

Building Networks for Knowledge-Exchange and Peer Learning in Science and Mathematics Education within SEAMEO Member Countries and Beyond – the Role of SEAMEO RECSAM

Azian Abdullah, Devadason Robert Peter, Ng Khar Thoe and Wahyudi
SEAMEO RECSAM

Abstract

SEAMEO RECSAM was founded with the main purpose of helping member countries improve science and mathematics education. This would serve as a foundation for the development of technically and scientifically trained human capital which would be increasingly needed for the economic progress of member countries. Similar to many other SEAMEO Centres, RECSAM was designed to be supported extensively by the host country, Malaysia, where it resides. RECSAM contributes to the improvement of science and mathematics education in the region and beyond through various programmes and activities. They include training, research & development, convening international conferences, seminars and congresses, as well as to serve as an information centre and clearinghouse. To ensure relevancy of its activities for the region, RECSAM's programmes are formulated in consultation with senior education representatives from member countries as well as expert input from associate member countries. As with many non-profit organisations, funding is a recurring challenge. However, with the support of the Malaysian Government, the SEAMEO Secretariat and the member countries, RECSAM has been able to continuously reinvent itself to be relevant to the needs of the region.

Introduction

Cooperation efforts by developed nations to developing nations, whether as financial aid or technical cooperation are well documented in the literature. What is less known is that developing countries have for a long time also collaborated among themselves to help each other for various reasons including to foster peace and as potential for future economic activity. According to de Sa e Silva (2009), this idea of two or more developing countries helping each other existed at least since the early 1950's. These collaborations could be between two countries or between groups of countries sharing commonalities like religion or proximity to one another. SEAMEO is one such collaborative effort of member countries helping each other in Southeast Asia. This paper will highlight RECSAM's role as one of the centres established by SEAMEO to promote and improve science and mathematics education at the regional level.

SEAMEO RECSAM as a Multilateral Organisation

The Southeast Asian Ministers of Education Organisation (SEAMEO) is a multilateral non-profit organisation established on 30 November 1965 aimed to promote cooperation in education, science and culture in the Southeast Asian region. It consists of eleven member countries, namely, Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor Leste, and Vietnam. Eight associate member countries support SEAMEO namely; Australia, Canada, France, Germany, Netherlands, New Zealand, Norway and Spain. It is also supported by three affiliate members, namely, the International Council for Open and Distance Education (ICDE) Norway, University of Tsukuba Japan and the British Council. Japan is a partner country. These countries and organisations support SEAMEO in various ways.

The SEAMEO Council is the policy making body of SEAMEO and consists of Ministers of Education of each member country as well as representatives from associate and affiliate members, and they normally meet every year during the SEAMEO Council Conference to make policy decisions. The SEAMEO Secretariat is the executive arm of the Council and it is located in Bangkok, Thailand. The SEAMEO Secretariat executes decisions made by the Council. SEAMEO carries out its activities through nineteen specialist regional centres/units that undertake training and research programmes in various fields of education, science and culture and SEAMEO Secretariat is the coordinating body for these centres. SEAMEO activities follow guidelines provided for in the SEAMEO Charter (SEAMEO, 1968).

The operational budget for the SEAMEO Secretariat is underwritten by member countries and their annual share is determined by the Asian Development Bank (ADB) contribution index. For instance, the contribution by Malaysia for 2005 was approximately RM 918, 700 or USD 255, 194 (EPU, 2006). The SEAMEO Secretariat has also a SEAMEO Education Development Fund which serves as a central repository for funds from other sources to support its activities.

The Regional Centre for Education in Science and Mathematics (RECSAM) is one of the first centres formed after the formation of SEAMEO. It was formed with the premise that developing countries need an increasing supply of human resource that rely on science and technology and a strong basics on science and mathematics will contribute towards that end. By design RECSAM is located in Penang, Malaysia and enjoys significant support from the government of Malaysia. Since its inception in 1967, SEAMEO RECSAM has assisted in the major development of educational manpower for the advancement of science and mathematics education at both primary and secondary school levels for its eleven member countries. Since then RECSAM has been continuously offering full scholarship to teachers and educators in the region to take part in training to improve their skills and make them more adaptable to the changing educational environment. Up to now, well over sixteen thousand teachers and key educators in science and mathematics have benefitted from RECSAM's programmes and activities. RECSAM

has made significant steps in its purposes and roles, as RECSAM now embarks into its Ninth Five-Year Plan for the years 2010 till 2015.

RECSAM is an autonomous organisation but it relies heavily on funding by the Malaysian government. For instance the site, buildings and its maintenance are heavily financed by the Malaysian government. As will be explained in a later section, this funding is not enough. The Enabling Instrument of RECSAM (SEAMEO RECSAM, 2007a) is the legal document to guide its operation. The Enabling Instrument requires the Governing Board, whose membership consists of a nominee from each member country to provide governance to RECSAM.

RECSAM is headed by a Centre Director who reports to the Governing Board which meets every year to endorse activities proposed by the Centre. RECSAM has three divisions; the Research & Development Division, the Training Programme Division, and the Administrative Division. The academic activities of the centre are carried out by a number of seconded, permanent and contract academic staff. Seconded staffs are government educators of member countries seconded to RECSAM. They work for about three to five years at RECSAM before returning to their country. The total number of staff approved in the organisational structure of RECSAM is ninety-eight. This includes twenty-two academic staff inclusive of the two Deputy Directors for R&D and Training Programme. However, the Centre has not managed to fill in all the posts and at present, there are only thirteen academic staffs. Two seconded academic staff from Thailand and Indonesia recently returned to home service but three more academic staff will be joining RECSAM before the end of the year once their documents and work permits are approved. The Administrative Division has seven executives taking charge of finance, publication, marketing, administration and the International House, library information & documentation, and ICT. The support staffs assist in the technical, administrative and general duties.

Until recently, RECSAM was the only organisation mandated to assist member states to improve education in science and mathematics in their respective countries. However, in 2009, two centres were established by SEAMEO in Indonesia, namely the Regional Centre for Quality Improvement of Teachers and Education Personnel (QITEP) in Mathematics which is located in Yogyakarta and the Regional Centre for QITEP in Science which is located in Bandung.

Knowledge-Exchange and Peer Learning Activities of RECSAM

The scope and type of knowledge-exchange and peer learning activities of RECSAM that has evolved over many years have been shaped by the dynamic needs of the region as well as funding constraints. RECSAM's activities mostly focus on empowering teachers and teacher educators to improve their science and mathematics Pedagogical Content Knowledge (PCK) as well as the development of effective school based professional development practices. Two main knowledge-exchange and peer learning programmes are described next.

Training Programmes

There are five main modes of training offered by RECSAM, namely Regular Courses, In-Country Courses, Customised Courses, Third Country Training Programmes, and training workshops. The ultimate goal of these programmes is to improve the effectiveness of teachers in PCK so that they in turn will contribute to improving students' learning in science and mathematics. The PCK introduced incorporates numerous pedagogies such as active teaching and learning approaches, constructivist inquiry-based activities, scientific skills, and multiple intelligences. Emphasis is given to trends and issues in Science, Technology, Environment, Society (STES), alternative assessment, problem-based learning (PBL) and Values-based education. Focus is also given to effective school based professional development through Action Research and Lesson Study. ICT is used extensively throughout the courses and participants are provided with the opportunity to explore and use these tools for teaching and learning.

RECSAM also explored the blended mode of training with research and development activities as the centre is a regional training hub to promote innovation and experimentation with sharing of best practices to enhance 'South-South Cooperation' initiatives. Generally, the mode of delivery for numerous types of 'knowledge-exchange and peer learning activities' was implemented either through face-to-face training courses/seminars/workshops, or digitally through e-learning mode to reach out to a wider audience. An on-line learning portal entitled "South East Asia Regional Capacity-building Hub" (SEARCH) was established to promote student-centred inquiry learning, project-based activities (PBA) and problem-based learning (PBL) (Ng & Nyunt, 2010).

Regular Courses. The government of Malaysia gives RECSAM a yearly Special Educational Development Fund (SEDF) to conduct activities for the member countries through full scholarships. This fund is mainly disbursed through the Regular Courses. The past few years saw seven one month Regular Courses being offered to member countries every fiscal year thus potentially benefitting a maximum of seventy-seven participants (one participant per country for each course). Additional participants can participate in these courses as fee-paying participants. These courses are designed in such a way that allows for maximum learning. Some of the highlights of the courses include inputs by experts followed by opportunities to translate these inputs into lesson plans. These lesson plans are then tried out with the course members where upon reflection, they are modified. These modified lesson plans are then tried out with the students in RECSAM's partner schools. Another post-mortem session is then held to improve the lessons based on observations of the participants and feedbacks from the course supervisors. At the end of the course, the participants are given a certificate of completion and later a certificate of competence if they show evidence of disseminating what they had learnt in their respective countries. The seven Regular Courses conducted for Fiscal Year (F.Y.) 2009/2010 are PS1444: Exploring Interactions in Science, Technology, Environment and

Society (STES) Education for Sustainable Development at the Primary Level, PS4120: Developing Scientific Skills for Meaningful Learning in Primary Science, SM-6522: Learning Mathematics in a Constructivist Secondary Classroom, SS-5265: Assessment in a Constructivist Environment for Teaching and Learning in Secondary Science, PM-2265: Realistic Mathematics Education (RME) for Meaningful Learning in Primary Mathematics, SM-3050: Integrating Information and Communication Technology (ICT) on Students' Assessment in Secondary Mathematics Classrooms, and PS-7112: Lesson Study: Enhancing Instructional Practices in Primary Science Classroom (SEAMEO RECSAM, 2010). RECSAM's Fiscal Year begins in July and ends in June the following year.

In-Country Courses. In-Country Courses are courses, typically of five days duration, that are conducted in the recipient country by two academic staff from RECSAM. They are a recent addition to the type of courses offered by RECSAM since F.Y. 2005/2006. They are one solution to concurrently addressing funding issues, increasing the centres' reach to more participants as well as customising the course specifically to the needs of the recipient country. Currently the funding by the Malaysian government allows for the conduct of seven Regular Courses and four In-Country courses per fiscal year. RECSAM will use the SEDF to finance the two staff to be sent to the recipient country while the latter will take responsibility for the local costs such as venue, participants' accommodation and meals, and other costs. Two examples (SEAMEO RECSAM, 2010) of In-Country courses held in 2009 include:

- “Active Teaching and Learning in Science” which was held at Ecotech Centre, Lahug, Cebu City, Philippines, from 14 - 18 September 2009. This In-Country course was organised by the Bureau of Elementary Education (BEE), Department of Education (DepED), Philippines. A total of 45 participants benefitted from the training programme.
- “Lesson Study” which was held at Princess Elizabeth Primary School, Singapore from 2 - 3 September 2009. The course was organised by the Training & Development Division, Ministry of Education Singapore with a total of 44 primary school teachers across Singapore.

Customised Courses. Customised Courses are courses that are customised to the needs of the recipient country or organisation. RECSAM does not fund these courses and it serves as an important income generating activity for RECSAM. The standard mode of Customised Courses involves direct negotiation between recipient country or an agent and RECSAM as part of a bilateral mode of cooperation. The two most recent examples of customised courses held are:

- “Classroom Action Research: Enhancing Teaching in Secondary Science and Mathematics” conducted at RECSAM from 9 November - 4 December 2009. Thirty Indonesian teachers benefitted from this programme and was requested and

sponsored by the Ministry of National Education, Indonesia.

- “Improving Student Performance through Assessment” for Ugandan and Zambian Science Educators from 31 May to 25 June 2010. These customised courses involved the participation of JICA as the funding agency making use of RECSAM to reach out to another developing country.

Third Country Training Programmes. The recent mode is to have a tripartite cooperation where a funding agency or organisation cooperates with another developing country or agency located in a developing country to fund programmes for a country or a number of countries. RECSAM was appointed as a Malaysian Technical Cooperation Programme (MTCP) Institution by the government in 2008 and RECSAM conducts two TCTP programmes; one with JICA for the African nations and the other with the Colombo Plan Secretariat in Sri Lanka for the Colombo Plan developing countries, four of which are shown below:

- Two TCTP courses for Colombo Plan countries entitled “Professional Development Programme for Secondary Mathematics Educators” and “Professional Development Programme for Secondary Science Educators” were conducted by RECSAM from 29 July - 18 August 2009. A total of 30 Mathematics and Science educators from Afghanistan, Bhutan, Brunei Darussalam, Fiji, Iran, Indonesia, Maldives, Myanmar, Nepal, Philippines, Sri Lanka and Thailand participated in these training programmes.
- Two TCTP programmes for the African nations entitled “Secondary Science Teacher Educators Training” and “Secondary Mathematics Teacher Educators Training” were conducted from 5 - 30 October 2009. A total of 30 Mathematics and Science educators from ten English-speaking African countries participated in these programmes, namely, Ethiopia, Kenya, Uganda, Nigeria, Tanzania, Zambia, Swaziland, Lesotho, Malawi, and Rwanda.

Training Workshops. In addition to the four main types of courses, RECSAM also conducts training workshops that are regularly convened at RECSAM. This is part of RECSAM’s role in hosting workshops and seminars from well-known academics of reputable educational institutions. These events are normally held between one and three days with the aim of providing an alternative scope for learning and some of them are planned to coincide with the Regular and Customised Courses so that these participants can have access to these high quality workshops.

Post Graduate Diploma. RECSAM also offers a Post Graduate Diploma programme leading to a Masters Degree in collaboration with Deakin University in Australia. The main rationale is to provide a route for participants from member countries to experience studying in a developed country for a fraction of the cost. A group of mathematics and science teachers from Aceh, Indonesia fully funded by the Aceh Province Government,

just concluded their six months Post Graduate Programme at RECSAM from 1 March – 20 August 2010. They will then further their studies for another four months at Deakin University to be awarded a Master of Education degree after completion.

Research and Development Activities

RECSAM convenes a number of knowledge generation and knowledge exchange activities to find solutions to emerging challenges as well as explore new opportunities to be taken by the region in order to progress science and mathematics education. Some of the major activities include:

Research. RECSAM conducts research to inform pedagogy as well as to inform policy. Research informing pedagogy is often confined to neighbouring schools within the vicinity of RECSAM. An example of a recently concluded research informing pedagogy is “The EUREKA Project” (Devadason et al. 2009), which studied the efficacy of using high fidelity 3D animations on science and mathematics for teaching and learning in six secondary neighbouring schools. Research informing policy often involves the participation of member countries. A recent study is on the use of ICT for teaching and learning Science and Mathematics among member countries. Eight countries participated in this study that resulted in the publication of a book (Devadason, Wahyudi, Cheah & Ng, 2010).

Journals. RECSAM publishes two journals; one caters for teachers while the other caters for researchers. The Learning Science and Mathematics online Journal is published every November and articles that offer practical suggestions for teaching and learning of science and mathematics are solicited especially from member countries or from participants from other countries who have participated in RECSAM’s programmes before. The International Journal of Science and Mathematics in Southeast Asia is a peer reviewed international journal published twice a year. The articles for this journal are reviewed by an international team of reviewers who are experts in the field of science and mathematics education.

Development of Resources. RECSAM coordinates and publishes resources that are of benefit to teachers and teacher educators. Recent publication includes the “The Training of Training Manual for Promoting Scientific and Technological Literacy (STL) for all” (Lee, 2008), “Teaching Science in School. La main a la pate resource materials for the primary classroom” (Foo, 2007) and the forthcoming book “Integrating Climate Change Issues in Southeast Asian Schools - A Teacher’s Guidebook” which is the result of a collaboration between RECSAM and other sister centres. RECSAM staff also contributed to the development of resources with other sister centres such as the SEAMEO Resource Package: Human Values-based Water, Sanitation and Hygiene Education (Pannen, Ng,

Jaslin, Dina & Herawati, 2007). On a smaller scale, participants' project works after the courses (at least those of a duration of one month or more), which are normally in the form of lesson plans, are also compiled and kept in the Library as resource materials.

Conference, Congress and Seminars. Knowledge sharing and exchange activities of RECSAM are periodically convened through the International Conference on Science and Mathematics Education (CoSMEd) and the Search for SEAMEO Young Scientists (SSYS) Regional Congress which are biennial events, and occasionally through seminars.

CoSMEd provides a venue where experts and practitioners (educators/teachers) from the region and beyond come together to discuss issues about teaching, learning and assessment in science and mathematics. The first CoSMEd was convened from 6 to 8 December 2005 with the theme "Bridging the theory-practice gap in science and mathematics education: The challenge to change". The 2nd CoSMEd was held from 13 to 16 November 2007 on the theme "Redefining Learning Culture for Sustainability" and the 3rd CoSMEd was conducted from 10 to 12 November 2009 on the theme "Improving Science and Mathematics Literacy: Theory, Innovation and Practice".

The SSYS regional congress was first convened in 1997 with the main objective of 'promoting scientific attitudes and awareness; as well as providing a forum for exchange of ideas and experiences among students in SEAMEO and invited associate member countries'. The success of the first congress had spearheaded subsequent SSYS events in line with the themes to promote "Science, Technology, Environment, and Society" (STES) education during the second SSYS in 1999 and the third SSYS in 2002. The Centre sponsors the registration of official delegates from all the participating SEAMEO member countries only but teacher and student delegates from Cambodia, Lao PDR, Myanmar, Vietnam and Timor Leste (CLMVT) are also provided with return airfare. The SSYS congresses that were conducted in 2004 and after were organised in accordance to UNESCO's Decade of Education for Sustainable Development, 2005 – 2014, and the fourth SSYS (8 to 10 March 2004) had the theme "Towards A Sustainable Future", the fifth SSYS (6 to 9 March 2006) with the theme "Sustainable Development for a Better World", the sixth SSYS (3 to 6 March 2008) with the theme "Sustainable Community Development through Science and Mathematics, and the seventh SSYS (2 to 5 March 2010) with the theme "Sustainable Solutions for the Local Community".

The Joint RECSAM-ICASE Regional Seminar on "The Way Forward for Science and Technology Education: Implication for Policy Makers" which was held from 16 - 19 February 2009 and the National Science and Mathematics Centres Meeting which was held on 25 and 26 June 2009 respectively at RECSAM are good examples of the occasional seminars convened by RECSAM. These seminars serve as forums to develop relevant activities for the region. For example, as a follow-up to these seminars, a working paper on Science and Mathematics Education Policy Benchmark: The Way Forward for Southeast Asia was prepared and forwarded to the SEAMEO Secretariat. The main aim of this working paper was to put forward a road map to improve the quality of Science and

Mathematics education in Southeast Asia and to seek support of the SEAMEO member countries for the drafting of the Science and Mathematics education policy benchmarks for Southeast Asia.

Addressing Technical and Allocative Efficiency Issues

One of the challenges of the centre is to provide programmes that are relevant and of sufficient quality for the region and beyond. This is a challenge because the SEAMEO region consists of countries with vast disparity within each country and among individual member countries. For example, Singapore is categorised as developed while Timor Leste is categorised under the least developed nation category. This is compounded by the need to deal with a number of countries that do not use English and with teachers and teacher educators that have different levels of competency in their subject.

Designing training programmes and research activities according to the needs of the member countries is thus a challenge. RECSAM has however formalised this process in the form of the Five-Year Plan and RECSAM will implement its 9th Five-Year Plan from July 2010 to June 2015. In formulating this plan, representative education experts from each member country and consultants from associate member countries were invited in 2009 to discuss and finalise the programmes deemed relevant for its members. It is during these Five-Year Plan meetings that issues like programme relevancy and potential impact are discussed and amicable solutions sought.

The detailed design of the Regular Courses is finalised one month before the commencement of the courses with input from lecturers of teacher training institutes or universities. While the core topics of the courses are facilitated by the centre's academic staff, external course consultants are also sourced mainly from the higher learning institutions. To provide international flavour, consultants from developed countries like Australia and New Zealand are also sourced to provide input during the course through training workshops. As not all participants have the opportunity to use the computer, ample opportunities are provided for them to equip themselves with ICT skills such that when they go back to their respective institutions, they have at least the basic skills to use the word processor and presentation tools as well as an idea of the use of ICT tools for teaching science and mathematics. To further enrich their experience in Malaysia, an educational study visit to Kuala Lumpur, the federal capital of Malaysia as well as Putra Jaya, the administrative capital of Malaysia is arranged. Feedback mechanisms like the weekly formative feedback (so that corrective measures can be taken immediately if there are problems), Pre- and Post-tests (to measure extent of learning), the summative Course Evaluation (to measure success of the course) are carried out. Summative Evaluations are also conducted for all major activities of the centre including conferences and reports produced.

All participants of the Regular Courses are expected to create The Multiplier Effect Document. It is essentially a document that spells out how the participant will disseminate

what was learnt in his/her country. With the Multiplier Effect document, the participant is in a better position to negotiate with education officials of his/her country, whether at school level or district level or higher to produce the optimal impact. An incentive in the form of a certificate of competence is given to the participant if he/she sends evidence of conducting the Multiplier Effect.

After the participants return to their respective countries, an impact study is conducted every three years to gather feedback on the impact Regular Courses had on improving practice in their respective countries. Funding constraints does not allow RECSAM staff to visit the participants to assess how the Regular Courses have impacted them. Instead a questionnaire is sent to each participant. A report is produced and reported to the Governing Board for further action. The Impact Study is currently the closest the centre is able to go towards determining how far its courses have impacted the participants.

Sustaining RECSAM as a Public Good Institution

As a centre that has been mandated to promote science and mathematics education among the SEAMEO member states, RECSAM faces a lot of challenges especially with regards to the limited funding. The Centre is hosted by the Malaysian government and receives a yearly grant from the government through the Ministry of Education. RECSAM has been receiving this yearly grant since 1995 when the centre was given autonomous status by the Malaysian government. With autonomy, the centre takes charge of its own administrative and financial matters. The grant is meant for staff remunerations and operations, which include maintenance and supplies. The salary scale of the staff at RECSAM is based on the civil services' salary scale with a 3% – 6 % increase. Each time the government revises the civil services' remunerations and allowances, RECSAM will follow suit to enable the centre to attract not only Malaysians but also foreign staff to work here as specialists. As a result, the amount spent on remunerations has increased over the years and by 2007, the centre has spent about 80% of the yearly grant on remunerations leaving an insufficient amount for operations.

Ever since RECSAM was awarded autonomous status in 1995, the centre had been generating its own revenue to be able to run its programmes to fulfil its mandate. In F.Y. 2006/2007, 6% of the expenditure came from the revenue which increased to 17% in F.Y. 2007/2008. However, when the Malaysian government awarded the centre an additional 42% in the yearly grant in 2008, we did not have to utilise our revenue and the revenue generated was channelled to the Reserve Fund to be kept for other use such as the physical development of the centre. It is estimated that for F.Y.2010/2011 to F.Y.2014/2015, about 9% to 19% of the centre's budget will have to be sourced from our revenue. RECSAM will need to generate more income not only to be able to carry out planned activities and programmes, but to continue to attract qualified people to work as specialists and maintain the quality of our trainings too.

Besides the yearly grant, RECSAM also receives an annual sum of US\$125,000 from the Malaysian government under the Special Educational Development Fund (SEDF) and this money is used to provide scholarships for science and mathematics educators from Southeast Asia to attend the one-month professional development Regular Courses at RECSAM. The scholarship includes the cost of airfare, tuition fees, book allowance, food allowance and accommodation. During the implementation of RECSAM's Eighth Five-Year Plan (SEAMEO RECSAM, 2003) from F.Y. 2005/2006 to F.Y. 2009/2010, nine Regular Courses were offered with one participant from each SEAMEO member country per course. However, in F.Y.2008/2009, the centre had to reduce the number of courses from nine to seven due to increasing operating costs, especially the airfares of the participants (SEAMEO RECSAM, 2007b). In 2006 too, Timor Leste became the newest member of SEAMEO and there were additional costs for nine more participants to be considered. For the Ninth Five-Year Plan (SEAMEO RECSAM, 2009) that will be implemented in July 2010 until June 2015, the Regular Courses will be further reduced from seven to four but the number of participants will remain at seventy-seven, the number that is offered for seven courses. This will be carried out by offering the scholarships to two participants per country for three of the courses.

To compensate for the limited number of participants who are able to attend courses at RECSAM, the SEDF is also used to send the centre's specialists to the SEAMEO member countries to conduct five-day courses. The In-Country Courses was started at the end of F.Y. 2005/2006 for two member countries but increased them to four in F.Y. 2008/2009. The In-Country courses will be further increased to six countries in July 2010 during the implementation of the Ninth Five-Year Plan. Apart from the Regular and In-Country courses, the SEDF is also meant to be used for staff exchange programmes and the annual Governing Board Meetings. Since the annual SEDF received is quite insufficient to be able to cover all the activities mentioned above, the Government of Malaysia has also deposited about US\$625,000 into an endowment fund that was set up in 1995 (SEAMEO RECSAM, 1995) and every year, the centre is only allowed to use the interest accrued from the principal sum to top up any shortage in that fund.

As a centre that was established under the wings of SEAMEO, RECSAM has enjoyed certain immunities and privileges accorded by the host government, and one of them is tax relief. In other words, the centre does not have to pay tax to the government for any revenue generated, and this has helped the centre to save a substantial amount of money every year. One way of generating revenue is by encouraging member countries to send more participants to attend the Regular Courses as fee-paying participants, and Indonesia and Thailand top the list. RECSAM also generates revenue by offering other training programmes apart from the Regular and In-Country Courses. These training programmes include the customised courses that are open to not only member countries but countries beyond the region as well. Table 1 shows the number of participants who attended RECSAM's Regular, In-Country and Customised Courses for the past 10 years taken from RECSAM's Annual Reports from F.Y. 2000/2001 to F.Y. 2009/2010.

Table 1. Number of participants in Regular, In-Country and Customised Courses

Fiscal Years	Regular Courses		In-Country Courses	Customised Courses
	Scholarship	Fee-Paying		
2000/2001	88	7	-	1061 (901)*
2001/2002	86	2	-	582*
2002/2003	90	11	-	546 (401)*
2003/2004	84	3	-	37
2004/2005	80	5	-	215
2005/2006	80	60 (58)**	74	90
2006/2007	88	19	79	225
2007/2008	89	44	181	111
2008/2009	60	1	214	302
2009/2010	72	2	233	220

* Malaysian teachers who attended the customised courses funded by the Malaysian Government on the World Bank ESSP Loan.

** Fee-Paying participants from Aceh and Bandung, Indonesia

As mentioned above, the centre also conducts training workshops facilitated by its own specialists or consultants from universities or training institutions worldwide, and these workshops are mainly catered to Malaysian teachers and teacher educators. Even though the training workshops are income-generating activities, free registration is usually given for a maximum of 50 places a year to Malaysian teachers.

RECSAM started the training of African educators five years ago under the Strengthening of Mathematics and Science education in Western, Eastern, Central and Southern Africa (SMASSE-WECSA) project. RECSAM was first approached by the JICA office in Kenya to enquire about training courses for their teacher educators in 2005. Five trainers from the Centre for Science, Mathematics and Technology Education (CEMESTE) in Kenya were sponsored by JICA as fee-paying participants in the Regular Courses in July 2005. This was followed by one-month customised courses for 40 Kenyan educators in August 2006, 24 Ugandan educators in June 2007, 40 Kenyan educators again in August 2007, and 28 Ugandan, Nigerian and Zambian educators in June 2008 and again in June 2009 for 32 of them. Two-week customised courses were also conducted for 13 Malawi Science trainers in February 2009 and 23 Mathematics and Science trainers in November 2009. Even though these programmes are considered as revenue generating activities, they have somehow propelled RECSAM to become a widely-known institution involved in south-south cooperation.

The centre also has very good facilities in the form of a hostel or Residence Halls with 119 rooms built in the early 1970's but was later expanded to 152 rooms and a 20-bedded dormitory was also added in 1997. Eight two-bedroom flats were also built in the same year to house some of the academic and management staff, especially for those who do not reside in Penang. In 2006, renovation works commenced to upgrade the Residence Halls and its name was changed to RECSAM International House and opened to the public. The occupancy rate of the International House has only reached an average

of 24% in 2009 and concerted attempts are being made to market it further. A swimming pool will be built soon to attract more customers to the International House. Other facilities that are rented out include the meeting and seminar rooms, conference hall, auditorium, and tennis courts. RECSAM also has a business complex with office space for rental and at present the complex houses the cafeteria, mini-market, photocopy shop, kindergarten, and offices.

Without the additional revenue, RECSAM will not be able to conduct all those activities that has been planned to promote science and mathematics education in the region. One big event that the Centre has been conducting since the late 1990's is the SEAMEO Search for Young Scientists (SSYS) Congress that is organised every two years and all the expenditure for this activity comes from the Centre's revenue. RECSAM used to organise the SEAMEO Mathematics Olympiad too but had to discontinue with the event due to shortage of funding. The Centre will not be able to upgrade and maintain its facilities too without the additional revenue, for example, purchasing of new computers, software, and equipment for the training labs, and upgrading the International House and all other facilities.

Future Directions

As argued in the previous sections, with escalating costs, especially on transportation, it has become increasingly difficult to run one of the major scholarship activities for the member countries, that is, the Regular Courses. As mentioned earlier, in the early nineties, the duration of the Regular Courses was three, six, and nine months but reduced to 6 weeks in 1997 (SEAMEO RECSAM, 1997) and currently further reduced to 4 weeks. Any duration less than one month may reduce its impact on the participants significantly and that includes lost opportunities for cultural exchanges and experiencing best practices. The Centre has realised the potential benefit of tripartite cooperation where a funding country or agency works with RECSAM to offer scholarships for its training programmes. Currently the Centre's experience with such cooperation is with both JICA and the Colombo Plan Secretariat. It is hoped that in future the Centre may be able to adapt this tripartite cooperation mode with some other funding agencies to offer more help to the least developed SEAMEO member countries.

In light of the dearth of research on science and mathematics education at the regional level, RECSAM will take the initiative to increase research and development in this area at the basic level. It is envisaged that research and development at the regional level will contribute towards policy and pedagogy changes that can affect the improvement of the quality of science and mathematics education in the region. This will often involve large sums of money and since funding from international agencies are difficult to procure due to keen competition for a limited resource as well as the requirement that funding is contingent on fulfilling the needs of the agency rather than the region. As such RECSAM has set up the 'Research and Development Fund' since 1st July

2009 using 5% of the revenue every year for this purpose. With such a funding mechanism it is hoped that the centre will be able to carry out its research and development activities with minimum funding constraints.

The Centre has in recent years looked at ways to measure progress in the improvement of science and mathematics education at the regional level. This will require the formulation of benchmarks and some form of comparison tests in science and mathematics. One way is to develop some form of Science and Mathematics Education Standards for the region. This will be done by examining the science and mathematics standards of various developed and developing countries. A set of standards will then be formulated with consultation among experts and representatives of the member ministries of education. A set of standards of this nature would serve as a base for each country to improve, a sort of “zone of proximal development”.

Another contribution towards regional improvement of science and mathematics education will be done through the Southeast Asian Regional Assessment (SEARA) on Mathematics and Science Competencies of Grade 7 Students. SEARA is an effort to map the science and mathematics competencies of the students in the region. It will be similar to the Trends in Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) but it will be done on a much smaller scale. SEARA will enable the SEAMEO member countries to determine the achievement levels of science and mathematics education in their own countries in relation to the other member countries in the region and strive towards achieving the higher benchmarks.

Conclusion

The wisdom of the founding education ministers of SEAMEO to locate its regional centres in its member countries has in a way paid off because all the centres have the support of the host government. This is true for RECSAM which is grateful for the support of the Ministry of Education Malaysia. RECSAM has, in recent years, faced many difficult challenges ranging from financial to human resources and yet continue to face the challenge of reinventing itself so that the impact for the region can be maximised. However, in the spirit of SEAMEO cooperation together with support from the associate and affiliate member countries and especially the Ministry of Education Malaysia, we see RECSAM continuously shaping itself to provide optimal support in the development of science and mathematics of member countries.

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