

SEAMEO – THE UNIVERSITY OF TSUKUBA SYMPOSIUM VI

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Southeast Asian Ministers of Education Organization
Regional Centre for Education in Science and Mathematics

Roles of RECSAM in Inclusive Education and STEM Education Development

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INTRODUCTION

- SEAMEO RECSAM was established in 1967
- The Centre helps to promote and enhance science and mathematics education in the SEAMEO Member Countries
- The Centre's vision is to be a leading centre for quality science and mathematics education



INTRODUCTION (cont'd)

- The Centre fulfils its mission by engaging in the following:
 - Design and implement high quality professional development programmes
 - Conduct research and development activities to inform pedagogy and policy



INTRODUCTION (cont'd)

- Convene international conference, seminars and workshops to pool expertise in science and mathematics education
- Serve as a clearinghouse for information on science and mathematics education in the region



Event timeline – focus area

- 1990s
 - Action research, cooperative learning, problem solving, inquiry-based learning, higher order thinking, abacus, misconceptions in mathematics
- 2000s
 - Lesson study, ICT, SMART schools, performance assessment, distant learning

Event timeline – focus area

- 2010s
 - Lesson study, assessment related to outcome of TIMSS, PISA, HOTS, Entrepreneurship, project-based learning, problem-based learning, inquiry-based learning
- Current engagement
 - 21st century skills, STEM education, HOTS, PISA, TIMSS, teaching mathematics through problem solving, lesson study, inquiry-based learning



Roles of RECSAM in supporting/contributing towards ASEAN Community

- Aims:
 - ✓ Improve the lives of the people in ASEAN which can be reflected on the economic and cultural development, social progress, peace and security, collaboration

Roles of RECSAM in supporting/contributing towards ASEAN Community (cont'd)

- ✓ Mutual assistance in training and research
- ✓ Improvement of living standards
- ✓ Promotion of Southeast Asian studies and cooperation



Roles of RECSAM in supporting/contributing towards ASEAN Community (cont'd)

- RECSAM can play the roles indirectly through teachers and educators to build human capital who:
 - ✓ Is resilient in facing challenges of the future
 - ✓ Is well equipped with the 21st century skills and competencies (OECD,1997)

Roles of RECSAM in supporting/contributing towards ASEAN Community (cont'd)

- ✓ Cultivates sustainability values and attitudes
- ✓ Is competent and well-versed in languages, ICT tools to convey ideas and thoughts
- ✓ Acts autonomously based on rational decisions

Roles of RECSAM in supporting/contributing towards ASEAN Community (cont'd)

- ✓ Has the ability to interact well with others in the community
- ✓ Is able to acquire knowledge, skills and find jobs and be competitive
- ✓ Is responsible and contributes to the society

RECSAM's course of actions

Two significant areas:

- Promoting inclusive education
- Promoting STEM education to keep up with the current trend and needs of the societies



RECSAM's course of actions

1. Promote Inclusive Education for Community through professional development programmes
 - Participants (in-service teachers) are mainly from ASEAN countries
 - ✓ Emphasise the ideas and practices to support teachers to include students with diverse needs in the classroom
 - ✓ Apply appropriate teaching and learning strategies to develop individual strength with high and appropriate expectations for each child

1. Promote Inclusive Education for Community through **professional development programmes (cont'd)**

- ✓ Support students through good inclusive practices such as collaboration, team work, innovative instructional practices, peer strategies, etc.
- ✓ Encourage collaboration and communication to deliver and share ideas for better understanding and improvement
- ✓ Value our diverse communities in most ASEAN societies. These communities start at school, where all students learn to live alongside peers. They learn together, play together, grow and nurture together

1. Promote Inclusive Education for Community through professional development programmes (cont'd)

- ✓ Courses in mathematics and science are designed and geared towards raising awareness of all ASEAN educators on their roles to develop the future generation to be well-equipped with knowledge, skills and values to build the ASEAN Community.

2. Promote Inclusive Education for Community through **SEA-BES** project

- SEA-BES is a regional curriculum project to develop a common shared and agreed upon standards for what every learner should know, be able to do and value in science and mathematics in the SEAMEO Member Countries.
- The Common Core Regional Learning Standards (CCRLS) in Science and Mathematics can be used to improve the quality of SEAMEO Member Countries' national curriculum by creating equity in curricular provisions across countries and high learning expectations for all students and learning outcomes that will enable students to contribute productively to their individual countries and region.

2. Promote Inclusive Education for Community through **SEA-BES project** (cont'd)

- The aim of the CCRLS in Science and Mathematics is to provide world class learning standards in science and mathematics including 21st century skills that can be used as a benchmark 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.

2. Promote Inclusive Education for Community through **SEA-BES project** (cont'd)

- On that context, science and mathematics learning standards are designed, emphasising development in the three components, namely;
 - ✓ To inculcate values, attitudes and human characters
 - ✓ To promote mathematical thinking process and scientific processes
 - ✓ To acquire fluency in the subject matter

These components are inter-connected and the competencies can be developed in classroom activities based in appropriate contexts.

2. Promote Inclusive Education for Community through **SEA-BES project** (cont'd)

- The project is made possible with maximum participation and involvement of experts and educators across the SEAMEO members and beyond
- CRICED has taken a lead role to link and extend our collaborations with others in the production of SEA-BES
- The support of CRICED still continues for the production of a mathematics learning standards guide book based on the CCRLS mathematics document

SEA-BES Regional Workshop (28-30 March 2017)



3. Promote STEM Education through STEM / SDG projects

- I. Search for SEAMEO Young Scientists (SSYS)
- II. International Conference on Science and Mathematics Education (CoSMEd)
- III. STEM Education Development



I. Search for SEAMEO Young Scientists (SSYS)

- SSYS is a regional platform where young scientists all over Southeast Asia and beyond gather to share and disseminate information on their scientific and mathematical research projects
- Since its inception in 1997, SSYS has been held once in every two years with a specific theme
- Encourage students to apply scientific and mathematical knowledge into technological problem-solving activities to address sustainability

I. Search for SEAMEO Young Scientists (SSYS) (cont'd)

- The theme of the biennial project in SSYS has always been focusing on 'sustainable development'

| SSYS ***THEMES*** | |
|-------------------|---|
| 2018 | Youth Creativity for Harmonising Sustainable Development Goals |
| 2016 | Youth Innovation for Sustainability |
| 2014 | Disaster Risk Reduction for Sustainable Development |
| 2012 | Beyond 2012: Greening the Environment for a Sustainable Future |
| 2010 | Sustainable Solutions for the Local Community |
| 2008 | Sustainable Community Development through Science and Mathematics |
| 2006 | Sustainable Development for a Better World |

I. Search for SEAMEO Young Scientists (SSYS)

- The three basic elements of sustainable development are ecological, economic and socio-cultural sustainability as outlined in the 2030 Agenda for Sustainable Development
- These three aspects of economic and social as well as cultural actions must be well blended to promote ecological balance and quality of human life. The concern about improving the quality of our life implies a change in our learning

I. Search for SEAMEO Young Scientists (SSYS)

- The project in SSYS aims to raise the awareness of youths about their roles and responsibility towards the sustainable development of their local community.
- The knowledge acquired and developed will provide confidence for them to be involved in pursuing their endeavour on matters related to sustainable development.

SSYS 2016 in action



Presentation of research projects



Judging of project exhibits



Viewing of exhibits



Award presentation



11th REGIONAL CONGRESS SEARCH FOR SEAMEO YOUNG SCIENTISTS



“YOUTH CREATIVITY FOR HARMONISING
SUSTAINABLE DEVELOPMENT GOALS”

26 FEBRUARY – 2 MARCH 2018
SEAMEO RECSAM, PENANG, MALAYSIA



II. International Conference on Science and Mathematics Education (CoSMEd)



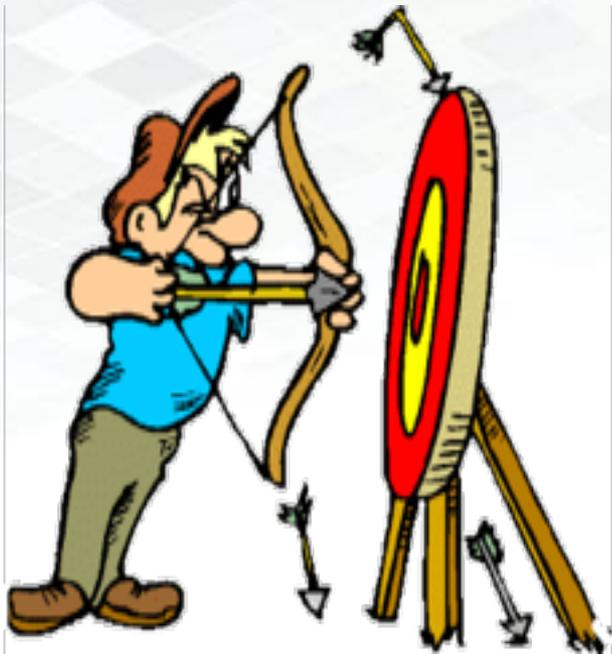
- A platform that brings educators and researchers together to discuss and address issues in Science and Mathematics education for the 21st century

II. International Conference on Science and Mathematics Education (CoSMEd)

| Conference | 6 th CoSMEd 2015 | 7 th CoSMEd 2017 |
|--------------------|---|--|
| Date | 16 – 19 November 2015 | 13 – 17 November 2017 |
| Theme | Revitalising Science and Mathematics Teaching and Learning Culture towards Sustainable Living | Humanising STEM Education for Sustainable Development Goals in the 21st Century |
| Conference strands | <ul style="list-style-type: none"> • Teaching and Learning Practices • Pedagogical Innovation • Teachers' Professional Development • Assessment and Evaluation • STEM Education Across Contexts • Equity and Equality | <ul style="list-style-type: none"> • 21st Century Teaching and Learning Innovations • Continuous Professional Development • Curriculum and Assessment • Humanising STEM Education and Career Development • Science and Mathematics Education for Special Needs Students |

II. CoSMEd 2017 in action





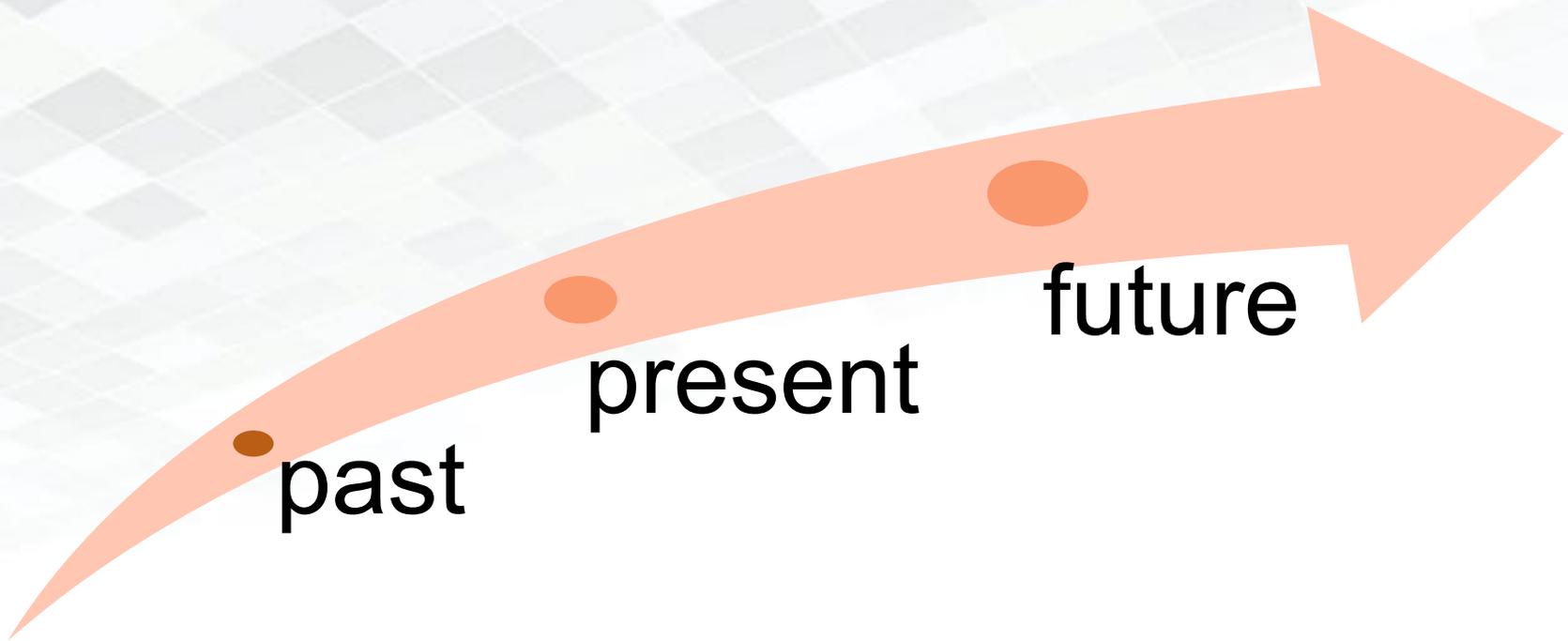
**What STEM-related
training
programmes and
research projects
does SEAMEO
RECSAM pursue?**



RECSAM plays a significant role in promoting STEM Education through

- research projects
- training of teachers and educators from SEAMEO Member Countries





Where is STEM Education at RECSAM?



STEM Education: Our Perspective

- STEM education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering, and mathematics.
- Students are actively engaged in inquiry, exploration, problem-solving, creative and critical thinking, logical reasoning, collaboration, investigation and in creating models, artefact, and relevant, authentic, meaningful and useful projects.



RECSAM'S STEM INITIATIVES



Workshop on Enhancing Science and Mathematics Teachers Pedagogical Content Knowledge on STEM Education

Assoc. Prof. Tairo NOMURA,
Saitama University, Japan
Collaboration with SEAMEO
Secretariat and MEXT, Japan
(20-22 January 2015)



RECSAM'S STEM INITIATIVES

**Differentiated
Instruction and
STEM: Enhancing
Mathematical
Thinking**

Prof. Beverly Ferrucci
Keene State College,
USA

(9-10 March 2015)



RECSAM'S STEM INITIATIVES



**Improvised Science
Workshop for
Regular Course
participants and
Malaysian teachers
and educators**

(15-16 April 2015)

RECSAM'S STEM INITIATIVES

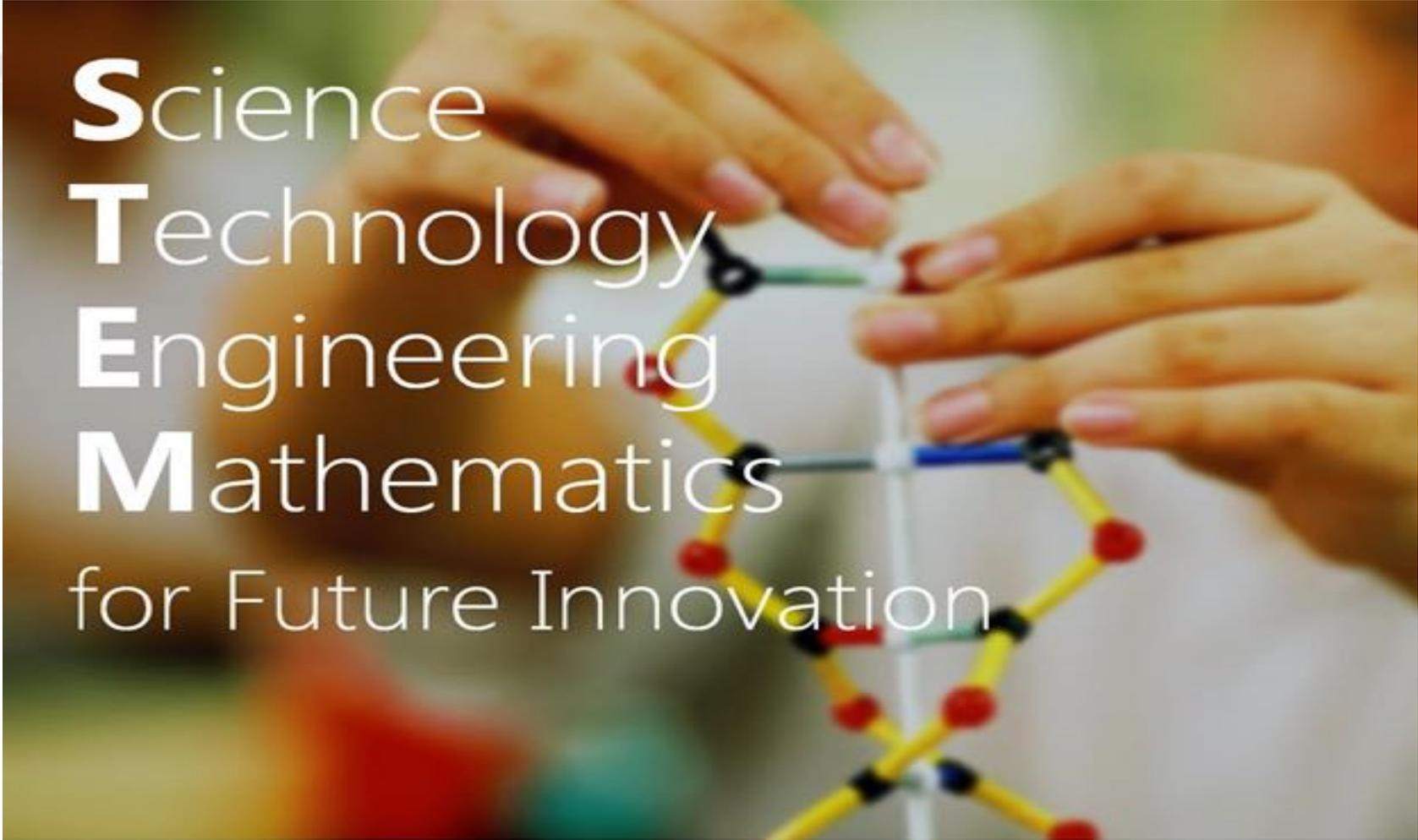


Early STEM Workshop
for educators of The
Institute of Childhood
Education-Studies and
Community Education
(CECE), Kuala Lumpur
(19-20 September 2015)

Promoting STEM Education through CSR Programme in our local community (14 May 2016)



STEM Partnership

A photograph showing two hands holding a colorful ball-and-stick molecular model. The model consists of yellow, red, black, and blue spheres connected by thin rods, representing a complex chemical structure. The background is blurred, showing other people in a classroom or laboratory setting.

Science
Technology
Engineering
Mathematics
for Future Innovation



RECSAM collaborates with the Ministry of Education Malaysia and local universities in the following:

- Research on STEM Education
- Implementation of STEM Education



Research on STEM Education

STEM Teachers' Mindset

Project aims:

- (1) To test the measurement model of teachers' self-perceived readiness to integrate STEM in teaching and learning
- (2) To investigate the readiness of teachers' self-perceived readiness to integrate STEM in teaching and learning
- (3) To determine the demographic factors which influence teachers' self-perceived readiness to integrate STEM in teaching and learning



Seminar on STEM Education for 21st Century Skills – Brightening Awareness of STEM Education as the National Agenda (14-15 May 2015)

- Facilitated by Prof. Dr. Lynn D. Dierking, Oregon State University and experts from Malaysia for 74 primary and secondary science and mathematics teachers and teacher educators



Enhancing STEM Thinking to Meet the Challenges of the 21st Century including TIMSS and PISA (20 May 2015)

- A seminar for the principals of secondary schools in Gombak District, Selangor, Malaysia



III. STEM Education Development

- a) Malaysia/UNESCO-IBE Needs Assessment Workshop (18-20 January 2016) for Strengthening STEM Curricula for Girls in Africa and Asia and the Pacific (Phase 1) under Malaysia-UNESCO Cooperation Programme (MUCP)
- An initiative programme intended to strengthen STEM Curricula for Girls focusing on educational content, methods and structures of STEM Education in fostering sustainable development

III. STEM Education Development

- b. Capacity Development Workshop (26-30 September 2016) for Strengthening STEM Curricula for Girls in Africa and Asia and the Pacific (Phase 1) under Malaysia-UNESCO Cooperation Programme (MUCP)
 - The project seeks to strengthen STEM policies, curricula and pedagogy in four beneficiary countries from Africa- Nigeria and Kenya- and Asia and the Pacific- Cambodia and Indonesia- mainly sharing Malaysian expertise and experience with regard to the inclusion of women in STEM fields

III. STEM Education Development

- c. STEM Workshop for 500 Malaysian teachers organised by Teacher Education Division, MOE Malaysia (in-service courses) and conducted in SEAMEO RECSAM
- Title: Enhancing STEM Learning in Secondary Mathematics/Science Classrooms
 - Main objective: To provide participants the necessary knowledge and skills in conducting STEM in their own classrooms.
 - 5 batches of 100 teachers per batch in 2017

III. STEM Education Development

- d. Workshop on STEM Using Low Cost Materials for
 - Secondary science and mathematics teachers and educators
 - Lecturers of Teacher Education Institute
- The aim of the workshop is to introduce participants effective hands-on activities using low cost educational materials for making teaching aids to improve the teaching and learning of STEM

III. STEM Education Development

e. Colloquium conducted at SEAMEO RECSAM

- Dr Margaret Chmiel from the Smithsonian Science Education Centre, United States gave a talk on “Challenges and Opportunities for Implementing STEM Education: Perspectives from the United States of America on 28 October 2016

III. STEM Education Development

- f) Workshop on Fostering Imagination and Critical Thinking in Engineering Design Process: A Challenge to STEM Education (6 – 8 February 2018)
- Collaborating Partner: Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan and SEAMEO Secretariat, Bangkok, Thailand
 - Facilitator: Dr. Tairo Nomura, Director, STEM Education Research Center and Assoc. Professor, Faculty of Education, Saitama University, Japan

(g) Promoting STEM Education through competitions

- i. Penang Science Olympiad 2016 (27 August 2016)
- ii. STEM Study Contest (23 September 2017)



III. STEM Education Development

➤ Objectives:

- ✓ Develop confidence in using technology to enhance students' problem-solving skills, imagination and critical thinking in STEM lessons
- ✓ Develop skills in engineering design process, model and product development through practical work and hands-on activities

III. STEM Education Development

➤ Objectives:

- ✓ Provide a platform for project-based and problem-based learning using STEM approach to solve real-life issues
- ✓ Promote collaborative learning on real-life problems that can use and apply integration of STEM knowledge and skills
- ✓ Raise awareness on the relevance of classroom learning in STEM fields and skills needed in the job market
- ✓ Learning forum for the exchange of new ideas, new knowledge and valuable experiences among students and teachers

Penang Science Olympiad



STEM Study Contest in action



Launching the water rocket



Making the structure for slowest moving object



Rubber band car racing



Group photo for all winners

Why STEM Education?

- The fundamental of all courses will focus on **the needs of ASEAN Community**
- The learning of the teachers and educators have to be kept abreast with other education development around the world

“To succeed in this new information-based and highly technological society, all students need to develop their capabilities in STEM to levels much beyond what was considered acceptable in the past”

(National Science Foundation, United States)

[Reference: <https://www.nsf.gov/pubs/2007/nsb07114/nsb07114.pdf>]



The Way Forward

- As a training institution, we need to build the skills, capacity and resources to participate in the delivery and achievement of the 17 SDGs which aim to end poverty, protect the planet and ensure prosperity for all (2030 Agenda, United Nations)
- Well-designed projects and courses need to be developed and implemented to ensure the impact and success of the programmes

[Reference: www.un.org/sustainabledevelopment/sustainable-development-goals]

- Enhance awareness and develop responsible citizens to play their respective roles through education in schools/institutions



Conclusion

- RECSAM constantly stays in-line with the latest development of STEM education and engaged in the 21st century learning skills and training.
- In envisaging the challenges of the future, much of the centre's training programmes focus on creating basic human characters, developing creative human capital with critical thinking and problem solving skills as well as enriching the science and mathematics knowledge of the community.
- In the latest endeavour, STEM education has been emphasised to bring about the awareness and enhance a workforce that will further affect the sustainability of economic development and wellbeing of the society at large