seadstem
Southeast Asian Digital STEM Platform

## Why STEM - 21st Century Skills in Southeast Asia's Education System

Southeast Asian education strategies put a special focus on *21st Century Skills*, which have been set by many education authorities as goal of the future. Despite having different political systems, ideologies, historical backgrounds and educational structures, the member states of ASEAN share a common vision: to strengthen the competitiveness of ASEAN, which can and should be achieved, above all, through education. The integrative STEM approach plays a key role in this because it teaches exactly those skills that are crucial for the *21st Century Skills:* critical thinking, communication, teamwork and creativity.

*21st Century Skills* is the term for an international concept that encompasses skills and learning dispositions deemed necessary by educators, business leaders, academics and government agencies to succeed in the society and workplace in the 21st century – skills that students have to master if they want to be successful in a rapidly changing digital society. Many of these skills are also connected to more effective learning, based on skills such as analytical thinking, complex problem solving and teamwork. These skills differ from traditional academic skills in that they are not primarily based on knowledge but also include working with others, analyzing, presenting and sharing the acquired knowledge with others, including peers, mentors and teachers.

An integral part of the *21st Century Skills* is STEM as an interdisciplinary educational approach. Because STEM is a meta-discipline that integrates knowledge and skills from all four areas and connects science and technology to meet the challenges of today's world, STEM graduates are in greater demand than ever today. Students equipped with STEM knowledge are able to identify, apply and integrate different concepts, understand complex problems and develop innovative solutions to solve these problems. Instead of limiting the knowledge and learning process to only one of the four STEM disciplines, it is considered in the context of a problem, project or a task. In schools, integrated STEM is typically associated with project- or problem-based learning (such as research questions), where the outcome can vary widely and the required knowledge is distributed among the individual STEM disciplines.

In order for students to understand the importance and benefit from an integrative STEM approach, the teachers need to grasp the concept with all its possibilities and complex facets, so they can eventually put it into practice and pass it on to their students – it is one of the top priorities in Southeast Asia:

The government in **MALAYSIA** strives to focus on the holistic development of students in accordance with the national educational philosophy. *21st Century Skills* and STEM play an essential role here. In order to further strengthen STEM and achieve the country's goal of becoming an industrialized country that meets the challenges and needs of a STEM-fueled economy, the Ministry of Education has presented a three-phase plan until 2025. The curriculum now includes analysis, critical thinking, hypothesis building, and decision-making, and promotes project-based learning and research through adaptive learning programs. Campaigns for television, print media and social media have been designed in collaboration with other government agencies, the private sector and NGOs to educate both students and the general public about the variety of career opportunities in STEM disciplines, in order to encourage more students to choose STEM subjects.

Similarly, in **CAMBODIA**, STEM plays an indispensable role in realizing the long-term vision of the country. The government pays great attention to STEM and is focused on expanding and strengthening STEM education to drive economic development and respond to labor market needs. Despite the importance of MINT, Cambodia faces a number of challenges in this area, such as the lack of qualified teachers, low motivation of STEM students and insufficient STEM equipment in schools. To address these issues, the government has published a roadmap to promote the inclusive MINT education approach in Cambodia. The core content of this roadmap will be used and implemented by various stakeholders, including policy makers, education administrators, managers, technicians, research institutes, education and training institutions, researchers, professors and others. The roadmap envisages creating a conducive environment for the development of students' skills in STEM, improving STEM research and capacity building for teachers and researchers, as well as integrating STEM into socio-economic development to increase the involvement of all relevant stakeholders.

In the **PHILIPPINES**, the integrative STEM educational approach is a guiding principle of the Ministry of Education, which is committed to increasing the quality of STEM education and encouraging more students to be interested in this area. To promote young people's scientific and technological awareness and to promote their innovative skills, the Ministry regularly organizes the National Science and Technology Fair (NSTF) at school, technical and regional levels. In the future, a special focus will be placed on attracting more girls and women for STEM. Continuous training will empower the teachers to develop and enhance skills that will help them to lead a generation of innovators.

The government and ministry of education in **THAILAND** have recognized the importance of science and technology for the country's development and promote the integration of STEM. The specially designed STEM Education program focuses on different strategies, in particular the development of the STEM curriculum and the mobilization of STEM education in Thai schools. Thailand is also the first country in the Asia-Pacific region to address and assess gender-specific imbalances in the STEM area.

In **VIETNAM**, STEM education is still at the very beginning. While MINT clubs have been set up in some schools and students have begun to approach MINT through experimentation and practice sessions, the Vietnamese government knows that there is still much to do. To further strengthen and develop the area, Vietnam invokes political dialogue, capacity-building and partner consultations, particularly with Malaysia, which has already made significant achievements in the field of STEM. Vietnam focuses on involving relevant actors in the curriculum, teacher education, teaching and learning resources in order to raise awareness of the importance of STEM education, including in terms of gender. Concrete action plans and strategy developments are in progress.

In **INDONESIA**, the promotion of STEM education is a priority for the Indonesian government as it seeks to assert itself among its competitors, both regionally and internationally. An increasing number of graduates from the integrative STEM area means there may be solutions to problems such as climate change, national security, urban development and civil protection in the near future. The latter is currently being discussed frequently in Indonesia: STEM-D (STEM and disaster) is being promoted as a strategy that enables students to acquire STEM knowledge and combine it with disaster prevention. Through STEM-D, students can better prepare for natural disasters in Indonesia. In addition, they are trained in problem analysis and solution development - an approach that can be of great value in the future.

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Compared with other ASEAN member states, the education system in **MYANMAR** lags somewhat behind. The curriculum in many schools is outdated. Good private education is expensive. Most poor families send their children to state schools, but complain that their children can only graduate with a degree that no potential employer recognizes. Educational reform also requires the provision and training of better teachers. Myanmar has big plans. But only with STEM competencies can the country take the path to industrialization, modernization and improvement of the living standards of the population over a longer period of time. As long as there is a lack of a sophisticated curriculum where STEM is one of the priorities, the country will not be able to lay the foundation for economic growth.

There is no doubt that the integrative MINT education approach is future-oriented. The goal of SEADSTEM - The Southeast Asian Digital STEM Platform - is to effectively promote this approach in the region of Southeast Asia in the long term.

## What is SEADSTEM – The Southeast Asian Digital STEM Platform?

SEADSTEM pursues a philosophy based primarily on solving problems from a multifaceted and interdisciplinary perspective. It is an interdisciplinary approach to learning that combines rigorous academic approaches with lifelike instruction, where students use science, engineering, engineering and math in contexts that link school, community and work, and thus enables the development of STEM education. Used properly, the process of incorporating this STEM approach into the curriculum can make a big difference to how students see the world - and solve problems.

The aim of SEADSTEM is therefore to effectively promote this approach in the ASEAN region. The project enables a direct exchange between STEM teachers in Southeast Asian countries who have the opportunity to exchange ideas and to develop examples of best practices to show how STEM concepts, principles and techniques are used in the development of products, processes and systems that students use in their daily lives. The project allows for a direct exchange between STEM teachers in the region, giving them the opportunity to exchange ideas to develop "best practice" examples.

## How does SEADSTEM qualify teachers for STEM?

The special objective of the training measures is, on the one hand, to qualify trainers from the individual countries, who in turn can play a multiplier role in their respective countries and qualify their teachers. Learning methods focus on combining e-learning with classroom training to enable efficient blended learning. The transfer process will be based on regional presence events where multipliers are trained to get to know the contents and transfer them to their own country.

These regional events are accompanied by additional local events, which have a modular structure and explain the approach and the platform to the teachers on a subject-specific basis. This ensures that the teachers are picked up where they are, opening doors for the implementation of the approach.

In order to support these local and time-limited events, various online offerings that are independent of time and place are going to complement the training portfolio. Provisions are made for explanatory videos that introduce the methodological approach and the platform. The explanatory videos will be supplemented by interactive WBTs. Even webinars

and virtual classrooms are conceivable, but they take slightly more effort in terms of preparation and implementation. The contents to be conveyed and adapted serve as the explanation of the modern STEM approach (project-oriented, interdisciplinary work) as well as the presentation of the platform. As the platform is constantly being expanded, creating new content for the platform is also part of the training.

All of these blocks are accompanied by a community, which is built via the presence events and transmitted via e.g. local Facebook groups or directly via the platform. This community is supposed to connect the teachers with each other, but also to provide an opportunity to address the multipliers. Thus, communication between the presence- and online events can take place and, for example, the creation of new materials for the platform can be accompanied both professionally and technically.