SEAMEO CENTRES POLICY RESEARCH NETWORK (CPRN) SUMMIT 2025

Building Bridges to a Sustainable Future: Inclusive Collaboration and Innovation in Education, Science, and Culture

Fostering STEM Integration in TVET Across Southeast Asia: Insights and Policy Recommendations

Dr Orawan Sriboonruang
Knowledge Management, Manager
and
Dr Kritsachai Somsaman
Centre Director of SEAMEO STEM-ED

HOSTED BY
SEAMEO VOCTECH
Regional Centre, Brunei Darussalam

SUPPORTED BY
Ministry of Education Brunei Darussalam
Southeast Asian Ministers of Education Organisation
CfBT Education Services
german cooperation
Implemented by giz
RECOTwin

IN CONJUNCTION WITH
Brunei MYCE 2025

The objectives of this study are to:

- Seek the best international practices in integrating STEM into TVET curricula.
- Identify challenges faced by TVET institutions in developing STEM-related skills to meet 4IR demands.
- Develop a joint regional strategic plan for STEM workforce readiness and development in Southeast Asia.

Research Questions are:

RQ 1:

What key policies, strategic approaches, and collaborative frameworks are necessary to develop a regional roadmap for integrated STEM education in TVET to ensure workforce readiness for Industry 4.0 in Southeast Asia?

RQ 2:

How can STEM integration in TVET curricula be optimised to enhance workforce readiness in Southeast Asia, considering international best practices, institutional challenges, and regional strategic planning?

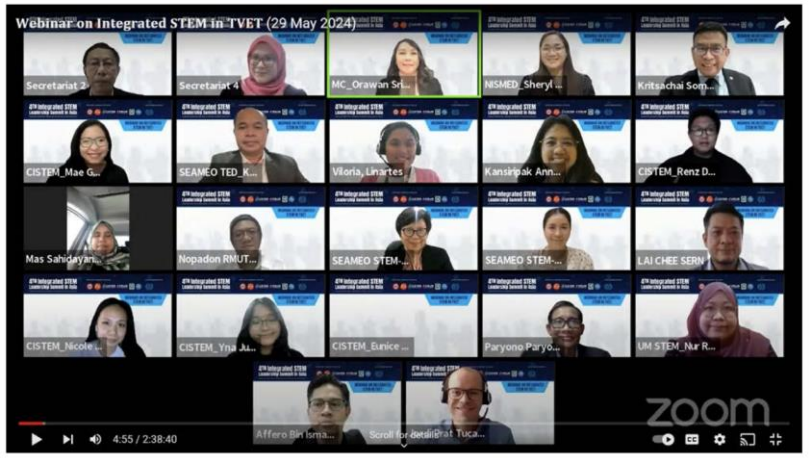
Methodology:

Setting the Stage for a Regional Strategic Plan

- SEAMEO STEM-ED, with the support of the International Labour Organization (ILO) Women in STEM Workforce Readiness Programme, organised the "***Experts Meeting and Knowledge Exchange Forum on the Integration of STEM in TVET***".

Validating and Sharing Global Perspectives

- Contributions from SEAMEO TED and SEAMEO VOCTECH, the pre-webinar theme "***Emerging STEM in TVET***" and "***4th Integrated STEM Leadership Summit in Asia***" were convened, on 29 May 2025 and 11-13 June 2025, hosted in Bangkok, Thailand by SEAMEO STEM-ED, to review "***The Bangkok Statement: Policy Recommendations on Integrated STEM in TVET***" the workforce for future challenges.



A Case of Cambodia: The challenges faced in integrating STEM into TVET:

Key Challenges and Lessons Learned:

- Challenges in Infrastructure and Teacher Qualifications: Limited infrastructure and varying levels of teacher qualifications hinder the effective implementation of STEM in TVET.
- Need for International Partnerships: for sharing resources, expertise, and best practices.
- Alignment of Curricula with Industry Needs: Ensuring that TVET curricula are aligned with industry needs.

A Case of Thailand: Advancing STEM Integration in Thai TVET :

Key Challenges and Lessons Learned:

- Expansion of Makerspace Hubs: Connecting 150 makerspace hubs to STEM centers and maximise industry engagement.
- Youth Engagement & Non-Continuing Students: Youth ambassador programmes and initiatives targeting students who do not continue past grade 9 can reintegrate them into productive roles and enhance their STEM skills.
- Local Government and Industry Support: Financial backing from local governments and industry partnerships for sustaining initiatives and embedding STEM into industrial training and cooperative education.
- Curriculum Enhancement & Final Year Projects: Revising TVET curricula to integrate STEM and project-based learning (PBL)

A Case of Malaysia: Strengthening STEM Integration in Malaysia's TVET System:

Key Challenges & Lessons Learned:

- Alignment of TVET with Industry through Work-Based Learning: Strengthening partnerships with industries through work-based learning
- Performance-Based Funding to Drive Innovation: Allocating funds based on institutional performance fosters innovation, enhancing the quality and relevance of TVET programmes.
- Strengthening Career Guidance Systems: Comprehensive career guidance is necessary to help students navigate TVET pathways and align their skills with industry needs.
- Promotion of STEM Education: Greater efforts are needed to raise awareness and integrate STEM within TVET, addressing gaps in recognition and implementation.
- Inclusion in the National Skills Registry: Incorporating STEM skills into Malaysia's National Skills Registry will help standardise and elevate competency expectations across industries.
- Utilisation of Makerspace Centres: Leveraging Malaysia's network of makerspaces will facilitate hands-on STEM learning, fostering creativity and innovation in TVET institutions.

A Case of Philippines: Strategies for Enhancing STEM Integration in Philippines TVET:

Key Challenges & Lessons Learned:

- Compliance with National Standards: All STEM initiatives within TVET must align with TESDA's established training regulations, ensuring consistency with national competency frameworks.
- Support for Energy Transitions: As the Philippines shifts towards sustainable energy, TVET programmes must equip students with the necessary skills for emerging energy industries at various levels.
- Establishment of Innovation Centers: Seventeen regional innovation centers are being developed to serve as hubs for STEM learning, offering specialised programmes tailored to local industry needs.
- Fostering Innovation and Entrepreneurship: These centers aim to create a ripple effect by equipping learners with product design and innovation skills, providing them with the resources to develop and market their ideas.
- Curriculum Integration: STEM has been embedded in TESDA programmes through structured curriculum guides, student workbooks, and assessment tools.
- Trainer Capacity Building: Nationwide upskilling initiatives are strengthening the STEM expertise of TESDA trainers in TVET institutions.
- Expansion of Online Learning: Three online courses focused on STEM in TVET and job readiness have been developed, complete with trainers' guides and workbooks.

The Role of SEAMEO Regional Centres and ILO in Strengthening STEM in TVET:

SEAMEO STEM-ED: Policy and Innovation in STEM Education

International Labour Organization (ILO): Bridging Education and Employment

SEAMEO STEM-ED drives policy development and research on STEM integration in TVET. Key initiatives include:

- Developing STEM-focused TVET curricula aligned with global labor market trends
- Hosting regional summits, such as the Integrated STEM Leadership Summit
- Conducting research on best practices for STEM pedagogy in TVET
- Partnering with ILO to align TVET skills with labor market demands

ILO plays a critical role in ensuring that STEM integration in TVET translates into employability. Through its expertise, ILO:

- Supports policy recommendations to align STEM skills with labor market needs
- Provides technical assistance on skills forecasting and workforce mobility
- Promotes inclusive workforce strategies, ensuring women and marginalised groups access STEM opportunities
- Develops frameworks for green jobs and sustainable TVET education

The Role of SEAMEO Regional Centres and ILO in Strengthening STEM in TVET:
SEAMEO VOCTECH: TVET Capacity Building and Workforce Readiness
SEAMEO TED: Teacher Professional Development

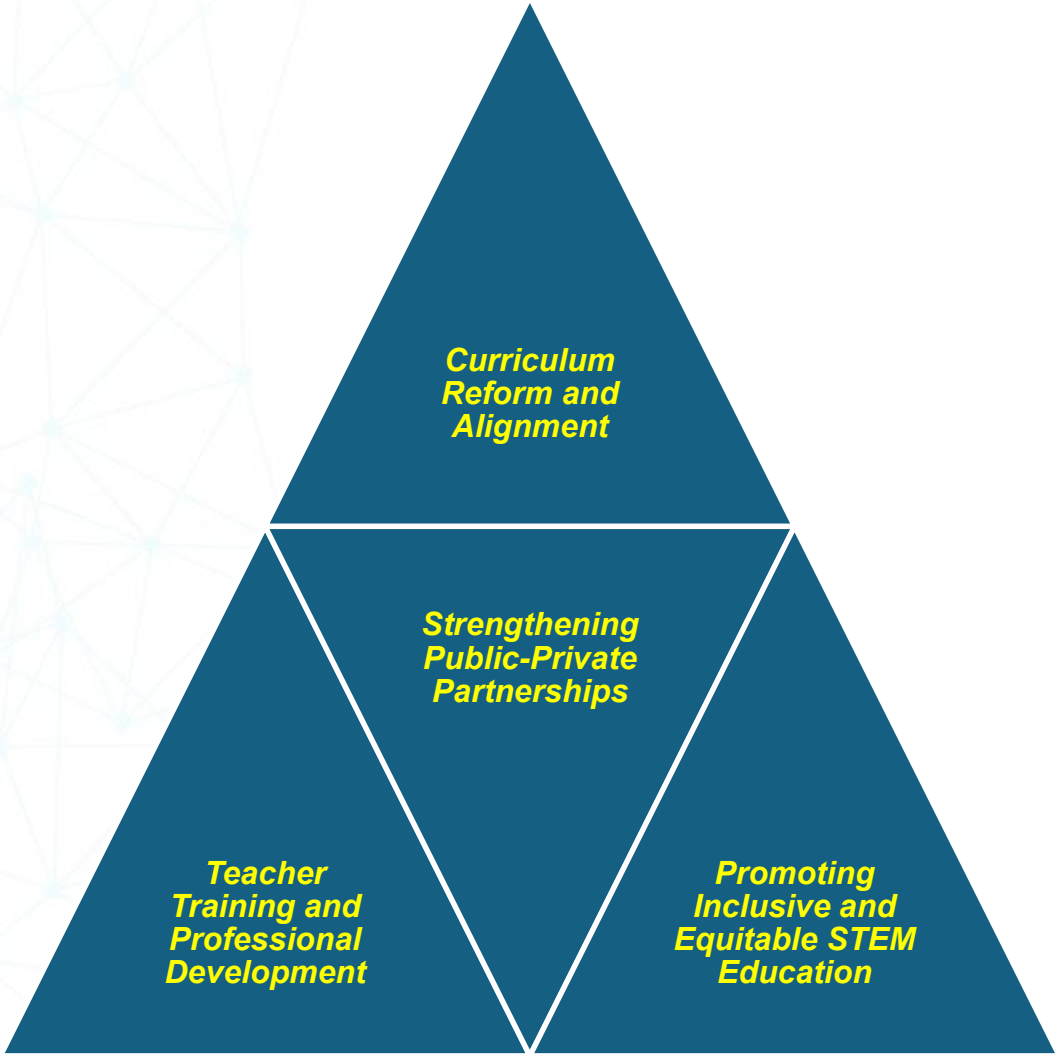
SEAMEO VOCTECH specialises in TVET teacher training, leadership programmes, and digital workforce development. Its contributions include:

- Regional TVET Leadership Programmes, focusing on upskilling educators and administrators
- SEA-VET.NET, an online platform consolidating TVET best practices and innovations
- Work-Based Learning Programmes, ensuring STEM competencies align with industry needs

SEAMEO TED focuses on teacher training, curriculum innovation, and digital education technologies. It plays a key role in:

- Sharing the best experience in training/ capacity building programmes for TVET teachers
- Reviewing and providing the recommendation for policy on STEM Integration in TVET

Key Strategic Enhancements to TVET Programmes Through STEM Integration Across Southeast Asia:



A: Curriculum Reform and Alignment

- Mapping STEM competencies to ASEAN TVET qualification frameworks
- Promoting project-based learning and digital simulations
- Aligning TVET curricula with ILO's skills gap assessments

B: Teacher Training and Professional Development

- Train TVET instructors in emerging technologies, AI, and robotics
- Provide industry internships for educators to gain real-world STEM experience
- Develop ILO-aligned STEM training toolkits for TVET educators

C: Strengthening Public-Private Partnerships

- Public-private partnerships that co-develop STEM training programmes
- STEM apprenticeships and dual-training models, integrating work-based learning
- Creating a regional database of industry-driven STEM job competencies

D: Promoting Inclusive and Equitable STEM Education

- Providing scholarships and mentorship programmes for underrepresented groups
- Expanding community-based TVET initiatives to increase STEM accessibility

"Bangkok Statement on Integrated STEM Education in TVET"

SEAMEO STEM-ED, SEAMEO VOCTECH, SEAMEO TED, and ILO will work together to:

- Support the ASEAN TVET Council in implementing regional STEM strategies.
- Identify and engage partners for collaborative projects in STEM-integrated TVET.
- Expand digital and work-based learning models, ensuring accessibility and scalability.
- Regularly assess and update policy recommendations to reflect emerging workforce trends.

Recommendations and Way Forward

- Developing a regional STEM-TVET roadmap, integrating labor market research from ILO
- Expanding teacher certification programmes for standardised STEM educator qualifications
- Enhancing digital transformation in TVET, incorporating AI, VR, and IoT
- Scaling up research collaboration between SEAMEO centers, ILO, and industry partners