

Nurturing Talents through Research Projects for Sustainable Community Development

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The 6th Regional Congress for the ‘Search for SEAMEO Young Scientists’ (SSYS) was held from 3 - 6 March 2008 at SEAMEO RECSAM, Penang, where 18 Science and 12 Mathematics research projects were exhibited by about 100 young scientists from the secondary schools of 8 ASEAN countries. Although the main aim of the congress was to provide a platform for talented youths to share information on their scientific and mathematical research projects, a competition was held concurrently to give recognition to high quality projects. Judging was based on the creativity of the exhibit, verbal presentation and interactive communication skills, written report, and significance of the project to the theme ‘Sustainable Community Development through Science and Mathematics’. This paper briefly reviews the projects presented, and then, based on the author’s direct observation of the exhibits and personalities of the researchers, informal discussions and interaction with the young scientists, written reports, and the feedback from the judges, attempts to gauge the relevance of the application of scientific and mathematical knowledge to technological problem-solving activities to address sustainable development. SSYS was first held in 1997 and since then has been held every two years with a specific theme. The scientific and mathematical research projects showcased by our talented ASEAN youths this year are in line with the theme of the 10th APCG ‘*Nurturing Talents for the Global Community*’.

INTRODUCTION

SEAMEO¹ RECSAM² holds a biannual event in Penang termed ‘the Search for SEAMEO Young Scientists (SSYS)’ for secondary school students from ASEAN³. In this event, the student scientists exhibit, share and disseminate information on their scientific and mathematical research projects. SSYS was inaugurated in 1997 and, since then, has been held every two years with a specific theme on *sustainable development*. It aims to encourage young learners to apply scientific and mathematical knowledge to technological problem-solving activities to address authentic environmental and socio-economic problems. This goes beyond stimulating interest in learning Science and Mathematics. It raises awareness in the young learners of the inter-relationship between science, mathematics, technology, the environment, economy and society. Working in cooperative teamwork with their peers could foster camaraderie, and by participating and engaging in intellectual discourse and exchanging ideas during the congress, exhibition and competition, these young scientists are able to network and gain a better understanding of their diverse cultures.

THE THEME

This year, the 6th Regional Congress for SSYS adopted the theme *Sustaining Community Development Through Science and Mathematics*. Sustainable development, as defined by the Brundtland Commission (1987), is *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*.

Generally understood, ‘needs’ basically refers to the continual attainment of well-being from the sustainability of the environment, society, and economy. *Sustaining community development* is seen to be the processes and changes that can improve the livelihood, welfare and living conditions of the people inhabiting a community. SSYS believes that education, notably in science, technology and mathematics, is essential to achieving the sustainability of human needs, and the youth have a crucial role to play to achieve this end.

¹ Southeast Asian Ministers of Education Organisation

² Regional Centre for Education in Science and Mathematics (<http://www.recsam.edu.my>)

³ Association for Southeast Asian Nations

PARTICIPATION AND PRESENTATION

The 6th SSYS was held from 3-6 March 2008 and it attracted 18 Science and 12 Mathematics research projects exhibited by about 100 young scientists from the secondary schools of eight ASEAN countries. Each project was presented by two student researchers and might be accompanied by a teacher adviser and several student assistants. Each country could have one Science and one Mathematics project, with two teacher advisers and four student researchers as official delegates, endorsed by the country's Ministry of Education. However, the respective countries are encouraged to enter more than one project for each category to garner wider participation.

Each research project was required to be related to the application and integration of knowledge in Basic Science (Biology/Chemistry/Physics/General) and Mathematics with Technology, Environment or Health which aims at improving the quality of life in the community for a better future. Projects would have to focus on the theme, i.e. the nature of the concept of sustainable community development, emphasizing the three pillars of development in environment, economy and society, to achieve sustainability. The originality of the projects, as well as the demonstration of innovation and creativity in applying scientific and mathematics principles in designing technological inventions or processes to meet the needs of societal development, were important factors in deciding the winners of the competition. In essence, the projects must be relevant and can contribute to the development of the community to meet its needs in environmental and socio-economic growth with sustainability. Innovation is seen in terms of the projects being useful, cost-efficient, environmentally-friendly and feasible. Creativity is seen as the ability to use simple scientific or mathematical principles, imagination, and even common sense, to generate ideas, programmes, models, or produce technological inventions or solutions to address environmental and societal problems.

The organizer was furnished with an abstract of each project, followed by a full written report. During the three days at the congress, the products of the research projects, including posters, materials, models and equipment, were exhibited in a hall. The

participants of each project had to do an oral and visual presentation using MS PowerPoint, and to answer questions raised by the judges and the audience. The judges then visited each project on display and the young researchers were subjected to intense quizzing and queries from the judges.

EVALUATING THE PROJECTS

SSYS is designed to encourage and give recognition to the potential and talents of the young scientists. The competition is to add more excitement to the event and provide incentive to the participants. The projects are judged based on the following criteria shown in Table 1.

Table 1: Criteria for Judging the Projects

Components	Criteria	Percentage
Project Exhibit (25%)	Use of scientific and mathematics principles or approaches	10
	Originality/ingenuity or creativity/innovativeness of work	10
	Use of computers/ICT knowledge (for projects involving ICT/multimedia) or technical/graphical skills (for the projects not involving ICT / multimedia)	5
Presentation (25%)	Skills in presentation	10
	Scientific and mathematical thought and creativity	5
	Interactive abilities which include the quality of questions asked and responses given during the Presentation	5
	Overall personality	5
Written Report (25%)	Abstract	5
	Introduction and Background of Study/Literature Review	5

	Research Method and Process	5
	Results, Findings and Discussion	5
	Conclusions and Recommendations	5
Significance of Project (25%)	Relevance to the theme	10
	Contribution to meeting human needs and the Sustainable development of society	10
	Impact on the quality of environment and society	5

Scores in each component were totaled and the project with the highest score was awarded Best Project Exhibit, Best Presentation, Best Written Report and Most Significant Project. The next two top scorers were awarded 2nd and 3rd placing. The project in each category that obtained the highest sum total of scores was declared the winner of the ‘Most Promising Young Scientist’ respectively. An overall winner of the Challenge Trophy was elected among the two.

This paper will not deal with the judging of the projects. It intends to describe briefly the projects presented. Then, based on oral and written reports as well as the exhibition, together with the feedback from the judges, it attempts to gauge the relevance of the application of scientific and mathematical knowledge to technological problem-solving activities to address sustainable development.

THE PROJECTS

Not all projects exhibited will be presented in this paper due to constraints of space. For the same reason, images and visual illustrations, which are integral to this paper, are not included here but will be shown during the paper presentation at this conference.

SCIENCE PROJECTS

(1) A SUSTAINABLE FORESTRY: THE STUDY ON *Acacia spp.* IN BERAKAS FOREST RESERVE

By Hj Muhammad Qawie Bin Hj Sabli & Muhammad Syazwan Bin Hj Zaini of Brunei

Darussalam

Description:

Acacia is a fast-growing exotic plant which can thrive easily in the tropics. It has been observed that their invasive success is due to abundant seed production, widespread dispersal efficiency and the ability to remain viable in the soil for a long time. Burnt sites are quickly occupied by Acacias because they grow well in conditions with high temperatures, high light intensity and low relative humidity. *Acacias* are unlikely to invade an undisturbed forest or a properly managed plantation.

Innovation & creativity:

A comparative study of the abundance of Acacias in burnt land, plantation land and a nearby forest. A recommendation is made to make this vegetation a potential timber product to be exploited commercially and thus contribute to the diversification of Brunei's economy. This will, as the researchers see it, certainly sustain the community and the economic development of Negara Brunei Darussalam.

(2) PLASTIC SOLUTIONS

By Lee Julin & Choi Xin Ling of Malaysia

Description:

In Malaysia, it is estimated that petrochemical plastics constitute about 15-20% of the solid waste in urban areas. Although there is now an increasing awareness and practice of recycling petrochemical plastics to combat pollution due to solid waste, plastic recycling factories in Penang have contributed to water polluting effluent. Thus, this "Plastic City" model for better plastic waste and pollution management was proposed as a two-pronged approach to lessen water pollution and minimize plastic wastage. The model includes Collecting and Sorting Centres, Plastic Reprocessing Centres, supporting factories, a Water Treatment Centre, a Research/Development Centre and a Power Station to be run

on biofuel. The project proposes an integrated approach in treating effluent release utilizing physical filters, chemical methods and biological activity.

Innovation and Creativity:

Recycling activities can also contribute to environmental degradation if not managed properly. The proposal to purify polluting effluent in plastic recycling to make it an integrated system sounds good for the environment and for human health.

(3) KADOK AS ANTI-ULCEROGENIC AGENT

By Fadhlina Abdul Bashir & Khadijah Rosli of Malaysia

Description:

Ulcer is due to the erosion of gastroduodenal mucus membrane. Consumption of nonsteroidal anti-inflammatory drugs (NSAIDs), spicy food and *Helicobacter pylori* infection cause the majority of stomach ulcer diseases. In this research project, *Piper sarmentosum*, commonly called 'kadok' in Malaysia, is used to demonstrate its ability to prevent stomach ulcer. The prevention tests were done by using kadok extract. The active compound in kadok extract was established through spectroscopic methods: UV, IR and preparative column chromatography. It was identified as isoasarone and 2,4,6-trimethoxybenzaldehyde (L3). The compound was tested on rats, and it was found that its effect on the inhibition of stomach ulcer is better than Cimetidine, which is usually prescribed by doctors. A toxicity test was done and it was discovered that kadok L3 is 100% harmless to consumers. From an anti-ulcerogenic test, it was found that kadok is an excellent natural remedy to prevent and heal stomach ulcers that cause ulcer diseases.

Innovation and Creativity:

This study seems to show that kadok is an excellent alternative to replace drugs in the medical field to prevent ulcerogenic activity that causes ulcer. Since kadok is commonly growing wild in any corner of this country, even at road sides, its could be widely used by people from all walks of life, rich or poor, to treat the stomach diseases due to ulcer.

(4) BIOLUMINESCENT BACTERIA (*V. fischeri* and *V. phosphoreum*) TO DIRECT A KILLING MECHANISM ON LEUKEMIA CELLS

By Emmanuel D. Delocado, Justine Timothy P. Cruz, Jose Noel Gamba & Edilberto Barcelona of the Philippines

Description:

This project attempted to use bioluminescent bacteria to destroy leukemia cells. Bacteria *V. fischeri* and *V. phosphoreum* were added into blood samples containing leukemia cells and also healthy blood samples. After twenty hours, it was found that the number of cancer cells treated with *V. phosphoreum* was much reduced compared to that treated with *V. fischeri*. It was speculated that *V. phosphoreum* killed more leukemia cells as compared with *V. fischeri* because *V. phosphoreum* emits a more intense heat.

Innovation and Creativity:

The project opens up a new area in the search for a cure for many types of cancer diseases.

(5) EQUINE AND BOVINE MANURE FILTRATES: A NATURAL FUNGICIDAL AGENT TO CONTROL THE DAMPING-OFF DISEASE ON *BRASSICA Chinensis* L. (BRASSICACEAE) CAUSED BY *SCLEROTIUM*

By Rolfsii SACC & Lester R. Gomez of The Philippines

Description:

Damping-off disease of seedlings is caused by *Sclerotium rolfsii* Sacc., a pathogen that usually grows just beneath the soil level, causing plants to wilt. It was found that equine manure (from horse) and bovine manure (from cow) could serve as a fungicide for the control of damping-off disease. Experiments were carried out using *Brassica chinensis* L. seedlings.

Innovation and Creativity:

This study shows that equine and bovine manures could help to prevent damping-off disease in plants. It showcases a cheaper method and an organic way to cure infected plants without damaging the environment as well as human health.

(6) ASSESSMENT OF MYCORRHIZAL DIVERSITY AND ITS GROWTH EFFECTS ON *Acacia mangium*, *Paraserianthes falcataria* and *Xanthostemon verdugonianus* IN MARGINAL AND MINE WASTE SOILS OF MANILA MINING CORPORATION, PLACER, SURIGAO DEL NORTE, PHILIPPINES

By Prexy Pearl C. Macana, Lafayette Kirsi S. Noel & Debra Ruth R. Edradan
of the Philippines

Description:

Phytoremediation is an emerging technology that uses plants to clean-up pollutants from the environment. This study was conducted to assess the mycorrhizal diversity in mine sites and its growth effects on plants, namely mangium (*Acacia mangium*), falcata (*Paraserianthes falcataria*) and mangkono (*Xanthostemon verdugonianus*), in marginal and mine waste soil of the Manila Mining Corporation (MMC). Generally, it was observed that plants grew better in marginal soil than in mine soil, and experimentation showed that mycorrhiza-inoculated plants outperformed the uninoculated counterpart. The native MMC inoculum was the best for mangium and mangkono; however, inoculation did not work in falcata seedlings. The highest Cu concentration was observed in mycorrhizal mangium. Mycorrhiza-infected roots were higher in mangium grown in marginal soil than in mine soil. *Acacia mangium* is recommended as a rehabilitation agent for copper-rich soil.

Innovation and Creativity:

This study shows that *Acacia mangium* can be used to rehabilitate mining soil, and as an agent to clean-up heavy metal (copper) pollution in the soil.

(7) ALLELOPATHY: TESTING ALLELOPATHIC EFFECTS OF PLANTS ON COMMON WEEDS, EDIBLE PLANTS AND MICROORGANISMS

By Beh Zhi Jie Cedrych, Guo Er Jia, Lim Yu Sheng Fabian & Ong Zhi Kan of
Singapore

Description:

The allelopathic effects from the extracts of certain plants, bryophyllum and cabbage, were tested on some common weeds (Touch-me-not and Cupid's shaving brush), edible plants (cai xin and green bean) and yeast (microorganism important in the baking and brewing industries) to determine their germination and growth rate. Analysis with the t-test revealed that the germination rate of the weed Touch-me-not decreased significantly in comparison to the control in the presence of bryophyllum extract. However, the reduction in the germination rate of Cupid's shaving brush was insignificant.

Bryophyllum extract had no significant effect on the germination rates of cai xin and green bean; however, its presence enhanced the mean height of the stems of these crop plants. Cabbage extract, on the other hand, increased the germination rate of green bean significantly above that of the control. Cabbage extract also enhanced the growth rate of yeast.

Innovation and Creativity:

The experimental results of the project show that bryophyllum has potential application in weed control and management. Moreover, both bryophyllum and cabbage can be used to improve crop yields. This project sheds light on the effects of the extracts of some plants to reduce the germination of weeds and increase that of crop plants. This simple form of 'control' can help in continuing community development, economically by allowing farmers to produce more crops per unit area of land, and socially by reducing the need to burn down more forests for agricultural land, thus sustaining biodiversity.

(8) A DESIGN OF TRANSCIEVER SYSTEM FOR A SLIDING GATE

ENTRANCE

By Choeu Bunsy, Cambodia

Description:

A new radio frequency (RF) transceiver and locking system was designed by applying simple solenoid and spring. This system could enable users to change the direction of the motion of the gate at any time they want. In addition, an infra-red (IR) sensor was installed in order to avoid accidents when any object might be passing through the gate during its closing movement. The experimental result showed that this new method could

work effectively if installed in the automatic sliding gate. It might also contribute to reducing the cost of this gate.

Innovation and Creativity:

While automatic sliding door using remote control is not new, the added feature of infra-red sensor to avoid accidents when closing is an innovative and yet useful feature.

(9) THE STUDY ON THE EFFECTIVENESS OF BREAKWATER USING THE PHYSICAL MODEL

By Plengrapin Buason of Thailand

Description:

This project investigates the efficiency of a breakwater in reducing water wave energy by using a physical model. This project is modelled on a breakwater at Ban Lham Sing seashore in Samut Prakan province. The structure of this model is composed of wood and the central part is covered with rings of foam instead of electricity posts covered with tyre in a real condition. The project researcher set the range of breakwater poles in different forms, for instance, laying them in the same range and every other pole in different line by alternating.

Innovation and Creativity:

Building a physical model to study the effectiveness of an existing engineering structure could help students to understand science principles better.

MATHEMATICS PROJECTS

(1) AN APPLICATION OF AN ELECTRONIC COUNTER TO THE SILK THREAD SPINNING

By Mak Rasmey of Cambodia

Description:

In Cambodia, silk weaving is one of the common part-time jobs for artisans. The unexpected length of the silk thread, which has to be first spun onto weaving tubes, has always been a problem for silk artisans when performing their job. It should be noted that

to make one silk product, a specific amount of silk is required to avoid silk waste. Most of the time, an excessive amount (or sometimes insufficient amount) of silk thread is spun onto tubes without any idea how long it is. This paper presents a method to get a silk thread's length in the spinning process as needed by using an electronic counter and an Infra Red Transceiver System attached to a weaving instrument while it is being spun in order to count the number of times the silk thread is transferred onto the tube. A rigorous experiment showed that the required length of silk thread can be obtained accurately by using the system designed, which will lead to great benefits to artisans.

Innovation and Creativity:

This invention offers practical and useful help to guide the silk weaving artisans to minimize waste, or alternatively maximize the use of silk in their work.

(2) MATHEMATICS IN MUSIC

By Ryner Lai Wei Chuen of Malaysia

Description:

This paper aims to search for mathematical concepts in music and attempts to compose musical pieces using mathematical concepts to instill mathematical interest in students. A survey was carried out to find out the interests of 200 Form Five students in Mathematics and Music. The musical pieces 'Ateklan', 'Nombor Satu, Nombor Dua', 'Lane', from the indigenous people of Sarawak (Kenyah) and a classical baroque piece by the great composer Johann Sebastian Bach entitled 'Fuga 16 – BWV 861' were studied. An attempt was made to search for concepts of Mathematics like transformation, such as translation (horizontal/vertical), inversion, reflection, enlargement, number sequence and number fraction in these musical pieces. Musical pieces were composed with lyrics based on mathematical concepts (such as using the Fibonacci sequence, π numbers, prime numbers) and mathematical formulas to instill mathematical interest in students who enjoy music but have no interest in mathematics. A pre-test and post-test were carried out to gauge the effectiveness of learning Mathematics using musical notes and increase the fun of learning.

Innovation and Creativity:

The project can generate much thinking and arouse interest. However, not many teachers and students have sufficient musical background to further pursue this work.

(3) THE QUICK CONVERTER

By Ernest Soo Soon Kok of Malaysia

Description:

The objective of this project is to construct a miniature temperature conversion scale that can be easily spun to convert the measurement of temperature needed from one unit to the other. Based on the formula for conversion, a converter was constructed which was able to convert temperature from one unit to another easily, with just a spin. The efficiency of the converter was then tested. The speed and efficiency (precision) and error(s) of the converter used by a sample of test subjects were recorded and compared with the results obtained using a calculator for the same group of subjects.

Innovation and Creativity:

The converter is user-friendly and cost-effective. The user need not worry about the formula for conversion. The project reports that the speed of conversion is even faster than using a calculator. In fact, this speed spin converter can be stuck on to an oven, microwave oven or refrigerator using a small magnet. Hence, it can be easily available in the kitchen. Based on the idea, other converters, for example, a currency exchange disc, can be similarly constructed.

(4) FACTORS AFFECTING BUILDING STABILITY – MATHEMATICAL PERCEPTION

By Ambrose Wong Yuk Siong & Jeremy Lim Ching Sen of Malaysia

Description:

The objective of this project is to study the factors that affect the stability and aesthetics of a building. A shake generator was designed and constructed to test various factors which determine its stability. Generally, the lower and heavier the object, the greater is its stability. The structure which has an increasing order of base area and weight from top to

bottom and the largest base area is the most stable. Pyramid (regular shape) and tetrahedron (irregular shape) are the most stable structures. These shapes offer more variation and are aesthetically pleasing. In conclusion, height, base area and the shape of a building will affect its stability as well as its aesthetics.

Innovation and Creativity:

Stability and aesthetics are a building's greatest assets. The project provides some clues to achieve these aspects in a building.

(5) SUSTAINING COMMUNITY DEVELOPMENT VIA MAXIMISING THE USE OF WATER TO BREED FISH AND PRODUCE VEGETABLES

By Ang JinTeong & Lyvin Khor Chia Yew of Malaysia

Description:

The project is aimed at reusing waste water from a fish tank at home to grow vegetables such as spinach, lettuce, bean sprouts and others using hydroponics method. Then, the water is reused by filtering and pumping back into the fish tank. In this way, food (vegetables) is produced and water is reused continuously. In this project, the amount of water saved was calculated and recorded. The amount and cost of electricity used to power the pump was noted. From the data obtained, it was possible to calculate the amount of water saved at per unit cost.

Innovation and Creativity:

This project has the potential to be adopted for use since the population in the modern world is continuously increasing, and the demand for water and food would increase accordingly.

(6) MAXIMISING FENCING ANIMAL RANCHES FOR ECONOMICAL USE OF LAND AND WOOD

By Gu Tian Yu Gary, Tan Jing Yi & Ong Wei Shiuan Wilson of Singapore

Description:

The competition for land for residential, industrial and agricultural use has grown tremendously in modern times. Ranchers who raise animals have a limited amount of

land due to rapid urbanisation. This project aims to find the most cost-effective way of fencing an animal ranch and allocating plots of land using the technique of optimisation.

Innovation and Creativity:

It provides a possible solution to maximize the use of materials to build fencing at an animal farm.

REFERENCES

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