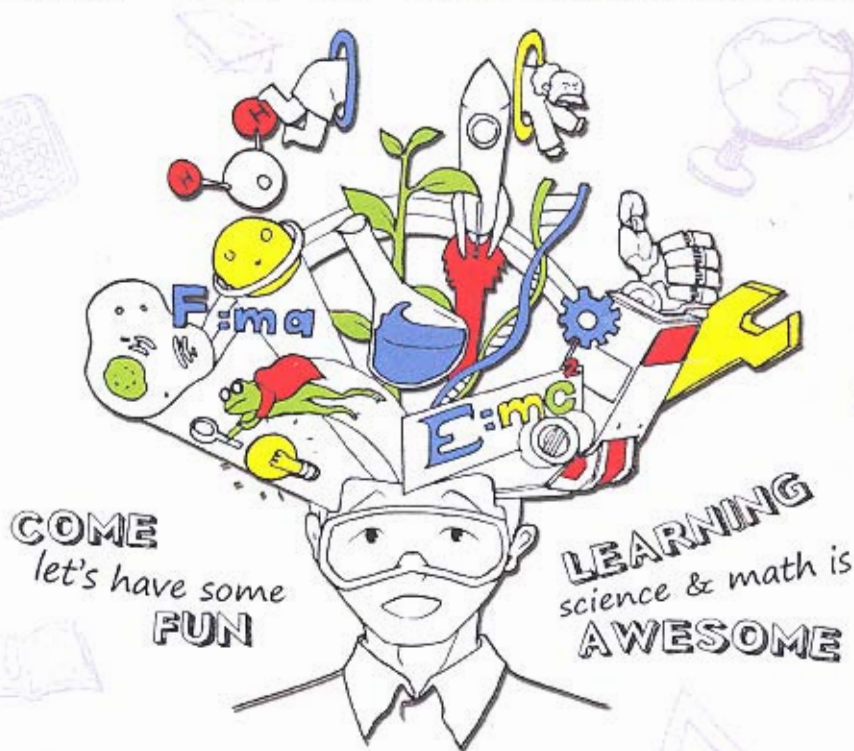


STEM

INNOVATION & NATURE FAIR 2017

2 Aug 2017 10 AM - 4 PM Dewan Kenyalang, MRSM Kuching



Organised by



Buku Program dan Maklumat Pameran

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Ucapan Aluan

YBHG. PROFESSOR DATO' DR. MOHAMAD KADIM SUAIDI

Naib Canselor, UNIMAS

Assalamualaikum dan Selamat Datang ke *STEM Innovation and Nature Fair 2017*.

Saya ingin mengucapkan tahniah kepada semua ahli jawatankuasa pelaksana program *STEM Innovation and Nature Fair 2017* dan Fakulti Sains dan Teknologi Sumber kerana berjaya menganjurkan satu program berasaskan *STEM Education*. Program ini amat signifikan dengan usaha kerajaan negeri Sarawak yang serius dan fokus dalam melahirkan lebih ramai bakat muda dan tenaga pakar dalam bidang sains, teknologi, kejuruteraan dan matematik, khususnya dalam kalangan anak watan Bumi Kenyalang bagi menyokong era Digital Ekonomi. Di bawah inisiatif kerajaan negeri, *Performance & Service Delivery Transformation: Key Result Area 4*, UNIMAS telah diberi tanggungjawab besar oleh kerajaan negeri Sarawak, untuk mengendalikan projek-projek berkaitan *STEM Education Lab (STEM Lab)*, termasuk program *STEM Innovation and Nature Fair 2017*. Melalui platform ini, sebanyak 25 booths telah disediakan untuk para penyelidik dari lima buah fakulti di UNIMAS, bagi berkongsi hasil kajian dan inovasi mereka dengan guru-guru dan para pelajar sekolah terutamanya dari aliran sains.

Di samping itu, program ini turut menyediakan pelbagai aktiviti secara *hands-on* yang dapat menarik minat pelajar untuk meneroka, bereksperimen dan melibatkan diri secara langsung dalam penemuan idea baharu yang berteraskan pemikiran kreatif dan inovatif. Melalui pendekatan ini, kita dapat menggalakkan mereka untuk berinteraksi dengan alam semula jadi dan memberi inspirasi kepada mereka untuk berinovasi. Besarlah harapan saya agar semua peserta dan pengunjung akan mendapat manfaat serta pengalaman yang menyenangkan sepanjang program ini diadakan. Akhirul kalam, syabas kepada semua ahli jawatankuasa pelaksana, peserta pameran dan pihak Maktab Rendah Sains Mara (MRSM) Kuching kerana berjaya merealisasikan program yang cukup bermakna ini.

Salam UNIMASku Sayang



Mesej Dekan FSTS

PROFESSOR DR. OTHMAN BOJO

Dekan, Fakulti Sains dan Teknologi Sumber, UNIMAS

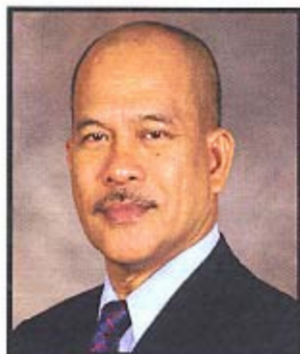
Saya mengambil kesempatan ini untuk mengucapkan tahniah kepada jawatankuasa pelaksana program *STEM Innovation and Nature Fair 2017* kerana berjaya menganjurkan program berasaskan *STEM Education* ini. Satu kebanggaan kepada Fakulti Sains dan Teknologi Sumber kerana ini merupakan kali pertama program sebegini dianjurkan oleh pihak fakulti dengan kerjasama erat daripada Kerajaan Negeri Sarawak, *UNIMAS STEM Education Lab* dan MRSM Kuching.

Program ini amat penting dalam menggalakkan generasi muda meminati jurusan sains bermula dari sekolah lagi dan kemudian memilih bidang-bidang berasaskan *STEM* ketika di universiti kelak. Ini dapat membantu mengatasi masalah kritikal kekurangan pelajar sains yang sedang melanda negara kita masa kini. Bertepatan dengan era Ekonomi Digital, program *STEM Innovation and Nature Fair 2017* ini adalah selari dengan hasrat Kerajaan Negeri Sarawak dalam melahirkan lebih ramai tenaga pakar dalam bidang berkaitan *STEM* yang juga bersifat global.

Melalui program seumpama ini, para pelajar sekolah akan mempunyai pemikiran yang kreatif dan inovatif sejak dari usia muda dan seterusnya bakal menjadi pekerja mahir atau pencipta (*inventor*) pada aplikasi-aplikasi di dunia sebenar bagi memajukan pelbagai industri di Sarawak, khususnya.

Saya percaya program seperti ini merupakan platform terbaik kepada para penyelidik dan pensyarah dari UNIMAS menyampaikan maklumat yang tepat kepada pihak sekolah dan masyarakat setempat akan kepentingan *STEM Education* kepada kepesatan pembangunan negara, termasuklah dalam kemajuan pendidikan negara.

Terima kasih yang tidak terhingga kepada semua yang telah bekerjasama menjayakan program *STEM Innovation and Nature Fair 2017* ini. Semoga semua peserta, penganjur dan pengunjung mendapat manfaat daripadanya.



Mesej Pengerusi UNIMAS STEM Education Laboratory

PROFESSOR MADYA IR. AL-KHALID OTHMAN

Dekan, Fakulti Kejuruteraan, UNIMAS

Pengerusi, UNIMAS *STEM Education Laboratory*

STEM Education merupakan asas kepada pembangunan sumber manusia yang berteraskan pendidikan teknikal, bersesuaian dengan hasrat Kerajaan Negeri Sarawak yang jelas mahu meningkatkan lagi jumlah sumber manusia yang berlatar belakangkan *STEM Education*, teknikal dan mempunyai kepakaran khusus bagi menjadikan Sarawak sebagai sebuah negeri maju sebelum 2030, di bawah pelaksanaan Ekonomi Digital yang berteraskan Revolusi Industri 4.0.

Oleh itu, *STEM Education* yang holistik di peringkat sekolah perlu dirancang dan dilaksanakan sebaik mungkin bagi mendapatkan hasil yang berkesan, seterusnya menyaksikan peningkatan jumlah peratusan pelajar sekolah yang memilih aliran sains dan kemudian memilih jurusan yang berasaskan *STEM* semasa di universiti. Usaha memasyarakatkan *STEM Education* dengan menyetengahkan kepentingan mata pelajaran berasaskan *STEM* dalam aplikasi kehidupan seharian perlu dilakukan agar ia tidak dipersepsikan sebagai mata pelajaran yang sukar dan tidak diminati oleh para pelajar.

Penganjuran *STEM Innovation and Nature Fair 2017* ini adalah amat signifikan dan selari dengan hasrat UNIMAS untuk membantu mempromosikan *STEM Education* di kalangan generasi muda dan juga masyarakat setempat selain dapat berbincang dengan lebih lanjut dengan pihak sekolah. Pelbagai produk inovasi dan bahan pengajaran interaktif berasaskan *STEM* dari kalangan penyelidik-penyelidik di UNIMAS dipamerkan bagi tujuan memberi pendedahan kepada para pelajar, ibu-bapa, guru-guru dan masyarakat setempat berkaitan dengan inovasi terkini melalui aplikasi sains dan teknologi.

Saya ingin merakamkan setinggi-tinggi penghargaan kepada semua pihak yang terlibat dalam penganjuran program ini. Semoga usaha ini beroleh keberhasilan di dalam melahirkan generasi muda yang dapat mengintegrasikan setiap komponen *STEM* dalam penyelesaian masalah secara inovatif dan kreatif serta berkebolehan tinggi sealiran dengan transformasi pendidikan negara.



Mesej Pengerusi STEM Innovation and Nature Fair 2017

DR. AIDA SHAFREENA AHMAD PUAD

Pengerusi, *STEM Innovation and Nature Fair 2017*

Pihak kami amat bersyukur di atas kurnia-Nya kerana program ini dapat dilaksanakan. Kami amat berbesar hati kerana mendapat kerjasama dan sokongan daripada penganjur-penganjur bersama iaitu Kerajaan Negeri Sarawak, UNIMAS *STEM Education Lab*, dan MRSM Kuching. Program ini memberi kebaikan tidak hanya kepada kami, bahkan kepada para pelajar, pihak sekolah dan masyarakat setempat yang hadir.

Nama *STEM Innovation and Nature Fair 2017* dipilih untuk memberi pendedahan kepada pengunjung akan kepentingan memahami sains asas seperti biologi, kimia dan fizik untuk memastikan pembangunan teknologi lain yang lebih *advance* tetapi dalam masa yang sama mesra alam semulajadi (*nature*). *Nature* adalah anugerah yang tidak ternilai yang perlu dipelihara agar generasi akan datang tidak kehilangan kepentingan serta keindahannya. Sebenarnya, jika bidang berkaitan *nature* seperti sains tumbuhan, sains akuatik dan sains haiwan, diberi perhatian serius, pelbagai masalah lain dapat diatasi, contohnya masalah banjir dan kekurangan sumber makanan. Dengan inovasi melibatkan pelbagai bidang berkaitan *STEM*, maka kelestarian *nature* dapat dijaga.

Saya mengucapkan tahniah kepada jawatankuasa pelaksana di atas komitmen yang tinggi dan sikap keserakanan yang ditunjukkan dalam memastikan kelancaran program ini. Terima kasih juga diucapkan kepada Kumpulan Muafakat MRSM Kuching di atas sokongan dan bantuan yang diberikan. Tidak dilupakan kepada para peserta pameran dari Fakulti Sains dan Teknologi Sumber, Fakulti Kejuruteraan, Fakulti Sains Komputer dan Teknologi Maklumat, Fakulti Perubatan dan Sains Kesihatan, Fakulti Seni Gunaan dan Kreatif, dan Pusat Pengajian Pra-Universiti, UNIMAS; tanpa kalian, program ini mungkin tidak akan berjaya.

Terima kasih.



Mesej Pengetua

EN. RIZA OMAR

Pengetua, MRSM Kuching, Sarawak

Assalamualaikum w.b.t. dan salam sejahtera,

Bersempena dengan *STEM Innovation and Nature Fair 2017* ini, sukacita saya merakamkan ribuan terima kasih kerana menjemput MRSM Kuching untuk bersama-sama menjayakan program ini.

Harapan kami agar program ini nanti berjaya meningkatkan pengetahuan, memberi pendedahan dan menarik minat pelajar tentang kepentingan pendidikan berasaskan sains, teknologi, kejuruteraan dan matematik (*STEM Education*). Hanya mereka yang menguasai pengetahuan dan sanggup bekerja keras sahaja dapat mengaplikasikan ilmu dan kemahiran tersebut dalam kehidupan harian mereka seterusnya merangkul kejayaan pada masa hadapan.

Pihak sekolah sentiasa berusaha untuk memastikan pendidikan bertaraf global diberikan kepada para pelajar dan sentiasa menggalakkan pelajar-pelajar untuk berfikir secara lebih kreatif dan analitik untuk mencipta inovasi baru yang bakal menjadi penyelesaian kepada masalah-masalah yang dihadapi oleh masyarakat.

Saya amat mengalu-alukan dan mengucapkan selamat datang kepada semua AJK pelaksana, peserta pameran dan juga para pelawat yang terdiri daripada kalangan guru-guru *STEM*, guru-guru kaunseling, pelajar-pelajar dan ibu bapa ke MRSM Kuching. Saya berharap agar kerjasama yang baik dapat terus terjalin antara kita semua di masa hadapan.



ATURCARA PROGRAM

Masa	Agenda
8.00 – 9.00 pagi	Ketibaan para pelajar, guru dan tetamu jemputan Pendaftaran
9.00 – 9.45 pagi	Majlis Pembukaan <ul style="list-style-type: none">▪ Bacaan doa dan lagu Negaraku▪ Ucapan Aluan Pengerusi <i>STEM Education and Nature Fair 2017</i>▪ Ucapan Pengetua MRSM Kuching, Sarawak▪ Jamuan ringan
9.45 – 10.30 pagi	Taklimat kemasukan ke universiti bagi lepasan SPM oleh Dekan Pusat Pengajian Pra-Universiti UNIMAS
10.00 pagi - 3.30 petang	Pameran dan aktiviti <i>hands-on</i>
3.30 – 4.30 petang	Majlis Perasmian dan Penutupan <ul style="list-style-type: none">▪ Ucapan Aluan Dekan Fakulti Sains dan Teknologi Sumber, UNIMAS – Prof. Dr. Othman Bojo▪ Ucapan Naib Canselor UNIMAS – Ybhg. Prof. Dato’ Dr. Mohamad Kadim Suaidi▪ Perasmian oleh Naib Canselor UNIMAS dan tayangan video montaj▪ Sesi fotografi▪ Jamuan ringan
4.30 petang	Majlis bersurai

STEM INNOVATION AND NATURE FAIR 2017

SENARAI *BOOTH* PAMERAN

BOOTH NO	PROJECT	RESEARCHERS
1	Production of Charcoal from <i>Bambusa vulgaris</i> and <i>Dendrocalamus asper</i>	Muhammad Iz'aan Izzuddin B. Zaheid, Ismail Jusoh
2	Turning Agricultural and Forest-Products Industry Wastes to Money by Growing Mushroom	Mohamad Hasnul Bolhassan, Mohamad Nurfazillah Mohammad Ramzie Faizal, Fatimah Daud, Michelle Ngassy Mering
3	Sago Palm: Waste to Wealth	Dayang Salwani Awang Adeni, Kopli Bujang, Muhammad Norhelmi Ahmad, Sharifah Mohammad, Nurfaezzah Amat, Nurfarahin Jainuddin
4	Sarawak Aquatic Wildlife: Green Turtle, Crocodile & Tomistoma	Ruhana Hassan, Nurhartini Kamalia Yahya, Charles Leh Moi Ung, Eugene Lim Kian Kheng, ZulKalnain Zainal Abidin, Anuar Ayob, Mohd Suffian Abdul Kadir, Hasunnaim Hasan, Aslina Mohd Jainal Muhammad Amirul Arib Md Adzhar, Nur Fatimah Mohd Azizi, Rambli Ahmad
5	Aquatic Science Field in Biodiversity Conservation, Food Safety and Security	Siti Akmar Khadijah Ab Rahim, Ainil Syamin Alias, Akma Iddin Masini, Nur Amirah Mohamad Alwie, Ahmad Syahir Alias, Nur Aina Syuhaida Rusli, Stephanie Sintu
6	Meet The Botanists (Plant Scientists)	Aida Shafreena Ahmad Puad, Jamliah Jamel, Wan Nuur Fatiha Wan Zakaria, Siti Noor Aishah Mohd Noor, Nur Aishah Amir

BOOTH NO	PROJECT	RESEARCHERS
7	The Chemistry Between Us: Human and Nature	Devagi Kanakaraju, Amira Satirawaty Mohamed Pauzan, Nurfatyha Rusydah Mohamad Shahdad, Muhamad Hazim Ya
8	Intelligent Low-cost Aquaponics Recirculation System (inLARS)	Farah Akmal Idrus, Roslianah Asdari, Teng Sing Tung, Wan Zabidii Wan Morni
9	Secrets of the Bornean Frogs' Skin	Ahmad Hata Rasit, Ramlah Zainudin, Muna Sabri, Elvy Quatrin, Nur Amirah Sungif, Tham Vivian, Sharizzaty Mohd Rais, Elizabeth Jega Jenggut, Mardhiah Shahabuddin
10	Cut! Action!!!! Frogs and Toads in the Wild Borneo	Ramlah Zainudin, Muhammad Fadzil Amram, Marly Matleen Augustine Agoh, Nooraina Atira Alaudin, Najmi Naim
11	The 'Hidden Gems' of Bornean Rainforest	Wan Nurainie Wan Ismail, Mohamad Fizl Sidq Ramji, Ratnawati Hazali, Badiozaman Sulaiman
12	<i>Scylla serrata</i> Housing Innovation System for Local Community in Sarawak	Saiful Bahari Mohd Yusoff, Khairul Adha A Rahim, Awangku Shahrir Naquiuddin, Zalina Ibrahim
13	ETR : Electrical Impulses Lower Limbs Exercise, Therapeutic, and Rehabilitation	Dr. Muhammad Firdaus Abong Abdullah, Ehfa bt Bujang Safawi, Fathan Kristiono Soetrisno, Muhyiddin Mohammed, Zico Ripin
14	Asasi UNIMAS Scienceploration Camp 2018	Liyana Truna, Mardhiah Shahabudin, Roberta Chaya Tawie Tingga, Adrus Mohd Tazuddin, Dzetty Soraya Abdul Aziz, Norni Hidayawati Mat Daud

BOOTH NO	PROJECT	RESEARCHERS
15	Centre For Pre-University Studies Universiti Malaysia Sarawak	Mohamad Razif bin Othman, Christharina Saurin Gintoron, Muhamad Ikhwan Idris
16	ILLUMINATES: Projection-Mapped Sculpture	Auzani Zeda Mohamed Kassim
17	HOTBOX – Food Container with Built-In Warmer	Muhyiddin Mohammed, Mahazir Zakaria
18	Golf Putting Video Annotator (GOPUTOR)	Irwandi Hipni Mohamad Hipiny, Hamimah Ujir
19	Feline breed recognition based on facial features	Hamimah Ujir, Mu'adzam Shahril Marjuki, Irwandi Hipni Mohamad Hipiny
20	Library in a Box	Johari Abdullah, Nurul Zawayah Mohamad
21	Shark Skinned Speed Boats	Siti Nur Azizah Amran, Saad Salahuddin Musa, Norliza Marusman, Syafina Zainal, Mohd Danial Ibrahim, Azham Zulkharnain
22	Oil and Solid Filtration for Domestic Wastewater	A. A. Mohamed Ali, A. H. Hashim, S. Anthony, N. Abdul Rahman
23	Electrical and Electronic Department, Faculty of Engineering, UNIMAS	Norhuzaimin Julai, Hazmi Hijazi Abdul Halim, Awangku Mohamad Azmirul Awangku Omar; Wan Mohamad Hamizah Wan Rosli
24	Stem Education Lab: High Impact Learning Programs	Al-Khalid Othman, Johari Abdullah, Noraziah Abdul Wahab, Rubiyah Baini, Nur Syuhada Ahmad Zauzi, Norzilawati Azwa Mohamad, Nur Amalina Shairah Abdul Samat, Airul Azhar Jitai

BOOTH-1

PRODUCTION OF CHARCOAL FROM *Bambusa vulgaris* AND *Dendrocalamus asper*

Muhammad Iz'uan Izzuddin Zahedi and Ismail Jusoh

Faculty of Resource Science and Technology, Universiti Malaysia Sarawak,
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RESEARCH SUMMARY

Malaysian charcoal industries are mainly depending on tree woods obtained from the timber and wood processing industries. Some of the highly demanded charcoal were produced from the valuable tree species of *Rhizophora apiculata* or locally known as bakau minyak. This tree species originated from the mangrove forest that held significant function in the ecosystem. If the mangrove forest is compromise to serious exploitation it certainly poses danger to its natural wildlife and humans. Bamboo is considered one of the forest most versatile products. It can be utilized into various things such as construction material, handicraft and furniture, food sources, medicine and as an alternative domestic fuel resource in a form of charcoal. Bamboo has a rapid growth rate and able to grow in abundance compared to the other woody plant species that might take more than five years to reach maturity. By using bamboo as an alternative raw material source in producing charcoal in Malaysia, environmental problems such as over-exploitation of forest resources can be reduced and economic improvement among the rural community can be established as the demand for charcoal in Malaysia increased steadily over the years. Two bamboo species namely *Bambusa vulgaris* and *Dendrocalamus asper* were utilized for making charcoal by using steel drum as the kiln. Harvested bamboo culms were aged about 4 to 5 years old and cut according to three major sections; the top section, middle section and the bottom section. The three bamboo sections measured 45 to 65 cm long were further split into two to three pieces. The pieces were then air-dried for the periods of two weeks before placing them into the kiln for the carbonization process. The kiln was constructed based on the design of Masato Iwasaki's steel drum kiln. The carbonization temperature used was $476 \pm 20^\circ\text{C}$ for both selected bamboo species and the temperature were maintained for 5 hours. The percentage of yield obtained from *B. vulgaris* was 62.1% while *D. asper* was 72.9%. Proximate analysis showed that, the moisture content, volatile matters, ash and fixed carbon of *B. vulgaris* charcoal were 3.9%, 18.1%, 4.6% and 73.5%, respectively. Meanwhile, the moisture content, volatile matters, ash and fixed carbon for *D. asper* charcoal were 4.1%, 13.9%, 5.6% and 76.4%, respectively. Both bamboo species can be made into charcoal and their charcoal properties showed that they are favourable for many uses.

BOOTH-2

TURNING AGRICULTURAL AND FOREST-PRODUCTS INDUSTRY WASTES TO MONEY BY GROWING MUSHROOM

Mohamad Hasnul Bolhassan, Mohamad Nurfazillah Mohammad Ramzie Faizal, Fatimah Daud and
Michelle Ngassy Mering

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RESEARCH/INNOVATION SUMMARY

The agricultural sector and forest-products industry activities have very high quantities of lignocellulosic wastes. These are represented by different parts of the forest-products and cultivated plants (e.g. timber, rice, banana, coconut, corn) that can be sawdust, straws, stalks, and husks. These wastes are usually eliminated by burning, producing in turn problems related to environmental pollution. Solving the problem of these wastes can be achieved by promoting a simple biotechnological process that involves the use of mushroom. Thus, the huge waste quantities coming from the agricultural and forest-products industry could constitute a valuable nutrient resource for mushroom and generate income for the peoples. Mushroom cultivation can directly improve livelihoods through economic, nutritional, and medicinal contributions. Mushrooms are often considered to provide a fair substitute for meat, with at least a comparable nutritional value to many vegetables and a good source of vitamin B, C, and D, including niacin, riboflavin, thiamine, and folate, and various minerals including potassium, phosphorus, calcium, magnesium, iron, and copper. Mushrooms can be successfully grown without access to land and can provide a regular income throughout the year. Essentially, mushroom species can be cultivated in two ways: Composted substrates: rice straw, banana leaves, corn cobs, and various other agricultural by-products including coffee husks and coconut residues; Woody substrates: logs or sawdust. Mushrooms can be cultivated on both a small and large scale to allow for personal consumption, principal income source, or the start of a commercial enterprise. Mushroom cultivation can make a valuable contribution to sustainable livelihoods for both rural and urban poor, because they are highly compatible with other livelihood activities, requiring minimal physical and financial inputs and resources, to be undertaken successfully. Mushroom cultivation activities can play an important role in supporting the local economy by contributing to subsistence food security, nutrition, and medicine; generating additional employment and income through local, regional, and national trade.

SAGO PALM: WASTE TO WEALTH

Dayang Salwan Awang Adeni, Kopli Bujang, Muhammad Norhelmi Ahmad, Sharifah Mohammad, Nurfaezah Amat and Nurfarahin Jaimuddin

Resource Biotechnology Programme, Faculty of Resource Science and Technology,
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RESEARCH/ INNOVATION SUMMARY

Sago palm is the local commodity of Sarawak that largely contributes in food production especially from the sago starch. Traditionally, sago starch considers as staple food for Melanau people in Sarawak. Nowadays, development of agricultural industry driven by the advance of science and technology drastically increase the quality and quantity of the products from sago palm that used in food, chemical, cosmetic and medicine industries. Hence, the demand of raw material from sago palm is extremely increased. In year 2015, 43 million tons of sago starch was exported and make Sarawak as the biggest sago starch exporter in the world. Unfortunately, increase in product from sago palm lead to the increase of waste from the production process. Every day, about 26,000 Kg of sago frond abandoned in the sago farm due to harvesting activity. Then, about 218 tons of wastewater contains 7 tons of sago "hampas" discharge into the river produced from the 600 logs to produce 12 tons of sago starch from a single factory. Improper management of these wastes from sago palm industry will lead to extreme environmental pollution. Consequently, utilization of the waste product is important to prevent the environmental pollution that harmful to our flora and fauna. Meanwhile, alternative product produced from sago palm waste is very valuable in the market. Therefore, we proudly present our products from utilization of sago palm waste based on research conducted in our lab:



Products from Sago Frond

- Cellulose sugar (for Prebiotic Drink)
- Lactic Acid (for Skin Peeler and Hand Sanitizer)

Cellulose was produced through enzymatic hydrolysis process, which then can be converted into Lactic acid via fermentation process using *Lactococcus lactis IO-1*. Generally, lactic acid is widely used in food, pharmaceutical and medical industries.

Products from Sago Fibre:

- Glucose sugar (for Golden Syrup or fermentable sugar)
- Bioethanol (for pharmaceutical or biofuel)

Glucose sugar was produced via enzymatic hydrolysis of residual starch in sago fibre. It contains glucose (92%) and other oligosaccharides (8%). Glucose sugar can be converted into bioethanol by anaerobic fermentation process using yeast.



Products from Sago Wastewater

Cultivation of algae in sago wastewater enhanced the growth of the algae at the same time act as wastewater treatment. The algae biomass contains starch which can be converted to biofuel such as bioethanol. Plus, algae biomass can also produce non-fuel product such as bioplastic, supplements and animal feed.

BOOTH-4

SARAWAK AQUATIC WILDLIFE: GREEN TURTLE, CROCODILE & TOMISTOMA

Ruhana Hassan¹, Nurhartini Kamalia Yahya¹, Charles Leh Moi Ung², Eugene Lim Kian Kheng⁴, ZulKalnain Zunal Abidin², Anuar Ayob², Mohd Suffian Abdul Kadir², Hasunnaim³ Hasan, Aslina Mohd Jainal², Muhammad Amirul Arib Md Adzhar¹, Nur Fatimah Mohd Aziz¹, Rambli Ahmad⁵

¹Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300, Kota Samarahan, Sarawak

²Faculty of Applied and Creative Arts, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak

³Jabatan Muzium Sarawak, Jalan Barrack, 93000 Kuching, Sarawak

⁴Pandan Gold Coast Holiday Villa, Pandan Beach, Lundu, Sarawak

⁵SARAWAK FORESTRY Corporation, Lot 218, KCLD, Jalan Tapang, Kota Sentosa,

93250 Kuching, Sarawak

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RESEARCH/INNOVATION SUMMARY

Green Turtle

Nobody knows exactly what happen during the 'lost years' of the turtle in the wild, thus a green turtle headstarting project was carried out in Pantai Pandan, Lundu, Saarak from June 2014 to December 2015 to shed some lights on the growth and behaviour of turtle juveniles. This project gave opportunity to carry out campaigns on sea turtle conservation with the following framework: talk, discussion, supervised human-turtle interactions (feeding, carapace cleaning) and beach cleaning. Upon completion of this study, an educational tool kit comprising a 2-min video, a manual and an information kiosk related to green turtle had been produced, which serve as documentation of the project as well as act as tools for future green turtle conservation projects.

Funded by: UNIMAS Dana Pelajar PhD F07(DPP18)/1186/2014(18) & Industrial Partner Pandan Gold Coast Holiday Villa, Pandan Beach, Lundu

Crocodile and Tomistoma

Saltwater crocodiles are found in almost all waterbodies in Sarawak while Tomistoma are rare, perhaps due to Tomistoma secretive nature. Misattribution incidents involving skeletal remains of crocodiles in wildlife forensic field are likely to occur without a proper guideline to be referred to. The aims of this study are to examine and document details on the skull, dentition and other bones of both saltwater crocodiles and Tomistoma, consequently produce a manual for Crocodile Tomistoma Forensic Identification.

Funded by: Fundamental Research Grant Scheme FRGS/STWN 10(01)/1066/2013 (12)



AQUATIC SCIENCE FIELD IN BIODIVERSITY CONSERVATION, FOOD SAFETY AND SECURITY

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EXHIBITION SUMMARY

About 70 % of the Earth is covered by water and the resources from aquatic habitats (ocean, sea, lake, reservoir, river, etc.) have been utilised for protein sources, active compound in new drugs development, minerals and recreation activities. Knowledge on the impact of human activities to the aquatic organisms is crucial because they interact closely with their home. Any sign of decline in aquatic resources could indicate the health status of their habitat or problems within the environment. If you pollute the water bodies, the effect will come back to you through water contact and food consumed. Therefore, the basic scientific knowledge and base line data in aquatic science have many important applications for conservation works that lead to food safety, food security of the nation and help to manage the natural resources in a sustainable manner. This booth will share the nature of aquatic science field and highlights some interesting findings by UNIMAS research teams in Borneo region. What students can enjoy and learn from this booth through activities provided are:

- 1) The early life stage of fish
- 2) The anatomy and behaviour of nipa tree climbing crab
- 3) The feeding behaviour of the hard clams
- 4) The biodiversity of aquatic life
- 5) Moments with aquatic biologists (Q & A session on posters exhibited)

BOOTH-6

MEET THE BOTANISTS (PLANT SCIENTISTS)

Aida Shafreena Ahmad Puad, Jamliah Jamel, Wan Nuur Fatiha Wan Zakaria, Siti Noor Aishah Mohd Noor & Nur Aishah Amir

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EXHIBITION SUMMARY

Ever wonder what botanists do in the field and in the lab? At this booth, students will be introduced to common activities carried out by botanists. When botanists go to the field collecting plant specimens for anatomical or molecular studies, it is very important for them to prepare voucher herbarium specimens (pressed plant specimens) for future reference. Therefore, during the exhibition students will be taught how to prepare herbarium specimens. Plant anatomical studies have various applications in science including taxonomy, forensic investigation, wood identification, archaeological plant remains identification and many more. Students can try to make their own stomata imprint using selected plant species and observe the stomata under the microscope. Another activity includes a demonstration on how to extract DNA from plant tissue and students will also get the chance to try it. DNA extraction is the first step in plant genetic engineering, plant DNA barcoding, plant forensics and other applications. We hope students will gain some knowledge and experience in a fun way.

THE CHEMISTRY BETWEEN US: HUMAN AND NATURE

Devagi Kanakaraju*, Anira Satrawaty Mohamed Pauzan, Nurfarlyha Rusyidah Mohamad Shahdad, Muhamad Hazim Ya

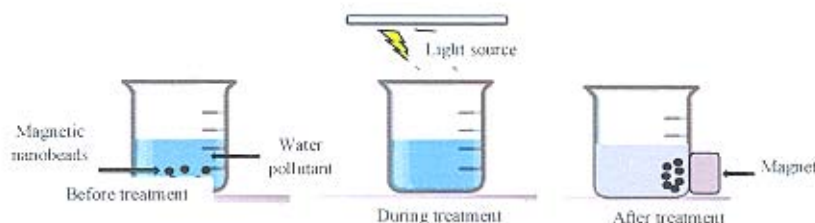
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RESEARCH/ INNOVATION SUMMARY

What comes to your mind when you hear the word Chemistry? Are you thinking of certain images? For instance, test tubes, solutions, the periodic table, a white-coated scientist mixing colourful liquids, fireworks, and even some cool explosions. It is certainly beyond that. Chemistry is part of everything in our lives and it is inevitably integral in understanding the natural world surrounding us. Chemistry is one of the physical sciences that help us to explain our world. Chemistry can be defined as "the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy". You basically involve chemistry in everything you do - cooking food, cleaning homes, making coffee, washing dishes or clothes and also in everything you use - cosmetics, clothing, pharmaceutical drugs, toothpaste, perfumes, fertilizers, construction materials, and etc. In short, there is a chemist in each of us. Doesn't it sound really cool? There are five main branches of chemistry (Figure 1). In this booth, you will be exposed to "Chemistry in Our Daily Life" and hand-on experiments for lower and higher secondary students. In addition to that, we will also demonstrate the application of an innovative magnetic-based material which was prepared in our laboratory for the removal of heavy metals and dyes in water using artificial light source and sunlight.



Figure 1



Funded by: FRGS E14099 F07 69 1204/2014(05)

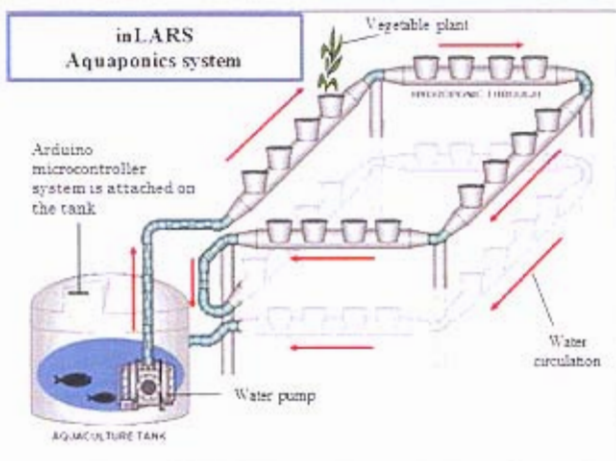
INTELLIGENT LOW-COST AQUAPONICS RECIRCULATION SYSTEM (inLARS)

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RESEARCH/INNOVATION SUMMARY

inLARS is an affordable aquaponics system which combined fish rearing tank and plant hydroponic through the water recirculation system controlled by the Arduino microcontroller system. In contrast to conventional aquarium, inLARS is able to monitor the variation of water quality parameters by controlling the pump speed and duration of hydroponics through lighting and temperature, to make it suitable for delicate vegetable plant and fish. inLARS also could continuously log the data to help the aquaponics researcher(s) get the insight of the interaction between the water quality and system performance. In addition, inLARS could promote the urban farming for the busy persons as this system has also embedded the auto-feeding sensor.



The inLARS aquaponics system design can be modified according to the size and shape of the aquaculture tank (fish tank). The microcontroller system is attached on/in the fish tank. Water from the fish tank is pumped up through the PVC pipeline for plant irrigation and nutrients supply. Water is treated by the plant in hydroponic trough and return back to the fish rearing tank.

Funded by: self-funded

SECRETS OF THE BORNEAN FROGS' SKIN

Ahmad Hata Rasit¹, Ramlah Zamulim², Muna Sabri³, Elvy Quatrin², Nur Amirah Sungril², Tham Vivian, Sharizzaty Mohd Rais², Elizabeth Jega Jenggul¹ and Mardiah Shahabuddin⁵

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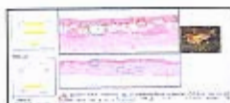
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RESEARCH/INNOVATION SUMMARY

Skins are the first protection barrier of the frog from sunlight exposure, chemicals, predator and also pathogen. Numerous finding on the potential of frog skin's secretion has been revealed and this secretion comes from the granular gland. With its unique properties can the frog skin be used for wound healing management and also for alternative food/ointment from the skins' fatty acid? Our findings have revealed some secrets of the Bornean frog's skin such as the followings; 1) wounded rat skin which was treated with *Odorrana hosii*'s skin, had better quality as more new tissues and hair follicle regrowth compared with the untreated wound, 2) Isolation of frog skin peptides revealed the antimicrobial properties against various bacteria such as *E. coli* and *S. aureus*. These peptides also showed hemolytic activity against human and red blood cells, (3) Thickness of the epidermis layer and glands distribution varies between dorsal and ventral skin of *Megophrys nasuta* suggesting an adaptation strategy. Biggest granular glands were also found in the dorsal region of the frog skin, *Odorrana hosii* implicates that the dorsal skin can be used for massive poison extraction. Lastly (4) frogs' skin also revealed the presence of fatty acids of EPA and DHA which can be used for alternative food source or medicinal value. Here, we presented our products based on the research findings above. Thus, many secrets lie within a body of frog/toad. Many more need to be explored on the biology of the frogs and toads. It is OUR DUTY TO CARE AND LOVE FOR OUR OWN BORNEAN FROGS/TOADS that will benefits us one sweet day.

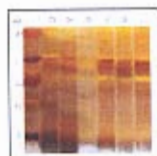
Product 1
THE SECRET OF FROGS' SKIN

Dorsal frog' skin Flap is potential for pharmaceutical purposes such as antimicrobials
Ventral frog' skin Flap is potential for biological wound dressing such as burnt wound



Product 2
ANTIMICROBIAL PEPTIDES

SDS PAGE of the partially purified frog peptides



Product 3
ANURAN SKIN HISTOLOGY SLIDE SET

Providing a microscopic look at the anatomy of anuran skins' cells and tissues, this collection helps students learn to identify different cell and tissues in the anuran skin



Product 4
ESSENTIAL OILS OF WARTY TOADS

Presence of essential fatty acids, cis-5,8,11,14,17-icosapentaenoic acid (EPA) and cis-4,7,10,13,16,19-docosahexaenoic acid (DHA)



Funded by: FRGS/04(03)/840/2012(8), FRGS/ST04(02)1074/2013(20) and NRGs/1088/2013(02)

CUT! ACTION!!!! FROGS AND TOADS IN THE WILD BORNEO

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RESEARCH/INNOVATION SUMMARY

Frogs are susceptible to habitat, their community ecology would be highly affected if the areas are constantly modified and altered by human disturbances. How do frogs and toads make a living in the wild? **Product 1** of hop with me board game will introduce us what will happen if the forest is being fragmented by human. **Product 2** showed how frogs and toads communicate if there is danger or they are ready for breeding. **Product 3** revealed the homes of the tiniest frog in Sarawak, the *Microhyla* and **Product 4** showed how complex is a species or known as cryptic species that live in various places and habitat. It is hope that the products displayed will trigger curiosity among students to inquire more about the nature of frogs and toads in the wild Borneo.

Product 1**'Hop with Me'**

Hop with me is a snake and Ladder board game that reflects issues of habitat fragmentation and its impact on other living organism.

'Hop with Me' is designed in such a way that each leap plays an important role of sighting great impact on any action taken

Product 2**Responses of Frog Call Playbacks**

The calls playback was manipulated to observe the response of both male and female frogs by playing the advertisement call of the species at their breeding sites. Results show that male and female of the same species react differently towards playback calls.

Product 3**Homes of the little frogs**

We presented the homes of the little Bornean frogs (*Microhyla nepenthicola*), the carnivorous pitcher plant, *Nepenthes ampullaria*. *Microhyla nepenthicola* breeds in, and consume insects that fall inside the cup of pitcher plant. There is no defect on the development of tadpoles in the pitcher cup and also no suffering from the pitcher's digestive liquid, thus reflects the species adaptation strategy.

Product 4**A Pocket Guide: *Limnonectes kuhlii* complex in Southeast Asia**

A cryptic species complex is a group of closely related species that have very similar appearance but genetically distinct. This pocket book provides a field guide on the cryptic species with illustration, elucidates aspects, fundamentals to be able to distinguish every new cryptic species described which was nominal under *L. kuhlii*.



Funded by: FRGS/STWN10 (02)/987/2013(28) and NRGs/1088/2013(02)

THE 'HIDDEN GEMS' OF BORNEAN RAINFOREST

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RESEARCH/INNOVATION SUMMARY

The wealth of biodiversity in Borneo is astounding. This represent a number of species including 277 mammals, 156 amphibians, 180 reptiles, 669 birds, 394 fish fauna and over 50,000 species of major insect groups (including butterflies, mayflies, dragonflies, beetles etc.). We are smack right in the middle of biodiversity hotspot but we tend to depreciate these treasures until we have lost it. Young generation need to be aware on the importance of biodiversity conservation. Hence, we aim to provide a fun and engaging experiences through our lenses in the field and several voucher specimens from our collection. Along with this, the Animal Resource Science and Management Programme has successfully initiated its "Kembara Zoologi" since 2013. Aligned with STEM Innovation and Nature Fair 2017, we are eager to approach young learners in Sarawak through knowledge transfer and experiential learning of Bornean fauna diversity.

Scylla serrata HOUSING INNOVATION SYSTEM FOR LOCAL COMMUNITY IN SARAWAK

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RESEARCH/INNOVATION SUMMARY

Mangrove crab or scientific name *Scylla serrata* has high potential growth in the aquaculture industry; to generate economic resources of the poor, especially those who live in coastal mangrove river. For instance, the Pulau Salak community in Sarawak, to date, they have relied on the mangrove crab as a source of income. *S. serrata* is typically associated with mangroves in estuaries and sheltered coastal habitats. *S. serrata* is a promising aquaculture species due to its fast growth and good market acceptability and price compared to blue swimming crabs (*Portunus pelagicus*). However, at present, *S. serrata* aquaculture operation requires significant capital input for both the breeding and grow out phases. In addition, *S. serrata* farming requires expertise in husbandry of crustaceans, water quality control, pond management, nutrition, processing and marketing. The development of low cost *S. serrata* culture system is vital to be developed, due to the potential business for both domestic and overseas markets, in order to create opportunities for local *S. serrata* farmers. Hence, this research aims to seek potential improvement of *S. serrata* culture system in order to sustain the economics of Pulau Salak community in Santubung, Sarawak. The output of this research proposes new design of *S. serrata* culture system. It is designed in a way that it can be employed and operated by low-skilled personnel (e.g. children, housewives, elderly) close to their home. Apart from cheap to be built, the design feature of this *S. serrata* culture system highlights unique methods and systems based on the flow-through natural water system and natural tidal sea water. According to the local fisherman, this product features found to be easy to be monitored and maintained by all groups as its implementation does not require high skills. This research gives big impact as it helps local community to sustain their economic and their daily life.

**ETR : Electrical Impulses Lower Limbs Exercise,
Therapeutic, and Rehabilitation**

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RESEARCH/INNOVATION SUMMARY

ETR (Electric Impulses lower limbs Exercise, Therapeutic and Rehabilitation) is an assistive machine/device for exercise, therapy and rehabilitation of patients with inability to move unassisted. It focuses on the patient's lower limbs with motion/movements programmed to stimulate exercises conducted by certified professional physiotherapist. The multifunction of ETR includes - exercise and rehabilitation, train cardiac capacity and prevent neurological osteoporosis, passively mobilized lower limbs, and gait training. ETR is a completely portable and mobile device that may in the near future eliminates the usage of complicated fixed equipment currently used today. Operating ETR is quick and simple, by installing its program into portable PC with any common computer operating system.

ASASI UNIMAS SCIENCEPLORATION CAMP 2018

Layana Truna, Mardiah Shalabudin, Roberta Chaya Tawie Tingga, Adrus Mohd Tazuddin, Dzetty Soraya Abdul Aziz, Norri Hidayawati Mat Daud

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SUMMARY

Asasi UNIMAS Scienceploration Camp 2018 organised by the Centre for Pre-University Studies, UNIMAS is an annual event celebrating the dynamism of science, engineering, technology and biomedicine. The two days and one night 'Asasi UNIMAS Scienceploration Camp 2018' is proposed for students especially SPM leavers and upper secondary students. The Scienceploration Camp focus on the integration of science and technology through a series of hands-on experiences. Through these engaging courses students will be developing problem-solving strategies and higher-level thinking. With adequate supervision, it is hoped that students will be inspired to learn more about biology and the environment, physics, chemistry, mathematics, and computer technology by choosing Asasi UNIMAS as their first choice for foundation studies and further able to disseminate knowledge by actively participate in building a science community in our own society. The Scienceploration Camp 2018 is going to be held on Saturday and Sunday, 24 – 25 February 2018. All activities will be carried out within the compound of Universiti Malaysia Sarawak, involving young and experienced lecturers as facilitators, hoping that the school students will discover nature and appreciate science subject.

Activity 1

Physics

Circuit Race

Participants are required to assemble/connect the electrical components into series/parallel circuit.

Activity 2

Mathematics

Pascal's Triangle

Participants are required to arrange Lego blocks by calculating seven levels of Pascal Triangle.



Activity 3

Biology

Cells

Participants are required to observe termites' guts under stereo microscope to see the symbiotic relationship between termites and protozoa.



Activity 4

IT

Einstein's Treasure

Participants are required to move an avatar based on three simple program codes. Each program code will have an increasing level of difficulty; easy, medium and hard to facilitate learning. The grid that the avatar moves on will be labelled with numbers.

The combination of the numbers from all three program code can be used by participants to unlock a combination padlock.

CENTRE FOR PRE-UNIVERSITY STUDIES UNIVERSITI MALAYSIA SARAWAK

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RESEARCH/ INNOVATION SUMMARY

Centre For Pre-University Studies (PPPU) is located in east campus, Universiti Malaysia Sarawak (UNIMAS) Kota Samarahan and is offering two foundation science programs, *Asasi Sains Hayat* and *Asasi Sains Fizikal*. The programs offered with the aim to prepare the Sijil Pelajaran Malaysia (SPM) leavers for the degree program in UNIMAS. This is a one year program consists of two semesters. The students are required to enroll in courses including basic sciences (Mathematics, Chemistry, Physics or Biology) and also generic courses such as English, Information Technology, Universal Values, Communication Skills and Co-Curriculum with Credits. The goal of the program is to prepare the students with a solid learning basic for their science related courses once they enter their degree in UNIMAS. The students will be exposed with many activities related to science and technology and hopefully in the future the students produced from this program could contribute to the nation's science and technology sector.



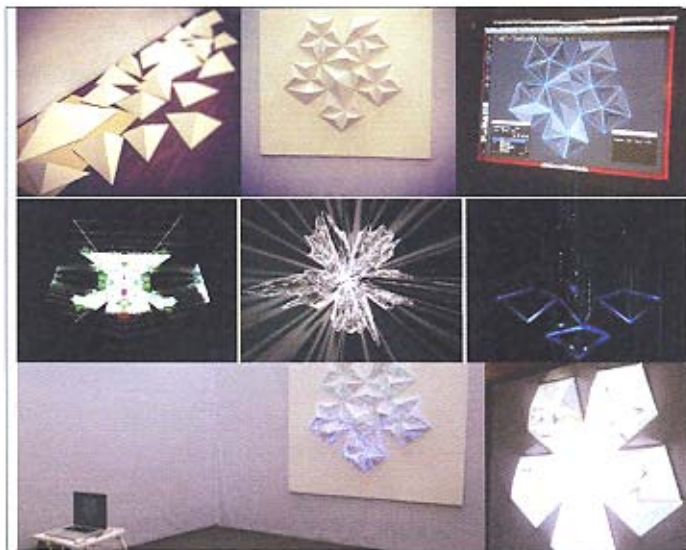
ILLUMINATES: PROJECTION-MAPPED SCULPTURE

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RESEARCH/ INNOVATION SUMMARY

Illuminate is a video mapping installation that explored the aesthetic of abstract animation. The animation was projected and mapped onto 24 pieces of white pyramids placed on the wall in a pentagonal arrangement. The pyramidal sculpture was used as a screen for the animation to be mapped onto. The animation commenced with minimal and definable geometries that gradually evolved into a rapid and complex motion in four-minute long, exhibited in a gallery space. The project exemplified the researcher's attempt to use technology as a tool for artistic exploration - expressing thoughts through the qualities of colours, lights, forms, and motions. The application of the animation language through projection mapping extended the virtual images to physical space. The aim was to develop a potential method to exhibit abstract animation language as a fine art form in gallery space - instead of being screened on a flat monitor. The mapping of the virtual animation onto the real sculpture was intended to give the viewers a sense of the physical existence of the digital objects. It formed as a new expressive art form which blends the real and virtual realities that could be experienced by viewers. This corresponded to projection mapping, the mixing of virtual and physical realities. The study provided innovative approach for animators/ artists to craft animation language to a much wider range of contemporary outcomes.



HOTBOX - FOOD CONTAINER WITH BUILT-IN WARMER

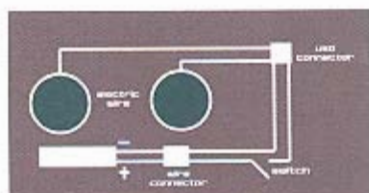
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RESEARCH/ INNOVATION SUMMARY

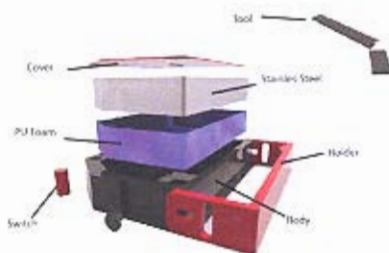
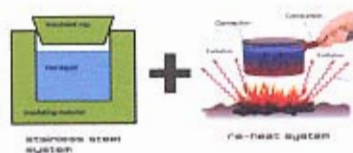
Nowadays people with healthy conscious generation prefer to bring their own home-prepared food anywhere there go especially to the school and office. Apart from keeping food, the purpose of this food container with built in warmer are design so that consumer can re-heat their food if it desired. It also can maintain the temperature of the food at a specified level. The boxy shape of this food container can maximize the usage of space. It is lightweight and easy to use. The design also emphasize on the safety aspect and ergonomically usage for consumer.

HOTBOX is creative food carrying and equip with removal battery powered. It also can use a direct sources of energy connected at the built in USB port. For safety, reason this HOTBOX comes with embedded overload protector to protect device being overload. The size of the product approximately measure 230mm x 180mm x 55mm.



1.0 Diagram of Re-Heat Circuit

COMBINATION BETWEEN STAINLESS STEEL FOOD CONTAINER SYSTEM AND RE-HEAT SYSTEM



3.0 Exploded View of HOT BOX Design

GOLF PUTTING VIDEO ANNOTATOR (GOPUTOR)

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RESEARCH/ INNOVATION SUMMARY

Golf putting requires the coordination of wrists, arms and upper body to execute an explicit pendulum-like stroke. The stroke has several well-defined phases, of which a successful execution of each increases the likelihood for a successful putt. Using a video feed from a chest-mounted camera, we measure these phases using object tracking methods. We present the results to the user via a web application.

FELINE BREED RECOGNITION BASED ON FACIAL FEATURES

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RESEARCH/ INNOVATION SUMMARY

Cats have different breeds all around the world. Cats' breeds, such as Ragdoll, Bengal, and others are recognizable by their distinguishable features on their faces, colour, and fur type. However, there are several breeds that are easily to be confused with other breeds as certain breeds of cats have similar facial features. To avoid this, cat's facial features must be studied. In this project, a facial recognition algorithm will be used to differentiate cat breeds. Facial feature extraction and classification algorithm are employed to distinguish facial features in the input image. This project is useful for veterinarians or researchers who have special interest to differentiate cat breeds. The developed algorithm is able to extract cat's facial features and classify them to the correct breed.

LIBRARY IN A BOX

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RESEARCH/ INNOVATION SUMMARY

For the past 20 years, there are various projects and implementation were deployed in Malaysia to address the issue of digital divide mainly in rural areas especially in Sabah and Sarawak. A few notable and successful projects are the eBario project, eLumai, and eBedian, implemented by the Institute of Social Informatics and Technology Innovation¹ (ISITI) of Universiti Malaysia Sarawak (UNIMAS). The main objective of these projects is to bridge the digital divide in term of providing access to Internet and network connectivity. This connectivity will then provide access to content, which can assist the community in various aspects of their life such as education, health, business, and so on. Additionally, it provides the mean of communication to the outside world, and empowers the community to raise their standard of life. Although these projects, in general have addressed the issue of digital divide, there are still many areas, especially in Sabah and Sarawak, which still do not have access to the world, and left out from the benefits of connected world through Internet. At the same time, there are other technical challenges for the above projects such as: (1) slow speed of Internet connection, and (2) loss of connectivity due to power failure, insufficient power, and factors that affect connectivity for satellite connection. These issues can in turn negatively affect the experience of the end users and might deter them from further using the services. Focusing on the issue of providing reading material to rural areas, the current method through hardcopy of books in rural libraries is not cost effective and logistically challenging (physical space, maintenance, and transportation of the books). Due to these factors, the number of books is limited, and is not updated to the latest version or content. This in turn creates knowledge divide in the affected community. Therefore, there is a need for a solution which is low power, robust, and low cost as a complement to many existing telecentres, which can provide offline content to the rural areas, mainly targeting educational content for children and other stakeholders. Thus, the main objective of the Library-In-A-Box (LiaB) project is to provide offline access to reference and reading material, targeting children, and to be deployed in remote/rural areas as a new deployment of as complementary to existing telecentres project. The LiaB platform consist of three main components: (1) the hardware component consist of low power and low cost Single Board Computer in the form of Raspberry Pi, and (2) software component consists of the web server and other software, and (3) content, which can be customized to the needs of the end users and community (Figure 1).



Figure 1: Overall architecture of the Library-in-a-Box system



Figure 2: Current prototype of the Library-in-a-Box system

The current prototype of LiaB is powered by a 20,000 ma external power bank (sufficient to power the unit for up to 6 hours), and a tablet which is connected to the LiaB through wireless connection and accessing the content (Figure 2) As a conclusion, the proposed LiaB platform is able to address the issues with the current implementation of telecentres, or a new site in rural areas, where there is a need to provide offline access to reading and reference material especially for children. It is hoped that this solution will be able to reduce or eliminate the knowledge divide in the rural areas and improve the rural community standard of living.

SHARK SKINNED SPEED BOATS

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RESEARCH/ INNOVATION SUMMARY

Shipping industries has been a thriving industry, since the start of industry revolution. Shipping industry devoted to move goods or passengers by water which has rapidly grown each year. However, the efficiency of most watercrafts are sometimes affected by environment especially during cruising that is normally due to physical phenomena such as force drag and upward draft. Fortunately, the functional properties of any mechanism today are possible to be enhanced by altering or improving its original design. The act of modifying the design of any geometry will contribute significantly to the performance of the system either statically or dynamically. Nowadays, surface engineering is widely implemented in various places using various type of techniques. For instance, the functional properties of shark denticles have caught the attention of our engineers and scientist today due to the hydrodynamic effects of the surface roughness of its skin. The skin of a fast swimming shark reveals riblet structures that help to reduce skin friction drag of the shark making its movement to be more efficient and fast. By considering the issue being faced by today's most shipping industries, we are inspired to design better surface properties by implementing biomimetic shark skin structure on watercraft surface as this could help in reducing drag force experienced by it. Simplified version of shark skin on square planes and watercraft models are both numerically constructed. Computational fluid dynamic (CFD) simulations are then carried out to predict the effectiveness of the hydrodynamic effects of the biomimetic shark skins. Interestingly, the numerical calculated results obtained and experimental verifications indicated that model with biomimetic sharks skin gives better improvement by showing a significant reduce in turbulent eddies formed on the flow near the models' surface as shown comparatively, in Figure 1(a) and Figure 1(b). Mimicking nature such as shark's denticles is a learning on how natural occurring of living creatures can inspire us to come up with designs that has functions like them and create new ideas to improve human life.

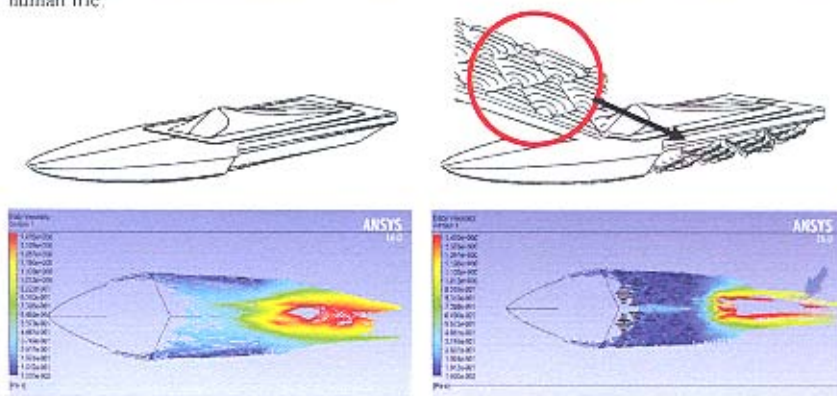


Figure 1(a): Speedboat without denticle

Figure 1(b): Speedboat with denticle

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OIL AND SOLID FILTRATION FOR DOMESTIC WASTEWATER

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RESEARCH/INNOVATION SUMMARY

Plastic bottles are one of the major petroleum based products that are commonly used by human kind in their daily lives. These bottles are normally used only once before being discarded. The amount of wastes produced from the plastic bottles is so enormous that they cover 10 percent of the total waste generated globally. The only ways to reduce usage of these substances are by recycling them or reusing them for other purposes. For this project, the team has designed an oil filtration system out of used plastic bottles that has the ability to filter out cleaner domestic wastewater before draining into the drains. This product is aimed to reduce the water pollution through a practical filtration system that uses density theory. It is possible by filtering the solid domestic waste and used cooking oil that can later be recycled to become another form of substance. The product consists of used plastics products that can be easily obtained such as mineral drinking bottles, drinking cup and drinking straws. These products are designed with minimal amount of cost.

MATERIALS AND COST

The following are the materials and costs used on making the Oil and Solid Filtration for Domestic Wastewater

MATERIALS	QUANTITY	COST (RM)
Plastic bottles (1.5L)	5	0 (used)
Drinking cups	1	0 (used)
Drinking straw	3	0 (used)
Hot glue gun silicone	1	0.30
Wire	1 meter	0 (used)
Total		0.30

ADVANTAGES AND DISADVANTAGES

ADVANTAGES	DISADVANTAGES
Environmental friendly by treating the water before they are discharged	Cannot withstand high temperature
Reduces the amount plastic bottle disposed to landfill	Fragile
Save money for filtration of solid waste	Cannot reduced wastewater Biochemical Oxygen Demand (BOD)
Reduces risk of the sink piping from block	
Can be duplicate and used easily by the communities	
Can be easily installed without needing plumbers	

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EXHIBITION SUMMARY

Students will be exposed to the proper usage of the basic test equipment usually used by engineers to do troubleshooting. Test equipment is designed to measure different kind of characteristics in electrical component. The frequent types of test equipment are voltmeter (for voltage), ammeter (for current) and ohmmeter (for resistance). These test equipment are for direct current only. Usually a multi meter has all those function. As for alternating current oscilloscope will be used. The multi meter is a combination of all the meters mention above. It can be used to measure voltage, current and resistance. Oscilloscopes are used to measure a wide range of frequencies with precision and also are used to examine wave shapes. When the controls are properly adjusted, an oscilloscope permits various voltage waveforms to be analysed visually. It produces an image on its screen. This image, called atrace, is usually a line on the screen. The oscilloscope displays voltage waveforms on two axis, like a graph. The horizontal axis on the screen is the time axis. The vertical axis is the voltage axis. For the screen to display a trace properly, the internal circuits of the scope must be properly adjusted.



Digital and analog multimeter

STEM EDUCATION LAB: HIGH IMPACT LEARNING PROGRAMS

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RESEARCH/ INNOVATION SUMMARY

The High Impact Learning Program for STEM Education Lab aims to nurture students' interest in STEM subjects via designing and developing highly interactive and engaging teaching and learning activities of STEM modules. The modules are developed based on interactive learning tools for renewable energy, ICT, human anatomy and mathematics. The learning strategy is based on project-oriented problem based learning whereby students are encourage to communicate, work in a team, harness their leadership skills and to solve problems via innovative and creative thinking. It is hoped that with the implementation of the programs among the students, it can initiate holistic STEM education activities and development in Sarawak thus support to strengthen the delivery of STEM subjects across Malaysian education system.

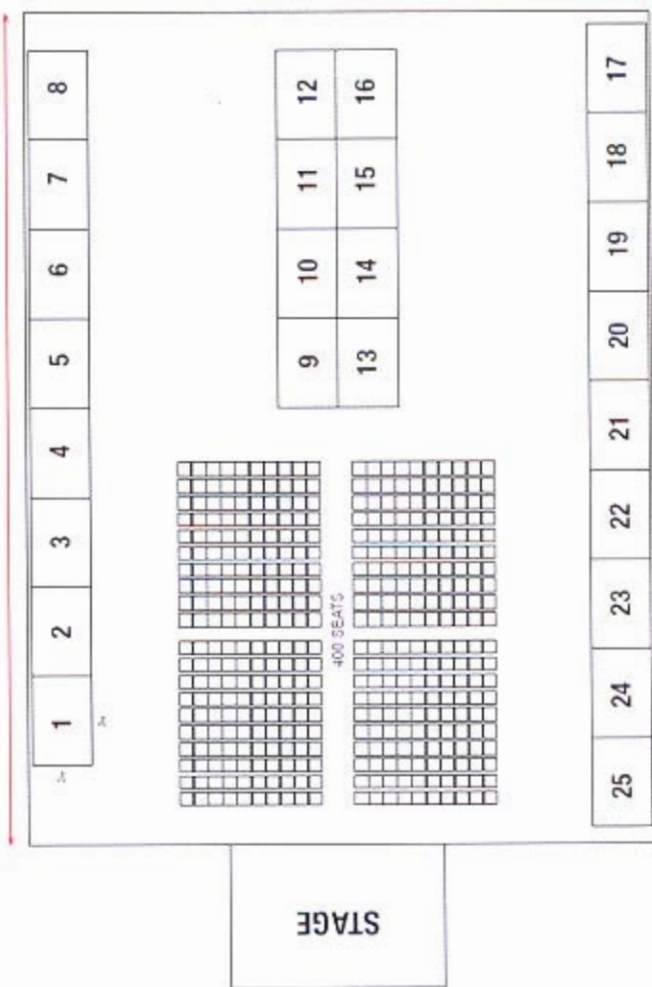
Acknowledgements

We would like to express our gratitude to the State Government of Sarawak and UNIMAS STEM Education Lab for funding the project.



28m

21m



No. of Booths : 25 (9.2m)

No of Seats : 400 pax