry of Education, Malaysia
11.	Dr. Htay Htay Win	Assistant Director (Science Curriculum),Ministry of Education, Myanmar
12.	Ms Daw Aye Nyunt	Deputy Staff Officer (Mathematics Curriculum), Ministry of Education, Myanmar
13.	Mr. Joseph R. Jacob	Senior Education Program Specialist, Curriculum Development Division, Department of Education, Philippines
14.	Ms Elizabeth G. Catao	Senior Education Program Specialist, Department of Education, Philippines
15.	Mr. Sarunyou Srisomporn	Specialist Teacher, Prachinratsadornamroong

		School, Amphoe Mueang Prachinburi Prachin Buri province, Office of Basic Education Commission, Thailand
16.	Ms Pacharapron Thongsawat	Teacher, Beaconhouse Yamsaard School, Lamlukka, Pathum Thani Province, Office of the Private Education Commission, Thailand
17.	Dr. Ho Vinh Thang	Senior Academic Staff, Secondary Education Department, Ministry of Education and Training, Vietnam
18.	Dr. Ta Ngoc Tri	Senior Academic Staff, Primary Education Department, Ministry of Education and Training, Hanoi, Vietnam
19.	Prof. Dr. Triyanta	Centre Director, QITEP in Science, Bandung, Indonesia
20.	Mr. Fadjar Shadiq	Deputy Director for Administration, SEAMEO QITEP in Mathematics, Yogyakarta, Indonesia
21.	Ms Anti Rismayanti	Research Officer, SEAMOLEC, Jakarta, Indonesia
22.	Dr. Wanida Tanaprayothsak	Assistant to the IPST President, IPST, Bangkok, Thailand
23.	Dr. Soledad Ulep	Director, UPNISMED, Quezon City, Philippines
24.	Ms Peggy Lim	British Council Penang, Malaysia
25.	Ms Liew Siew Hui	British Council Malaysia, Kuala Lumpur

SEAMEO RECSAM SCIENCE SPECIALISTS

No	Name of Science Specialist	Division
1.	Dr. Nur Jahan Ahmad	Research & Development
2.	Mr. Dominador D. Mangao	Research & Development
3.	Dr. Ng Khar Thoe	Research & Development
4.	Mr. Julito C. Aligaen	Research & Development
5.	Dr. Hazura Ab Bakar	Research & Development
6.	Dr. Koay Suan See	Training Programme
7.	Ms Khor Sim Suan	Training Programme
8.	Dr. Fazzlijan binti Mohamad Adnan Khan	Training Programme
9.	Mr. Lee Shok Mee	Training Programme
10.	Mr. Hideo Nakano	Training Programme
11.	Mr. Yuji Otsuka	Training Programme

MASTER/EXPERIENCED SCIENCE TEACHERS FROM PENANG STATE

No	Name of Teacher	Name of School
1.	Dr. Kong Sow Lai	SKM Sungai Ara, Penang
2.	Ms. Linda Toh	SMK Penang Free, Penang
3.	Ms. Sofiazan Mohd Yusof	SMK Agama Al Irshad Pokok Sena, Penang

4.	Ms. Nurun Najah bt Elias	SMK Al-Mashoor (P), Penang
5.	Mr. Thiagarajan	ST. George's Girl's School, Penang
6.	Ms Savanee Sararaks	SMK Abdullah Munshi, Penang
7.	Ms. Lim Yoon Khim	SJK (C) Kwang Hwa , Penang
8.	Mr. Ooi Eng San	SK St. Xavier, Penang
9.	Ms Goon Lai Imm	SK Korok Balik Pulau, Penang
10.	Ms Susliza binti Ismail	SK Minden Height, Penang
11.	Mr Wan Mohd Azam bin Wan Mohamad	SK Minden Height, Penang
12.	Mr. Han Kaw Sey	SMK Teluk Bahang, Penang

SCIENCE LECTURERS

No	Name of Lecturer	Name of Institution
1.	Dr. Mageswary Karpudewan	School of Educational Studies, USM, Penang
2.	Dr. Devadason Robert Peter	IPG Kampus Ipoh, Perak
3.	Dr. Parvinder Singh A/L Amar Singh	IPG Kampus Pulau Pinang, Penang
4.	Dr. Yeoh Poh Choo	IPG Kampus Pulau Pinang, Penang
5.	Ms. Foo Lay Kuan	IPG Kampus Pulau Pinang, Penang

SUPPORT STAFF

No	Name of Staff	Name of Division/Unit
1.	Ms Faridah Abdul Hamid	Personal Assistant to the Director , Office of the Centre Director
2.	Ms Tiana Mohamad	Programme Officer, Research & Development
3.	Ms Jenny Ong Lay Sim	Admin Assistant, Research & Development
4.	Ms Ong Mei Yean	Research Officer, Research & Development

Prepared by:

Research & Development Division
SEAMEO RECSAM
Penang, Malaysia

13 July 2016