

The Southeast Asian Regional Standards for Mathematics Teachers (SEARS-MT) Project

Introduction

The Southeast Asian Ministers of Education Organization (SEAMEO) was established in 1965 among the governments of the Southeast Asian countries to promote regional cooperation in education, science and culture in the region. Since then SEAMEO has continued to nurture human capacities and explore the peoples' fullest potential and aims to make lives better in quality and equity in education, preventive health education, culture and tradition, information and communication technology, languages, poverty alleviation and agriculture and natural resources. As one of the strategies to achieve its goals, the SEAMEO has set up centres of excellence, each with expertise in niche areas.

SEAMEO RECSAM is one of the SEAMEO's twenty centres of excellence and is mandated to provide the needs of SEAMEO member countries in the development and enhancement of expertise in science and mathematics education. The SEARS-MT was conceptualised as part of SEAMEO RECSAM's plans to improve the quality of mathematics teachers in the region. Plans for SEARS-MT were first initiated in the Centre's 9th Five-year Plan (2010-2015).

Rationale

Southeast Asia is in one of the major corridors of development and SEAMEO uniquely represents the collective aspiration of the region to focus on education and capacity building as an engine of growth. The focus on education undoubtedly raises questions around improving the quality of teachers who are and will be instrumental in providing quality education for the next generation of leaders and human resource needs. It is through quality teachers that the Southeast Asian (SEA) region can hope to sustain its development.

The SEAMEO region is however diverse both in terms of culture as well as economic growth. The 2011 figures of Gross Domestic Product (GDP) per capita for the region provided by the World Bank ranges from as high as approximately USD 46,000 to as low as approximately USD 900. Data from the Trends in Mathematics and Science Studies (TIMSS) and the Program for International Student Assessment (PISA) similarly show a wide disparity in student achievement in science and mathematics.

As the region gears itself for growth and development, the agenda for developing human resources who are technologically savvy becomes even more important. The emphasis on science and mathematics education underpins this agenda. Teachers are at the heart of any attempt to improve education and for the standard of science and mathematics in the region to improve, due emphasis must be given to improve the quality of its teachers. In order to monitor any improvement there is a need to establish benchmarks to be used in making comparisons and determining the rate of development. These benchmarks for science and mathematics teachers do not exist for the SEAMEO region.

Acknowledging the diversity that exists in the SEAMEO region and the importance of providing quality science and mathematics teachers for sustained academic achievement which in turn will contribute to sustained economic growth, the SEAMEO Regional Centre for Education in

Science and Mathematics (RECSAM) is embarking on a program to draft the Southeast Asia Regional Standards for Mathematics Teachers (SEARS-MT) which will be used as benchmarks for monitoring improvement in teacher quality. SEAMEO RECSAM further plans to develop the Southeast Asia Regional Standards for Science Teachers (SEARS-ST).

As a regional initiative the SEARS-MT and SEARS-ST would be especially beneficial for new emerging economies in the region which may not have the capacity to develop their own teachers' standards at the moment. These standards may be aspirational for some countries.

The Goal

The goal of the Southeast Asia Regional Standards for Mathematics Teachers (SEARS-MT) is to document a set of standards that describes the qualities that a mathematics teacher in the SEAMEO region should attain in the 21st century.

It is extremely important to address the transformation of mathematics teacher education by drafting the Standards of Mathematics teachers in this region. The SEARS-MT will develop statements about mathematics teachers' professionalism specifically outlining the characteristics and attributes of mathematics teachers which are unique to the Southeast Asian region. This document will formally articulate and outline a set of comprehensive elements essential for all mathematics teachers of the 21st century.

The Purpose

The SEARS-MT can be utilised in three ways to enhance the professional development of mathematics teachers:

1. As a guide to provide benchmarks or aspirational goals for relevant educational agencies in formulating policies to improve the quality of teacher development programmes that prepare and equip pre-service and in-service mathematics teachers.
2. As a guide in structuring teacher education programmes in both pre-service and in-service teacher preparation.
3. As a guide for teacher development at the personal level. Teachers can use this document as a roadmap to guide their own personal professional development as a mathematics teacher.

Definition of Key Terms

The *Dimensions* represent four main areas of teacher quality. They provide an overarching structure to the standards. While they bring focus to the four main separate areas of teacher quality, they are not mutually exclusive, as some aspects of quality teaching may involve more than one dimension.

The *Standards* provide specific information about the *Dimensions* by describing elements of each *Dimension*. They articulate what teachers are expected to possess, know and do. The *Standards* and their descriptors represent an analysis of effective, contemporary practice by teachers throughout the SEAMEO region.

The *Indicators* allow for another level of specificity of the *Standards*. *Indicators* provide further details about the *Standards* by identifying desirable qualities of teachers, and contemporary

practice by teachers throughout the SEAMEO region. Their development includes a synthesis of the descriptions of teachers' knowledge, practice and professional engagement.

The *Local Descriptors* provide greater specificity in terms of how *Indicators* could manifest within local cultural and educational contexts of SEAMEO countries. Each SEAMEO country will construct their own local descriptors which will articulate how the standards and indicators are operationalised to their respective countries.

DRAFT

The Southeast Asian Regional Standards for Mathematics Teachers

Dimension 1: Professional Knowledge

This dimension encompasses knowledge and understanding of the fundamental ideas, principles and the structure of mathematics. This knowledge is intertwined with effective pedagogy in the teaching and learning of mathematics. The latter includes an in-depth knowledge of the characteristics of the students and implications for the use of appropriate strategies for students of varying abilities and socio-cultural background. This dimension also emphasises the role of teachers' knowledge that is relevant to use of ICT to enhance student learning by promoting deep engagement with the concepts and the procedures of mathematics.

Key Aspects:

- Knowledge in understanding of fundamental mathematical ideas and principles, and teaching approaches.
- Knowledge of the characteristics of students and their implications for learning.
- Knowledge of supporting creativity and the development of higher order thinking skills.
- Knowledge of ICT to model and solve problems.

Standards and Indicators

Standards	Indicators
Knowledge of Mathematics	Knowledge of the discipline of mathematics
	Knowledge of key concepts, procedures, and processes that are relevant to mathematics
	Knowledge of mathematics curriculum
	Knowledge of making relations between mathematics and other disciplines
Knowledge of Students	Knowledge of motivational and engagement levels of students for learning mathematics
	Knowledge of socioeconomics, cultural, ethnic and religious backgrounds of students
	Knowledge of physical, social and intellectual developmental characteristics of the students
Knowledge of Students' Learning of Mathematics	Knowledge of how students' prior knowledge impacts on learning
	Knowledge of students' conceptions and misconceptions about mathematics
	Knowledge of potential difficulties faced by the students in learning particular mathematics concepts
	Knowledge of the application of learning and instructional theories in the teaching of mathematics
	Knowledge of the repertoire of effective teaching strategies

Knowledge of Intellectual Quality	Knowledge of strategies for supporting creativity and innovation
	Knowledge of strategies for developing students' higher order thinking skills in mathematics
	Knowledge for making complex relations between and representations of core topics
	Knowledge of supporting students to develop complex mathematical thinking and decision-making
	Knowledge of cross-curricular relations with mathematics
Knowledge of ICT	Knowledge of ICT integration in the teaching and learning
	Knowledge of how particular software supports a mathematics concept
	Knowledge of use of ICT to model context and solve problems
	Knowledge of students' knowledge and use of ICT
	Knowledge of application/software development specifically on mathematics lessons

Dimension 2: Professional Teaching and Learning Process

This dimension encompasses the teacher's purposeful planning, implementing and evaluating of learning tasks in the mathematics classroom. The effective implementation and evaluation of purposefully planned student tasks is essential to establish learning environments that engage the students and promote the learning of mathematics.

Key Aspects:

- enhance discourse, create learning environment, and providing students with mathematical tasks
- analyse the process of teaching and learning through various strategies
- plan, implement, assess, and reflect upon mathematical thinking

Standards and Indicators

Standards	Indicators
Mathematical Tasks and Discourse	Engage and enrich students in mathematical thinking through discourse
	Communicate thinking through various means of representations and reasoning
	Facilitate student use of conjecturing, reasoning, proving, modelling, and verifying to solve mathematical tasks
	Provide students with mathematical activities, problem solving tasks and real-life investigations to meet the needs of all students
Planning for Learning Process	Plan for an effective and safe learning environment to cater to the diversity of all students
	Incorporate a variety of commercial and self-developed learning resources and instructional materials with appropriate teaching strategies

Implementing teaching strategies	Use of effective communication and promotion of classroom discussion
	Use of strategies to challenge students' thinking and engage them actively
	Manage the learning environment effectively
	Negotiate mathematical meaning and modelling mathematical thinking and reasoning
Monitoring, assessment and evaluation	Provide on-going, constructive and purposeful feedback for learning
	Develop and use a range of appropriate assessment tasks and strategies
	Regularly assess and report student learning outcomes
	Analyse students' learning through assessment
	Utilise the performance data to inform teaching practice
	Maintain on-going and informative records of student progress and learning outcomes
Reflection of teaching and learning	Document the reflection of teaching practice post-lesson analysis
	Utilise the record of reflection for self-improvement

Dimension 3: Personal and Professional Attributes

This dimension encompasses teacher personal and professional characteristics that assist students to engage, to appreciate, and to value their learning in the subject. Teachers display an enthusiasm for their subject and a commitment to maximise students' opportunities to learn and achieve optimum potential. Teachers will exhibit care, respect for their students, and a professional and moral behaviour towards colleagues, parents/carers, stakeholders and the community. Teachers value continual improvement of personal professional development and display a commitment to engage with the school, the home and the community.

Key Aspects:

- Mathematics teachers possess personal attributes that assist students to engage, to appreciate, to value their learning in the subject and to achieve their potential
- Teachers exhibit care, respect for their students, and a professional, and moral behaviour towards colleagues, parents/carers, stakeholders and the community
- Teachers value continual improvement of personal professional development and display a commitment to engage with the school, the home and the community
- Teachers lead and engage the communities to promote mathematics learning

Standards and Indicators

Standards	Indicators
Personal attributes	<p data-bbox="598 309 1394 376">Exhibit enthusiasm and confidence for both mathematics and teaching mathematics</p> <p data-bbox="598 387 1331 421">Show a conviction that all students can learn mathematics</p> <p data-bbox="598 432 1394 499">Commit to setting high achievable standards for the mathematics learning of each student</p> <p data-bbox="598 510 1246 544">Exhibit care and respect to students and colleagues</p>
Personal professional development	<p data-bbox="598 566 1299 600">Commit to lifelong learning and personal development</p> <p data-bbox="598 611 1394 678">Enhance their understanding of mathematics and skills in mathematics teaching</p> <p data-bbox="598 689 1394 790">Have informed views on relevant current trends in mathematics education including knowledge of national priorities and associated policies</p> <p data-bbox="598 801 1177 835">Participate in a range of professional activities</p>
Personal responsibilities towards community	<p data-bbox="598 846 1394 913">Contribute to the communities relevant to their professional work</p> <p data-bbox="598 925 1394 992">Advocate for mathematics learning in their school and in their wider community</p> <p data-bbox="598 1003 1394 1070">Facilitate effective communication with parents/carers and stakeholders regarding students' learning and progress</p> <p data-bbox="598 1081 1394 1137">Create opportunities for mathematics learning beyond the classroom</p>

Dimension 4: Professional Communities

This dimension encompasses the importance of the teachers' professional community. The professional community and individual teachers have mutually beneficial relationship. This relationship strengthens collaboration among members within the professional community. Beyond that, this community is a part of a network of other professional communities through which collective wisdom is formed, shared and multiplied.

Key Aspects:

- Maintain professional code of conduct, professionalism and autonomy
- Engage and contribute in the professional communities both at schools and outside schools

Standards and Indicators

Standards	Indicators
Professional ethics	Adhere to the codes of conduct
	Demonstrate professionalism
	Practise professional autonomy (e.g. willingness to perform duty above expectation)
Professional communities at schools	Enrich the educational context for students (e.g. co-curricular activities, advisor for mathematics club, mathematics competition, mathematics project)
	Participate in the school-based professional learning community (e.g. mentoring, lesson study, action research, journal contribution)
Professional communities outside schools	Affiliate with professional organisation (national and local government, international organisation, private company, journal publication)
	Take part in professional community networking among practitioners of schools, educational institutes, and/or universities