UNIVERSITI TUNKU ABDUL RAHMAN DU012(A)

Wholly owned by UTAR Education Foundation (200201010564(578227-M))

UTAR SUSTAINABLE DEVELOPMENT GOALS REPORT 2020

Broadening Horizons, Transforming Lives

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INTRODUCTION

UTAR's Growth Strategies in Alignment with the SDGs

UTAR is highly reputed as one of the fastest growing private higher education institutions in the country with phenomenal growth in all aspects of its development since its inception. Since its inception on 13 August 2002 with 411 students for its first intake, the enrolment has now reached over 21,000 students with campuses located in Kampar, Perak and Bandar Sungai Long, Selangor. UTAR is a not-for-profit private university and is owned by the UTAR Education Foundation. It has graduated over 69,000 students.

(All figures are correct as at April 2021)

Over the years, the University has grown significantly and its strategies are reflected in its 10-Year Strategic Plan (2013-2022) which defines the strategic directions that are essential to propel the University to greater heights in support of quality education and to train youths to be future responsible leaders and citizens to meet the human resource needs of the nation.

The 10-Year Strategic Plan focuses on four directions which are:

1. **Promote holistic development and sustainable growth**
2. **Generate academic programmes with socio-economic and transformative impact**
3. **Foster ubiquitous learning and lifelong education**
4. **Enhance diversification and internationalisation**

These strategic directions are guided by UTAR's Six Educational Pillars of Education which are:

- 德 — *Virtue and Morality*
- 智 — *Knowledge and Intellect*
- 体 — *Physical and Mental Health*
- 群 — *Sociality and Humanitarianism*
- 美 — *Aesthetics and Harmony*
- 新 — *Creativity and Innovation*

These core values encompass all the key areas of learning for a holistic education and a balanced life. While it is crucial to attain academic excellence, the development of soft skills, moral values and character building is equally important to be socially responsible members of the society. UTAR staff and students are constantly engaged in community and volunteer projects providing voluntary services and R&D services to instil among students the importance of engaging with the community in support of sustainability, an economically just society and respect for the less privileged.

The implementation of UTAR's strategies embraces the spectrum of university functions and focused areas that are essential for the attainment of the vision and mission of the University to be a global university of educational excellence with transformative societal impact. These focused areas are:

- Governance
- Academic programmes
- Research and Development
- Collaborations and internationalisation
- Staff development
- Student development
- Facilities and services
- Community

The University's strategic plans are also aligned with the universal objectives of the UN's Sustainable Development Goals (SDGs) which seek to end poverty, protect the planet and ensure economic growth and prosperity for all. As a University, UTAR plays a contributing role towards the cross-sectoral implementation of the SDGs, providing an invaluable source of expertise in R&D, sharing knowledge, and guiding students in advancing the SDG agenda while fulfilling its own goals.

UTAR believes that through quality and focused education, youths can be trained and empowered to be responsible citizens who can enable and promote peace, tolerance and respect for the diverse communities, support and implement green practices to ensure sustainability and contribute to the economic and social welfare of the community to eradicate poverty. Youths must recognise the vast and fast-changing dynamics of the global arena that will also affect the local and national communities and the way decisions are made and plans are implemented. The University's initiatives are also interrelated with the goals of the SDGs to advance the 2030 agenda of the SDGs.

The various initiatives of the University incorporate the following objectives:

- Building, strengthening and institutionalising university partnerships with local and foreign universities, industry partners, the government and the community
- Building sustainable relationships and strengthen engagement with less privileged communities to provide support and assistance training, environmental and health challenges
- Engaging in R & D to study, generate, translate and disseminate knowledge to increase societal impact of research through dynamic partnerships, resource and knowledge sharing to strengthen the understanding of managing interactions between the environment and human health
- Training and shaping future leaders on sustainable development by integrating some SDGs into curricula to provide students with the knowledge and the skills needed to be responsible citizens and to promote multidisciplinary and systems approaches to solving increasingly complex challenges of society today
- Engaging data analytics to map, track and document the various efforts that link research, knowledge, decision-making and practice to help establish meaningful frameworks to identify, measure and report on the relevant indicators in a valid way. Continuous evaluation of sustainable efforts enables demonstration of commitment and progress which are critical for learning and improvements, promoting transparency and sustaining partnerships
- Recognising the efforts of staff and students in support of the SDGs

University Social Responsibility

In line with its focus on holistic development, sustainable growth and the community, UTAR places great emphasis on social responsibility among its staff and students. Its projects and initiatives cover a diverse spectrum of activities, rooted in its core values and reflected in its voluntary services in support of the people and the community to enhance their quality of living. Activities range from research, R&D projects, consultation, training, conferences, talks and seminars, to voluntary community services in New Villages and rural areas, health campaigns, gotong-royong, free health services, awareness programmes, financial aid and scholarships, leadership and youth camps, and teaching and learning support. From top management to academics, support staff and students, service to the community and even the industry is part and parcel of the University education. From working with the underprivileged in villages and cleaning up homes to collaborations with industry companies to improve products and services and conduct research; these activities are conducted throughout the year, providing value creation for both the givers and receivers.

UTAR has always adopted good governance, responsible management and social responsibility since its inception and has always believed that this approach is essential for long term sustainability, lifelong learning and value creation for its staff, students and the community.

In fulfilling its University Social Responsibility, UTAR strives to

- Make positive contributions in the campus, in the local communities, to the society and to the nation
- Focus on continuous improvements and progress
- Minimise environmental impacts and take steps to ensure environmental conservation
- Support and respect diversity, multi-cultural and multi-racial harmony
- Collaborate with international and local university and industry partners for synergy and knowledge exchange
- Train our youths on volunteerism, teamwork, charity and responsible leadership
- Support the educational objectives of the state and nation to ensure peace, harmony and economic growth

Over the years, UTAR has always practised giving back to the community to help the less privileged and providing educational opportunities especially to those who lack the financial means to pursue tertiary education. To date, over RM100million internal scholarships have been imbursed to over 13,600 students and over RM19.5million external scholarship have been imbursed to over 600 students. On the other hand, internal loans imbursed to over 1,300 students amount to over RM9million, while external loans including PTPTN loan imbursed to over 75,600 students amount to over RM1billion.

Some of UTAR's community projects and initiatives in support of SDGs include the annual Kuala Lumpur Engineering and Science Fair in collaboration with the ASEAN Academy of Engineering and Technology (AAET), Malaysian Industry-Government Group for High Technology (MIGHT), the Institution of Engineers Malaysia (IEM), Malaysian Ministry of Education and Malaysian Ministry of Science, Technology and Innovation to promote STEM education among school children, especially those from rural schools and the community.

It is also UTAR's practice to share knowledge and expertise with the educational community and the public. UTAR's Centre for Corporate and Community Development (CCCD) has been conducting short courses, training programmes, free seminars and talks to the public which has benefitted more than 247,000 participants since 2003. UTAR's Soft Skills Development Programme and the various community projects with international communities focus on the core competencies that prepare its students to understand and face the global challenges of diverse communities around the world.

Since its early years, UTAR has designed quality programmes incorporating the objectives of the SDGs, practised good governance, diversified its partnerships and student bodies, employed effective teaching-learning pedagogy, initiated research and publications and expanded its support for the community. All these have come to fruition when the University was awarded self-accreditation status by the Malaysian Qualifications Agency (MQA) of the Ministry of Higher Education.

UTAR has always been committed towards making the world a better place in alignment with the SDG agenda. Its contribution covers various areas such as community engagement, environment conservation and green technology, quality education, medical and health support, economics and commerce, social and multicultural harmony and bursary, and these are reflected on the numerous awards and recognitions received. Among the significant awards received are the Sin Chew Business Excellence Award 2017 - CSR Excellence Award category, and the Sin Chew Education Awards (SCEA) 2018/2019 for Outstanding Educational Institutions in the Private Universities/Colleges Category. UTAR is also ranked 106th World's Most Sustainable University in the 2020 UI GreenMetric World University Rankings.

(All figures are correct as at April 2021)

SDG@UTAR

Our Commitment

We acknowledge the significance of sustainability in all aspects of our operations, and we aim to follow ethical practices to minimise the impact on our society and the environment, ensure the safety and well-being of the community, and practise responsible consumption and production to ensure sustainability for future generations.

Our Advocacy

UTAR supports and promulgates sustainability though the following actions:

SDG Committees

SDG sub-committees, represented by faculty and administrative staff, researchers, and students, were set up to encourage ownership and participation in the University's sustainability initiatives within the campus and with external communities.

Teaching

Sustainability education is incorporated as part of the University's educational experience to provide students with the relevant knowledge and awareness on community and collaborative efforts to improve the planet for tomorrow.

Research and Publications

Research centres were set up to conduct studies and recommend best practices that support community health and well-being, safety, environmental protection, sustainable practices, renewable energy and resources, and responsible consumption and production. These centres also conduct impact surveys and research, compile data and report through publications in local and international journals, social media and website.

Strategic Plan and Roadmap

University social responsibility and sustainability are incorporated into UTAR's 10-Year Strategic Plan as an integrated roadmap that marks the strategic journey and direction undertaken by the University for sustainable progress and development now and in the future.

International Collaborations

More than 500 MoU/MoA local and international university and industry partners is a source of international exchanges, sharing of knowledge and resources, training and forum on issues related to the SDGs.

Community Engagements

Regular and annual voluntary service community projects are conducted to encourage engagements from the community, and local and international universities. Community projects by students and staff focus on enhancing the quality of living in the community, education and welfare, safety and well-being, socio-economic issues, as well as environmental conservation and sustainable practices.

STEM Education

UTAR advocates the nation's STEM Education initiatives in ensuring the sustainability of STEM education in schools for the continual training of human resources in the fields of science, technology, engineering and mathematics to meet the needs of the future and for sustainability.

UTAR's Policy Commitments to the UN Sustainable Development Goals

Founded with the bedrock principle of by the people, for the people, UTAR, as a not-for-profit university, has always embraced the society through various commitments which are also in line with the United Nations (UN) Sustainable Development Goals. Not limited to empowering students through quality yet affordable education, UTAR plays a contributing role towards the cross-sectoral implementation of the SDGs, providing an invaluable source of expertise in R&D and education, while sharing knowledge, and guiding students in advancing the SDG agenda and fulfilling its own goals. UTAR has throughout the years spearheaded sustainable initiatives which not only broaden the horizons of one generation, but also transform their lives as well as that of the generations to come.

Non-Discrimination and Anti-Harassment Policy

Objective
UTAR, as a not-for-profit private educational institution, is committed to a work and study environment that promotes professionalism and seeks to attract staff and students in support of diversity. This policy shall govern the University in dealing with programme admissions, employment and University operations, and in accordance with the relevant Laws and Regulations of the country.

Policy
This policy is put in place to prevent prejudice, unlawful discrimination or harassment against individuals on the basis of race, religion, and gender. Any person violating this policy will be subject to corrective action as per University rules and regulations.

Any feedback or report on harassment or unlawful discrimination (regardless of verbal, physical or via electronic means), will be attended to and investigations will be conducted. Appropriate actions will be taken accordingly, following the University policies, rules and regulations, and where necessary, in accordance with the relevant Laws and Regulations of the country. The University will take corrective actions to prevent recurrences and will provide counselling support to those affected, if required.

Staff and Students of the University shall undertake to comply with the University policies, rules and regulations, and also in accordance with the relevant Laws and Regulations of the country at all times.

For enquiries or feedback related to this policy, please refer to the Director of the Division of Human Resource or the Head of the Department of Student Affairs.

Environmental Policy

In line with its focus on excellence in teaching and research, UTAR is committed to promoting environmental sustainability and creating environmental awareness among its students, staff, stakeholders and the public to conserve the environment and to prevent environmental pollution.

This policy sets out the six fundamental principles that UTAR accepts to be responsible for the environment and its sustainability.

Principle 1
We are committed to implementing a holistic framework to ensure the systematic management of environmental sustainability through compliance with applicable environmental legislation and standards.

Principle 2
We will undertake to create awareness and the appreciation of environmental sustainability among students, staff, alumni, stakeholders and the public through education, research, consultancy and community engagement.

Principle 3
We will aspire to continuously improve our environmental performance to achieve the objectives of this policy through education, research, consultancy and community engagement, as well as integration of best practices into our campus activities.

Principle 4
We will strive to minimise the adverse impacts on the environment by reducing the use of energy and water, and implement educational programmes to use energy and water more efficiently, while adopting good energy and water management practices.

Principle 5
We will endeavour to eliminate and minimise waste and preserve natural resources, and ensure that the management of materials and disposal of waste is implemented in an environmentally responsible manner.

Principle 6
We will expect our suppliers, vendors and contractors to comply with local environmental laws and regulations to ensure the protection of the environment.

The University is committed to ensuring the protection of the environment to protect its resources and to prevent any adverse environmental impacts.

Sustainable Food Policy

As a teaching, learning and research institution, with responsibilities to the local community and society, Universiti Tunku Abdul Rahman aims to implement its procurement activities in an environmentally and socially responsible manner. This Policy shall apply to all food operators and other related service providers in the University. All food operators and related service providers are required to comply with this Policy in their daily operations.

The University aims to:
- Educate staff and students on healthy and sustainable food consumption and habits through good health practices, advice and educational events.
- Ensure food safety and nutrition within a sustainable food system.
- Ensure that food operators and service-related providers adopt measures that support food sustainability in an environmentally and socially responsible manner.
- Commit to supporting the local community and contribute to the economy in a manner that is economically viable, ecologically sound, and socially supportive.

All food operators and related service providers in the University are required to:
- Develop objectives and make efforts in support of good environmental and social effects associated with the food products and services we purchase.
- Identify and adopt measures to take into consideration environmental and socially responsible factors during the food selection and cooking process.
- Identify and provide a choice of healthy and balanced food options, in support of sustainability, to our students, staff and visitors.
- Promote good health and its educational social benefits through supporting good eating habits and providing a healthy selection of quality and safe food.
- Encourage related suppliers and contractors to minimise negative environmental and social effects associated with the products and services they provide.

Regulations on the Usage of Expanded Polystyrene

1. Purpose

1.1 The following rules and regulations are applicable to all food Cafeteria Operators, Push Cart Operators and any food vendors who supply and sell foods and drinks within the premises of the University. It also applies to any type of events and/or activities held within the premises of the University.

1.2 These regulations are made to reduce the use of polystyrene in everyday purchasing and encourage consumers to stop using expanded polystyrene packaging. These regulations shall help the University to prevent pollution due to the usage of expanded polystyrene. This initiative is in line with the University's Green Campus Initiative.

2. Authority and Definitions

2.1 The University reserves the right to maintain full jurisdiction over the vendors/users and to take action against all violators of these regulations, and amend these regulations from time to time as deemed by the University.

2.2 The following terms shall have the meanings specified:

2.2.1 "University Premises" means any land or buildings under the ownership of the University or under the control of the University including land or buildings occupied by private individuals or companies whether as tenants or licensees.

2.2.2 "Cafeteria Operators" means all Cafeteria Operators or Stall Operators operating at the cafeteria within the University Premises.

2.2.3 "Push Carts Operators" means all Push Cart Operators operating within the University Premises.

2.2.4 "Event Organiser" means any organiser or committee or host of any event or activities approved to be held within the University Premises by the University.

2.2.5 "Customers" means anyone buying foods and drinks from the Cafeteria Operators, Push Cart Operators or Food Vendors within the University Premises.

2.2.6 "Outsiders" means anyone other than UTAR students and staff with a bona fide reason for entering the University.

2.2.7 "University" means Universiti Tunku Abdul Rahman.

2.2.8 "Staff" means any or all employees of the University no matter full-time or part-time.

2.2.9 "Student" means any or all students registered under a programme of study at the University regardless of full-time or part-time.

2.2.10 "Expanded polystyrene" means a rigid cellular form of polystyrene with low weight/density and good thermal insulation characteristics in general.

2.2.11 "Polyethylene terephthalate" is a type of thermoplastic polymer resin from the polyester family which is widely used for food and liquid containers as well as clothing fibres.

2.2.12 "Polypropylene" is a type of thermoplastic polymer from the group of polyolefin. It is widely used for food and liquid containers, milk bottles as well as stationery. Polypropylene has high melting points thus it is suitable to be sterilized under steam or boiled water.

3. Cafeteria and Push Cart Operators

3.1 The Cafeteria and Push Cart Operators shall not use expanded polystyrene-based drinking cups and eating plates for in-house usage. The Cafeteria and Push Cart Operators are encouraged to use recyclable single-use plates and cups for dine-in usage.

3.2 The Cafeteria and Push Cart Operators shall not use expanded polystyrene-based food and drink packaging/takeaway boxes and cups. The Cafeteria and Push Cart Operators shall use other options such as biodegradable paper, polyethylene terephthalate or polypropylene boxes and cups for food and drink packaging.

3.3 The Cafeteria and Push Cart Operators are not allowed to charge any additional cost for the use of recyclable plates, cups and dishware for dine-in usage.

3.4 The Cafeteria and Push Cart Operators are not allowed to charge any additional cost for the use of paper, polyethylene terephthalate or polypropylene-based cups and plates for dine-in usage.

4. Event Organiser

4.1 The Event Organiser shall not use expanded polystyrene-based drinking cups and eating plates for dine-in usage. The Event Organiser is encouraged to use recyclable plates and cups for dine-in usage.

4.2 The Event Organiser shall not use expanded polystyrene-based food and drink packaging/takeaway boxes and cups. The Event Organiser shall use other options such as biodegradable paper, polyethylene terephthalate or polypropylene boxes and cups for food and drink packaging.

4.3 The Event Organiser is not allowed to charge any additional cost for the use of recyclable plates, cups and dishware for dine-in usage.

4.4 The Event Organiser is not allowed to charge any additional cost for the use of paper, polyethylene terephthalate or polypropylene based cups and plates dine-in usage.

5. Enforcement and Investigation Powers

5.1 The Department of Student Affairs of each campus shall enforce the expanded polystyrene usage regulations and have the authority to ensure the compliance of Expanded Polystyrene Usage Regulations.

6. Assistance and Referrals

6.1 Any concerns or queries regarding the expanded polystyrene usage policies, enforcement and operational aspects should be directed to the Head of Department of Student Affairs of each campus.

1 NO POVERTY

Goal 1: End poverty in all its forms everywhere

PUBLIC ENGAGEMENT

Community outreach programme for Nursing students

Students from UTAR Department of Nursing celebrated Nurses' Day in an unconventional manner by visiting and donating supplies to a children's orphanage. They visited Yayasan Sunbeams Home (YSH), a non-governmental foundation shelter for displaced, abused and neglected children on 27 June 2020, accompanied by Faculty of Medicine and Health Sciences (FMHS) lecturer Sheela Devi Sukuru. The visit aimed to respond effectively to the needs of the orphanage through social services and also to fulfil the social responsibility of giving back to the community. They prepared daily supplies to be donated to the orphanage, which included rice, cooking oil, biscuits and canned food, to help sustain the orphanage during the Movement Control Order (MCO) period.

Research in numbers: SDG1	Course units on SDG1	SDG1 related activities
23 publications	36 course units	65 activities 9,555 participants

RESEARCH

Managerial ambidexterity and firm performance: The mediating role of knowledge brokerage

Ambidexterity or the ability by individuals or firms to simultaneously and synergistically pursue both exploitation and exploration activities has been found to have positive effects on firm performance. However, the ambidexterity literature has been predominated by the studies at the organisational level, and little is known about the antecedents and consequences of ambidexterity at the individual level. This study examines environmental dynamism and social network as the antecedents of managerial ambidexterity, and knowledge brokerage and firm performance as the consequences. This study tests the mediating role of knowledge brokerage on the relationship between managerial ambidexterity and firm performance. Data are collected from 308 senior executives working in technology manufacturing firms in Malaysia using a questionnaire survey. The findings reveal that environmental dynamism and social networks are significantly and positively related to managerial ambidexterity, and knowledge brokerage mediates the relationship between managerial ambidexterity and firm performance.

B40 income group reaction towards spending, savings & investment, and debt management for a better future financial well-being

The Eleventh Malaysia Plan (11MP), 2016-2020, marks the final phase towards achieving a developed and inclusive nation in line with Vision 2020. The Eleventh Plan, with the theme 'Anchoring Growth on People', focuses on the prosperity and wellbeing of Malaysian citizen. One of the focus areas in 11MP is to uplift the B40 households towards a middle-income society. The targets are to double the B40 mean income (RM2,537 in 2014) and median income (RM2,629 in 2014) in 2020; increase the percentage with tertiary educational attainment from 9% in 2014 to 20% in 2020; and increase the income share from 16.5% in 2014 to 20% in 2020. This will be achieved through the three main strategies in 11MP which are to raise the income and wealth of the B40 households, to address the increasing cost of living and to enhance the delivery system of B40 household programmes. The B40 is measured as households that earn a household income of RM3,855 and below in 2014. As stated above, the B40 have a mean income of RM2,537 and a median income of RM2,629. Between 2009 and 2014, the increase in expenditure has outstripped the increase in income for the B40 in both urban and rural areas, asserting more pressure on their cost of living and general wellbeing. Moreover, the B40 have low wealth and non-financial asset ownership, vulnerable to economic shocks and highly dependent on government support and assistance. According to AKPK in 2018, the percentage for having good and exemplary financial behaviour was only at 19% and 5% respectively from the total respondent. The rest were categorised as reasonable, low and weak financial behaviour. Their survey was supported by another study by Mahzan, Zanudin, Sukor, Zainir and Ahmad (2019), where they reported individuals with a lower level of income and education are prone to have fewer exposures to financial education. The financial condition on B40 found to be vulnerable where their study resulted in the lowest score in terms of financial behaviour and financial knowledge. The findings of the study will also give better insights to the policymakers when it comes to designing and implementing appropriate policies that can ensure good life quality among the older population in the country.

2 ZERO HUNGER

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

PUBLIC ENGAGEMENT

UTAR students benefit from Food Assistance Programme

During the duration of the conditional movement control order (CMCO) due to the Covid-19 pandemic, students who remained in their hostel were cared for through the Food Assistance Programme, conducted by the Department of Student Affairs (DSA) Sungai Long and DSA Kampar, along with Student Representative Council (SRC) of Sungai Long and Kampar Campuses, in collaboration with the Ministry of Higher Education. The programme lasted from 6 April to 13 May 2020 and offered registered students three meals a day. Around 3,000 students from both campuses combined benefitted from this programme.

Research in numbers: SDG2	Course units on SDG2	SDG2 related activities
9 publications	63 course units	16 activities 1,869 participants

RESEARCH

Advances on the antioxidant peptides from edible plant sources

Plant-derived antioxidant peptides diminished reactive oxygen species production, besides activating endogenous antioxidant defences in cellular models. Some such peptides exerted protection by modulating pro- and anti-apoptotic proteins as well as gene and protein expression of antioxidant enzymes. By using cellular models, the intestinal absorption and metabolism of such peptides were elucidated. Plant protein hydrolysates enhanced antioxidant protection in animal models, often by upregulating antioxidant enzyme activities in various body tissues. The structure-activity relationship of plant-derived antioxidant peptides is not well-understood. Nevertheless, information connecting peptide secondary structure to cellular antioxidant effects has emerged.

The diversity, antimicrobial activity and plant growth promoting properties of indigenous cyanobacteria from hot springs of Peninsular Malaysia as potential source of biofertilizers

Cyanobacteria is a group of ancient photosynthetic bacteria that can be found thriving in extreme environments such as hot springs. Malaysia is home to many hot springs due to the geothermal activity along the flank of the Titiwangsa mountain range. Although previous studies have employed high-throughput sequencing methods to describe the overall prokaryotic community in Malaysian hot springs, the species diversity of the cyanobacterial community was not reported and is therefore worth investigating. To date, most research on the biodiversity of cyanobacteria utilized the monophasic approach. They employ culture-dependent (direct isolation on nutrient media), culture-independent (sequencing of microbial 16s rRNA gene) or classical morphological identification methods which could overlook cryptic species and underestimate the microbial diversity. Cyanobacteria are known for their multifaceted applications as human food supplements, animal feed, biofuel and bioethanol production, food colourants and bioremediation of environmental pollutants. A handful of studies have shown that cyanobacteria are also useful as biofertilizers for both crop growth and disease control as they synthesize plant growth-promoting (PGP) hormones and antimicrobial metabolites. They have also been discovered to reduce greenhouse gases emission from intensified agriculture activities. The thermophilic and halophilic nature of cyanobacteria isolated from hot springs can be advantageous as they could survive under adverse agriculture field and soil conditions without compromising their bioactivity. Nevertheless, the antimicrobial and PGP properties of these indigenous extremophiles in Malaysia remains a mystery and should be exploited for further application as biofertilizer. Therefore, the first objective of this study is to adopt a polyphasic approach which combines both morphological and molecular techniques (culture-dependent and independent methods) to provide an overview of the cyanobacterial community in three hot springs (Ayer Hangat, Kampung Ara Panjang and Sungai Serai) from Peninsular Malaysia. These hot springs locations were chosen based on tourist popularity, level of human activities and salinity level. The second objective involves the screening of antimicrobial and PGP properties of the cyanobacterial isolates. The wealth of knowledge generated from this study is expected to serve as a foundation for the development of a novel and eco-friendly cyanobacteria-based biofertilizer.

3 GOOD HEALTH AND WELL-BEING

Goal 3: Ensure healthy lives and promote well-being for all at all ages

PUBLIC ENGAGEMENT

UTAR creates and donates face shields for frontliners

UTAR sponsored and donated 1,000 face shields to Hospital Universiti Kebangsaan Malaysia (HUKM), also known as Hospital Canselor Tuanku Muhriz (HCTM), on 15 April 2020 for hospital staff who have been in the frontline during the COVID-19 pandemic. Puan Yasmin Rahimi, a senior manager under the Director's Office of Hospital Canselor Tuanku Muhriz UKM, received the donation from UTAR for the hospital.

A new batch of 1,500 face shields was produced by four UTAR engineering students from the Lee Kong Chian Faculty of Engineering and Science (LKC FES) who set up an enterprise called Kon10Innovation, under the UTAR Unovate Centre. Under the leadership of Lim Kai Wen, Kon10Innovation created the 3D printed medical face shields using eight 3D printers, which can produce 1000 face shields in one day. Lim has recently enhanced the hardware and made the production more automated that can produce up to 1,300 face shields in a day. The face shields created are of good grade materials that can withstand heat and can be reused after sanitisation. The sponge on the face shield can also be easily replaced after use. The face shields were received by the Board of Trustee of ECM Libra Foundation Lim Beng Choon, and distributed to the frontliners in Negeri Sembilan.

Research in numbers: SDG3	Course units on SDG3	SDG3 related activities
154 publications	272 course units	182 activities 33,273 participants

RESEARCH

Non-attachment and happiness: Mediating versus moderating roles of grit personality

The findings suggesting that non-attached people are happier does not mean they detach from life. They are able to work with perseverance on their long-term goals, but they do not attach to the outcome of their goals. The findings provide further conceptual clarification of grit personality and non-attachment and further information to educators and program managers while designing programs to improve happiness.

Prevalence of hypogonadism among type 2 diabetic males attending diabetes clinic & primary healthcare clinic in PPUKM

Diabetes mellitus is a major health issue in Malaysia, with almost 30% of Malaysians being diagnosed with it. Worldwide studies have shown that 25-40% of diabetic males are suffering from hypogonadism, but there are no local Malaysian data available. Hypogonadism in males is an indicator of deteriorating health, as well as associated with various health outcome. Low testosterone levels may present with physical symptoms such as reduced sexual function, decreased muscle mass and strength, increased adiposity, reduced bone mineral density, lower haemoglobin level, and reduced quality of life. Other literature has shown that low testosterone may further worsen insulin resistance and adiposity, as well as being a risk factor for potential cardiovascular events. Hence, this study will determine the prevalence of hypogonadism among diabetic Malaysian males attending Diabetes clinic in PPUKM & Primary Healthcare Clinics in Cheras, as well as their baseline characteristics including anthropological measurements, sex hormone profile, glycaemic profile and lipid profiles. With this data available, then future interventions can be planned to tackle this issue.

Webinar on "Trends in Cardiovascular Research and Rehabilitation"

The Centre for Research on Non-communicable diseases (CRNCD), Faculty of Medicine and Health Sciences (FMHS) organised a webinar titled "Trends in Cardiovascular Research and Rehabilitation" on 18 August 2020 via Microsoft Teams. Invited speakers, University of Malaya academic Dr Dharmani Devi Murugan spoke on "Endothelial dysfunction: Why is it important in Cardiovascular Research?", while Universiti Sains Malaysia academic Dr Tan Jun Jie spoke on "Stem Cell therapy for Ischemic Heart Disease" and UTAR academic Mr Imtiyaz Ali Mir on "Efficacy of aerobic interval training vs continuous training on CVS health related outcomes". Their insights educated participants on the three elements of medicine that are related to cardiovascular related diseases, laboratory research, therapeutic applications through stem cell treatment, and rehabilitation and training for CVS diseases.

4 QUALITY EDUCATION

Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Foundation programmes	4
Degree programmes	78
Postgraduate programmes	47
Lifelong learning programmes	120
Graduates in year 2020	5,422
Research centres	35
Clubs & societies	78
MoU partners	490+
*Proportion of 1st generation students	2303

PUBLIC ENGAGEMENT

Lifelong learning after formal education

UTAR fosters lifelong learning towards learning community development to face challenges of the fast moving world in the 21st century propelled by Fourth Industrial Revolution. To thrive in the new age of work, UTAR offers courses designed to upskill and reskill talents to address workforce transformations through focus areas such as data science, digital skills, energy management, healthcare, entrepreneurship, communication, and professional qualifications. Professionals can fulfill their continuing professional development (CPD) requirements through courses that are endorsed by professional bodies. In addition to training, activities and events involving the Mind & STEM (science, technology, engineering and mathematics) are organised to prepare workers for the future of the economy.

* This is the FTE (Full Time Equivalent) number of students starting a degree at the university who are first generation students. A first generation student is one who reports they are the first person in their immediate family to attend university at any level.

Note: The individual may have studied at another university previously

Research in numbers: SDG4	Course units on SDG4	SDG4 related activities
76 publications	495 course units	1,454 activities 268,489 participants

RESEARCH

Computational thinking and collaborative storytelling in learning Python

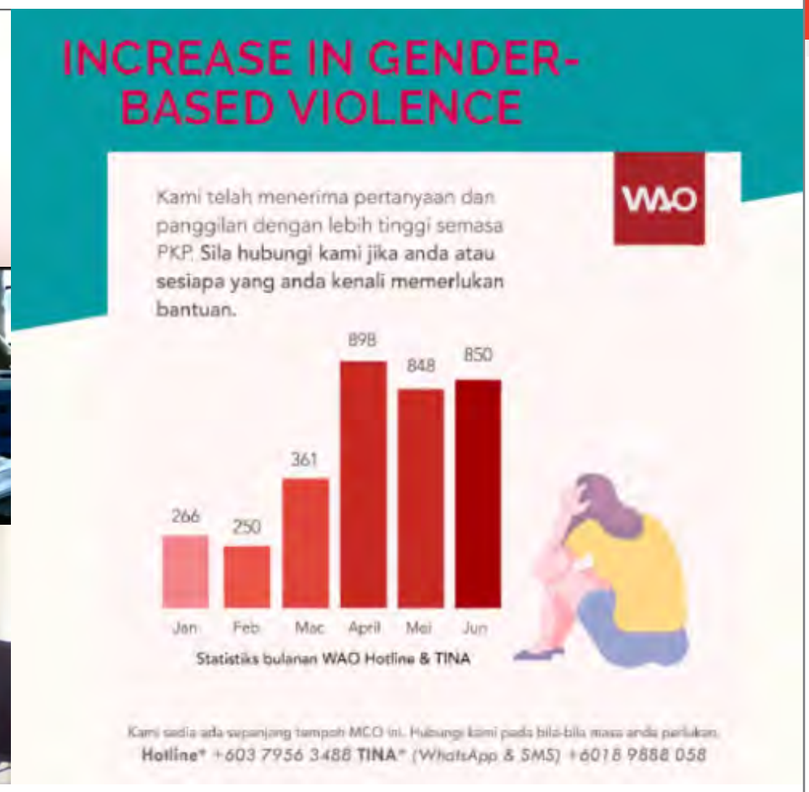
Creative and computational thinking are different but complementary. Combining them would bring significant benefits for young people. With interdisciplinarity in mind, FunPlay Code aims to bridge STEM disciplines with the humanities, and the Arts by combining collaborative storytelling and programming. Modelled after Scratch, FunPlay Code encourages users to express experiences in Python codes. These computational concepts/perspectives can be shared, commented, liked, modded collaboratively in a story format. A search function to enable filtering of stories further caters to users' interests. Functions are developed based on Feature Driven Development methodology. We investigate whether FunPlay Code would be perceived to be easy to use, useful and the likelihood of technology acceptance. User acceptance testing is done remotely with five participants due to the country's covid-19 Movement Control Order (MCO)/lockdown. Findings are relatively positive. The highest mean score is for social interaction/collaborative storytelling, possibly because the story is fun/surprising yet academic.

Copyrights laws on online teaching and learning: A comparative study between Malaysia and international laws

The 2030 Agenda for Sustainable Development agreed by various Head of State under SDG 4 has further pledge towards ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all. Through SDG 4, all UN member states are required to address all forms of exclusion and inequalities in access, participation and learning outcomes. Article 8 of the Berne Act 1886, state as follows: "With regard to the right to make lawful borrowings from literary or artistic works for publications intended for education or of scientific character, or for chrestomathies, the effect of the legislation of the countries of the Union and special arrangements existing or to be concluded between them is reserved". Article 10(2) of the Berne Convention for the Protection of Literary and Artistic Works 1971 (Berne Convention) reads: It shall be a matter for legislation in the countries of the Union, and for special agreements existing or to be concluded between them, to permit the utilization, to the extent justified by the purpose, of literary or artistic works by way of illustration in publications, broadcasts or sound or visual recordings for teaching, provided such utilization is compatible with fair practice. Article 10(2) specifically permits utilizing copyright works for teaching subject to certain conditions such as justified by the purpose of works and compatible with fair practice. What is "fair practice" and "justified" is of subjective matter and ultimately depends on the decision of the national courts of the country. Using works without permission or paying compensation or utilising a substantial amount of works as commonly practised in OER, does not seem to fall under such criteria although it's for teaching purposes since it may be inconsistent with common practices. Review on the teaching exceptions under Article 10(2) of the Berne Convention further excludes education taught outside the formal educational institutions. Nevertheless, this view proved to be disadvantageous especially in the setting where technology opens up opportunities for distance learning and lifelong learning. Article 13 WTO Agreement on Trade-Related Aspects of Intellectual Property Rights 1994 (TRIPs) requires that member countries confine its exceptions to exclusive rights to a) certain special cases b) which do not conflict with a normal exploitation of the work and c) do not unreasonably prejudice the legitimate interests of the right holder. These requirements are meant to be as guidelines that need to be followed by member countries. The real application of these guidelines operates only when there are specific regulations provided in the local laws of a country.

5 GENDER EQUALITY

Goal 5: Achieve gender equality and empower all women and girls



PUBLIC ENGAGEMENT

Repositioning women in the wake of Covid-19 pandemic

UTAR Tun Tan Cheng Lock Centre for Social and Policy Studies (TCLC) organised an online forum titled "Rising above the Pandemic: Covid-19 and Its Effect on Women and Gender" on 12 August 2020 via ZOOM, with the aim to implement a gender-sensitive approach in response to the pandemic and the recovery phase, as well as to make these measures more effective and to ensure that no one is left behind. At the forum, participants learnt that in many instances, women may be overburdened with unpaid work, unable to continue their learning at a distance and face growing domestic violence. Sharing their insights were invited speakers Women's Aid Organisation (WAO) Capacity Building Coordinator Nazreen Nizam who spoke on Challenges faced by women and girls during the pandemic", UTAR Faculty of Creative Industries (FCI) academic Dr Lim Soo Jin, who spoke on "Work and Employability of Women in various Trades", and Universiti Sains Malaysia academic Dr Premalatha Karupiah, who spoke on "Gender Mainstreaming and Intersectionality of Women in a Pandemic".

Research in numbers: SDG5	Course units on SDG5	SDG5 related activities
12 publications	21 course units	30 activities 992 participants

RESEARCH

Understanding the role of Facebook to support women with endometriosis: A Malaysian perspective

The main objective is to examine the pertinent issues discussed by endometriosis patients in Malaysia on MyEndosis Facebook group as an alternative platform for online support. Results showed the issues discussed were (a) personal struggles, (b) medication and treatment, (c) alternative medication, (d) side effects, and (e) medication recommended by doctors. While using this social medium, users found (a) emotional support, (b) esteem support, (c) information support, (d) network support, and (e) tangible assistance in their engagement with others. The analysis suggested that users' interactions were structured around information, emotion, and community building, which many doctors and nurses were not aware of. The group was shaped as a social network where peer users share social support, cultivate companionship, and exert social influence.

Gender gap in industry 4.0 related critical educational subjects (STEM) within higher education: Measurement from female university students' perspectives

Although the gender gap in math course-taking and performance has narrowed in recent decades, females continue to be under-represented in math-intensive fields of Science, Technology, Engineering, and Mathematics (STEM) in higher education. Industries like engineering and manufacturing are mostly male-dominated. In Malaysia, women are persistently under-represented especially in the engineering and manufacturing fields. The under-representation of women in STEM impacts the Fourth Industrial Revolution. There is a great demand for STEM in the era of the Fourth Industrial Revolution and STEM is the most demanding sectors in the labour market. It has been argued that the changes of the Fourth Industrial Revolution will heavily disrupt female employees with the largest female gender gap in STEM. According to World Economic Forum Annual Meeting (2018), we must start fostering a culture of science, technology, engineering and mathematics (STEM) education for girls to enable them to meet the challenges of the Fourth Industrial Revolution. This research investigates factors that influence women's interest especially in engineering and manufacturing industry 4.0 related critical educational STEM at higher education and how to close the gender gap in these fields. The gap of women participation in STEM is deteriorating right now and if this issue is not addressed in the near future, it will be a great loss to our workforce market in line with industry 4.0 related critical fields. The research targets 300 female students from six prominent universities in Malaysia. The findings of the research would provide a novel insight that can be developed for a better understanding of gender disparity in STEM education from the university the students' perspectives. The findings would also assist policymakers in tackling gender disparity in STEM particularly in Engineering and Manufacturing programmes. Policy responses to promoting women in STEM need to holistically address both the lack of women in STEM fields as well as the structural factors that have led to this situation. The study would propose evidence-based recommendations for policy and practice to improve STEM education especially Industry 4.0 Related Critical Educational STEM subjects such as engineering and manufacturing programme.

6 CLEAN WATER AND SANITATION

Goal 6: Ensure availability and sustainable management of water and sanitation for all

PUBLIC ENGAGEMENT

Chemical engineering students contribute innovative solution for water treatment

In their effort to enable students to showcase their talents and gain exposure to the current technologies and knowledge in the field of chemical engineering, Lee Kong Chian Faculty of Engineering and Science (LKC FES) and UTAR Institution of Chemical Engineers (IChemE) Student Chapter at Sungai Long Campus organised "Insight 2020" from 18 to 22 February 2020. Themed 'The Blue Treasure-Ocean', the event aimed to increase the awareness of students and participants on environmental issues and protection of resources, particularly clean water for the future generation. An array of activities were conducted, including a forum, whereby panellists Dr Supramaniam and LKC FES PhD (Engineering) and MEngSc programmes Head Dr Ng Yee Sern discussed on "The Fourth Industrial Revolution of Glove Industrial". There was also a talk on "Industrial Wastewater Treatment Technology and Management" by Purewater Engineering Sdn Bhd Malaysia General Manager Ir Ng Kien An. Two site visits were conducted, and students gained exposure to real-world learning experience when they visited Yakult Malaysia Sdn Bhd and Linde Malaysia Sdn Bhd.

Research in numbers: SDG6	Course units on SDG6	SDG6 related activities
80 publications	28 course units	7 activities, 437 participants

RESEARCH

Removal of zinc from wastewater through the reduction potential determination and electrodeposition using adsorption-desorption solutions

The rubber product manufacturing industry generates large volumes of wastewater containing on average 10 ppm of zinc. Presently, zinc is removed via a chemical precipitation process generating hazardous precipitate that requires secure disposal. This study evaluated the removal of zinc through adsorption on Palm Shell Activated Carbon (PSAC) and subsequent desorption in hydrochloric, nitric (0.1 and 0.2 M), and citric (0.2 and 0.5 M) acids to produce solutions for the electrodeposition of zinc to achieve the permissible discharge level of 2 ppm. The highest desorption efficiency was achieved using HCl. Cyclic Voltammetry (CV) was applied to determine the reduction potential of zinc in desorption solutions. The presence of KCL and a buffer solution improved the electrodeposition of zinc. The chloride-based solution showed the best electroreduction behaviour of zinc with a well-defined reduction peak as compared to the nitrate and citrate-based solutions, with a wider reduction peak and no peak, respectively. The chloride-based solution, selected for the electrodeposition experiments, showed a 64% reduction in zinc concentration within 10 min. The prolonged to 30 min electrodeposition resulted in only 7 % of further increment. Overall, the obtained results confirm the feasibility of zinc removal through the electrodeposition from the adsorption-desorption solution, which provides an effective alternative to the currently industrially used chemical precipitation method.

Water quality index prediction using long short-term memory (LSTM) deep learning method with signal preprocessing

Dynamic changes in water quality parameters involved in rivers are extremely complicated. Large changes in water quality parameters may directly lead to the death of aquaculture organisms. Owing to this, the Department of Environment (DOE) of Malaysia assesses the river water quality based on water quality index (WQI) that takes ammonia nitrogen (AN), biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), pH, and suspended solids (SS) into consideration. It is compulsory to measure all six parameters followed by tedious calculations before the final WQI can be computed. The principal component analysis could be conducted with the aid of machine learning techniques such as artificial neural network (ANN) and support vector machine (SVM) to identify the relationship between water quality indicators, which aim to reduce the numbers of input variables. However, the presence of noise in time series data would increase training time and lower the prediction accuracy of the trained model. Data preprocessing techniques would be needed to prevent the model from accommodating unnecessary errors during the training process. In recent years, machine learning-based WQI prediction studies have been focusing on urban rivers in the main cities instead of rural rivers that are more susceptible to severe pollution. Most of the studies did not evaluate the robustness of their model using data acquired from different rivers. Accordingly, this research is moving towards the notion of applying machine learning and deep learning methods to estimate water quality index with lesser input variables. Machine learning is an artificial intelligence-driven modelling method used to characterize a complicated system using limited data. Basic machine learning models such as ANN and SVM would be adopted to predict WQI time series and compared with the long short-term memory coupled recurrent neural network (LSTM-RNN). As the noise present in the data could increase the complexity of the training model, wavelet transformation will be employed as a data preprocessing method to eliminate data noise. Multiple performance measure indicators will be used to evaluate the prediction accuracy of the model, including coefficient of determination (R2), mean absolute error (MAE), root mean square error (RMSE), mean bias error (MBE) and mean absolute relative error (MARE). The best model would be employed in monitoring different rivers in Malaysia to evaluate model robustness. The overall aim of this study is to develop a reliable model to accurately predict WQI time series in river water using artificial intelligence so that water pollution can be effectively monitored, prevented, and remediated by policymakers.

7 AFFORDABLE AND CLEAN ENERGY

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

PUBLIC ENGAGEMENT

A public talk on ways to make electricity affordable

At a Chinese daily talk show, "Living Delight" organised by 8TV of Media Prima Berhad on 29 June 2020, Lee Kong Chian Faculty of Engineering and Science (LKC FES) academic Dr Chong Lee Wai addressed the issue of Malaysians facing high electricity bill during the pandemic. In tackling this issue with the hope to make electricity affordable for every Malaysian, Dr Chong elaborated on the various financial aid provided by utility service providers and the Government; demonstrated the calculation method for electricity bills during the period of Movement Control Order (MCO); and shared energy saving tips to reduce consumption and cost.

Research in numbers: SDG7	Course units on SDG7	SDG7 related activities
86 publications	18 course units	4 activities, 260 participants

RESEARCH

An outlook on large-scale solar power production in Peninsular Malaysia for scenario year 2030

Traditional power generation mix lacks renewable energy (RE) sources to cover the fast depletion of fossil fuel. Malaysia is picking up on solar energy with the aim of enhancing the national power generation mix by reducing the dependency on fossil fuel and thus mitigate greenhouse gas (GHG) emissions. However, the integration of a large amount of solar power may pose a challenge to power system planning and operation. This paper, therefore, attempts to present an outlook on large-scale solar (LSS) in Peninsular Malaysia for the scenario year 2030 to serve as a guideline for future power planning by adopting the optimum penetration of LSS. Firstly, total optimal potential areas (OPA) for LSS power production in Peninsular Malaysia are determined based on several important geometry factors. Next, its corresponding technical potentials include energy generation potential (EGP), installation capacity (IC) and annual carbon dioxide emission reduction (CO2 ER) are reported. Three hypothetical studies of solar penetration: 5%, 10% and 15% are demonstrated and subsequently compared with the national electricity consumption forecast 2030. Peninsular Malaysia has enormous potential for LSS power production as reflected from a total OPA of 10,092 km2. With only 10% of solar penetration (206,691 GWh/yr), it is sufficient to cover national energy demand, forecast to be 134,642 GWh/yr. This positive finding is very encouraging to reveal the significant potential of LSS in the national energy mix. It will give a much-needed boost to the country RE sector and a robust growth is envisaged.

Enhanced oil recovery from palm oil mill effluent using ultrasonication technique

Palm oil production is the most exploited vegetable oil worldwide. However, the palm oil mill effluent (POME) contributed to significant water pollution. About 2.5 tonnes of POME was produced for every tonne of crude palm oil produced. The standard discharge limit for oil and grease (O&G) according to Environmental Quality (prescribed premises) (crude palm oil) Regulations 1977 is 50 mg/L while the concentration of O&G in POME is about 6000 mg/L. Hence, O&G recovery from wastewater is extremely important. The oil droplets of POME can be found in two phases, being either suspended in the solids or floating in the supernatant. The oil content inside the solid particles is not fully recovered through the solvent extraction process. Ultrasonication is a technology that uses the principle of a sound wave to agitate particles in the mixture by converting an electrical signal into a physical vibration to break particles. Due to the readily available source of POME, theoretically ultrasonication technique can break apart the solid particles and release the oil content and eventually enhance the yield of the oil recovered. The objective of this study is to apply ultrasonication technique to enhance the oil recovery of POME. The optimum ultrasonication condition will be optimised using response surface methodology for maximum oil recovery yield. FAME analysis using gas chromatography will be applied to compare, differentiate and identify the composition of fatty acids from recovered oil. Although some studies have been carried out on oil extraction from POME, enhancing the yield of recovered oil from POME using ultrasonication technique has never been done before.

8 DECENT WORK AND ECONOMIC GROWTH

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

PUBLIC ENGAGEMENT

Business survival tips during COVID-19

The Centre for Corporate and Community Development in collaboration with Unovate Centre and Belt and Road Strategic Research Centre co-organised a live webinar titled "How Can Your Business Survive COVID-19" on 8 May 2020, via Voov Meeting. Invited speaker, Reanda LLKG International Managing Partner-cum-K-Konsult Taxation Sdn Bhd Chief Executive Officer Koong Lin Loong, shed light on the challenges faced by small and medium-sized enterprises (SMEs) during and after the movement control order (MCO), survival tips for SMEs to survive the pandemic, and solutions to overcome the tough times. From Koong, participants also learnt about government assistance provided to SMEs, such as wage subsidy programme, automatic moratoriums on all bank loans, micro-enterprises facility, special relief facility, all economic sectors facility, special grant RM3,000, automation and digitalisation facility, agrofood facility, foreign workers' levy rebate, exemption and discounts of rental premises and tax deduction of rental rebate.

Research in numbers: SDG8	Course units on SDG8	SDG8 related activities
57 publications	222 course units	119 activities 23,756 participants

RESEARCH

The efficiency and performance evaluation of government-linked companies (GLCs) in Malaysia using data envelopment analysis

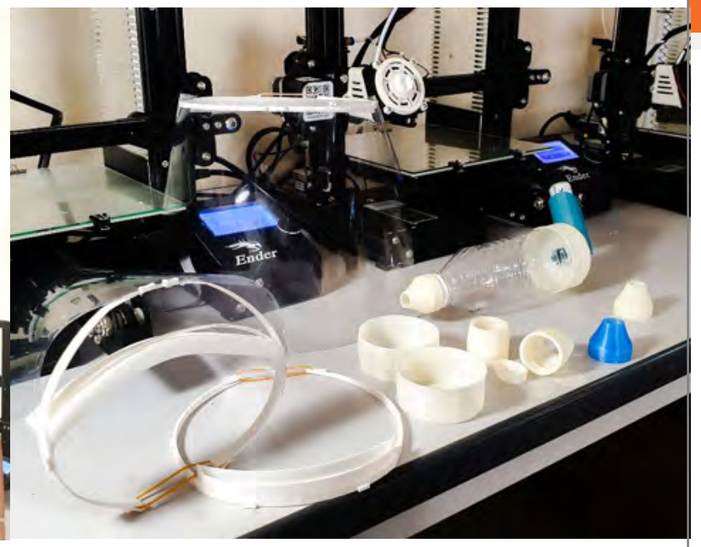
Efficiency is a vital criterion in a globally competitive business and sustainable growth. Efficiency has always been reflected in a company's performance based on the existing input or resources available against the optimum output generated. A highly strong organisational capability will attract higher revenue and more investors to the company. The purpose of this study is to evaluate, compare and rank the overall efficiency based on the annual report of companies in the Malaysian stock market by using Data Envelopment Analysis (DEA). The analysis is carried out on 15 government-linked companies (GLCs) where cross-sectional data between periods of 2013 to 2017 were evaluated. Three efficiency input were considered including return on assets, return on equity and tobin's q where the outcome or outputs were profitability. The results indicate the significance to the investors as the overall efficiency of the companies is ranked according to several years of reports using the DEA model. The implication of this research would benefit the organisations to perform better.

Digitalisation of the economy and its social and economic impacts for sustainable Malaysian development

It is expected that most practical applications will be able to show an accurate result and incur better forecasting. The significance of this research lies in the time series model which can be efficiently implemented. The implementation of digital economy initiatives by the Malaysian government provides a business environment for Malaysian and businesses to develop. The improvement of digital economy impacts will contribute to further development of the economy in Malaysia.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation



PUBLIC ENGAGEMENT

Kon10 Innovations join hands to combat Covid-19

Joining the fight against the Covid-19 pandemic with innovative solutions, Kon10 Innovations, UTAR's Unovate Centre Start-up incubatee, created 3D-printed face shields and nebuliser spacers for hospital usage. In April, Kon10 Innovations produced a total of 1,500 face shields, 4,050 PVC sheets with punched holes and 5,000 sterilised and grooved cut sponge strips, and saw UTAR donating 1,000 face shields to Assunta Hospital and another 1,000 face shields to Hospital Ampang.

The face shields offered extra protection to the medical staff, while the nebuliser spacer is used to contain and space out the drug with a proper mixture of air to allow patients to intake the air-mixed drug properly. Additionally, a valve is used to ensure that the drug travels one way to avoid backflow when the patient coughs. Led by Founder Lim Kai Wen, and members, Lee Kong Chian Faculty of Engineering and Science students Lim Tyng Xian, Sin Chia Ling and Ooi Hsin Yein, Kon10 Innovations provides engineering solution and prototyping services to start-ups and entry-level industries, as well as industrial automation design and precision scale modelling services. Kon10 Innovations aims to design human integrated robotics in the future for the medical field, construction and logistics. Their clients include BoomGrow, Daikin, and GogoKids. Visit Kon10 Innovations Facebook to learn more about them.

Research in numbers: SDG9	Course units on SDG9	SDG9 related activities
201 publications	466 course units	66 activities 7,250 participants

RESEARCH

Bearing fault identification based on convolutional neural network by different input modes

Convolutional neural networks (CNNs) have been applied to the field of fault diagnosis as one of the most widely used deep learning architectures. Different input modes of CNN for bearing fault identification were analyzed by researchers to improve recognition accuracies, such as time-domain diagram, grayscale diagram, short-time Fourier transform diagram, and continuous wavelet transform diagram. However, for the data with small sample size and high background noise, the performance of the CNN is constrained. In this paper, one CNN input mode for bearing fault recognition is proposed based on time-domain colour feature diagram (TDCF) through adding red colour to diagrams. The method significantly enhanced the fault characteristics of the signal, which is beneficial to the CNN extraction of bearing fault features. Convolution visualization illustrates the effectiveness of the proposed method that provides more bearing fault recognition information. Different sample size and colour rate were analysed by bearing vibration data with high noise. The results showed that the bearing fault identification method based on CNN with 0.4 TDCF obtained the highest fault identification accuracy compared with other input mode methods. The feasibility of the proposed method has been validated, which also provides one reference for other faults identification and pattern recognition.

Investigation on the feasibility of power switching devices against surge protection (SPD)

Surge protection devices (SPD) are made to shunt away the excessive current to the ground whenever surge current or voltage is induced at power or signal line. Traditionally, these SPDs are built based on the traditional metal oxide varistor (MOV), spark gap or gas discharge tube (GDT). For the past decade, industry technologies revolution has transformed most of the analogue device into IC base module. These IC are vulnerable to static charge and lightning surge attacks. Based on the report done by many researchers, it was found that these SPDs failed to provide protection under repetitive surges and excessive surge condition which led to the failure of SPD and control system. Many incidents such as explosion in oil and gas plants and refinery are believed to be the failure of those SPDs. In current project, potential of power switching devices SPD such as MOSFET and IGBT in term of response time, power handling capability against transient energy will be explored. Hybrid test surge waveforms based on 1.2/50μs and 8/20μs according to IEC61643 and IEC61000 standard will be used to examine the power devices performance. The internal equivalent model of these power switching devices will be developed and simulate to explain the possible failure due to surge activities. The primary investigation shows power devices exhibits good power handling capability, fast response time and high efficiency. It is expected that SPDs based on MOSFET and IGBT are potential candidate as a new generation surge protection device suitable for Category A and Category B as stated in IEEE C62.41.

10 REDUCED INEQUALITIES

Goal 10: Reduce inequality within and among countries

PUBLIC ENGAGEMENT

Refresh Camp: IT Tuition Programme for New Village children

Ensuring that every individual has the knowledge and skills to access equal opportunities in this rapidly advancing technological world has become more crucial than ever. These skills and knowledge also enable them to gain competitive advantage as they explore various fields in school, work, and society. Commiting to this effort was Faculty of Information and Communication Technology (FICT) and Department of Soft Skills Competency (DSSC) when they organised a Refresh Camp using SCRATCH Programming to equip New Village primary schoolchildren with basic IT skills (elementary level) and allow them to be familiar with IT as a tool, as well as to enhance their communications skills, creativity, and resourcefulness in solving problems. The tuition programme consisted of two hands-on sessions that aimed to enable schoolchildren to use their creativity to create animation, games or stories using SCRATCH. At its core, the programme also introduced computer science and computing-related techniques that closely reflects their interest and values in order to stimulate their creativity, imagination, and interests towards computing.

Span over the course of six months from June 2020 and conducted via Google Meet, the tuition programme emphasised on providing knowledge, practices, and fundamental literacies that young people need to create different types of dynamic and interactive computational media, which they can enjoy using in their daily lives. More than that, the tuition programme also supported young people's development as computational thinkers – individuals who can draw on computational concepts, practices, and perspectives in all aspects of their lives, across disciplines and contexts. The schoolchildren who benefited came from SJK (C) Phui Ying, SJK (C) Bukit Merah, and SJK (C) Yit Chee), SJK (C) Kampung Bali, SJK (C)Bukit Merah, and SJK (C) Man Ming.

Research in numbers: SDG10	Course units on SDG10	SDG10 related activities
11 publications	41 course units	15 activities 1,782 participants

RESEARCH

Effectiveness of Persons with Disabilities Act 2008 and Elections Act 1958 in protecting visually impaired person's freedom of expression in casting votes

Freedom of expression is considered a natural right; one which belongs to everyone, by virtue of them being human. This freedom is evident especially when one cast a vote in the General Election to choose the best candidate to represent him or her in Parliament. Therefore there is doubt on such freedom of expression given to disable person especially one who is visually impaired. The objective of this research is to study on the effectiveness of Persons with Disabilities Act 2008 and Elections Act 1958 in protecting visually impaired person's freedom of expression in casting votes. This research has also included the experiences gained by individuals with visual impairment in the General Election 2018. The findings of this research will help the government to improve the existing Acts in order to protect the interests of visually impaired individual.

The impact of entrepreneurial competencies on firms' sustainability growth. A study of Malaysian Women entrepreneurs

Entrepreneurship has been the major driver of innovation and competitiveness among firms which generates a nation's economy. It creates more job opportunities through business activities. In Malaysia's context, women have prolific potential to uplift national economic and innovative growth by participating in entrepreneurship development. The growth of entrepreneurship in the 29th century stimulates many women entrepreneurs to aggressively start their own businesses. Malaysian women have played an important role in different sectors of business from 2011 to 2016. The present research examines the impact of entrepreneurial competencies on the sustainable growth of a firm. In this respect, some of the entrepreneurial competencies, namely network competency, leadership competency, commitment competency, strategic competency and social capital as moderator will be used to examine the sustainability growth of firm women entrepreneurs from Kedah and Kelantan states in Malaysia.

11 SUSTAINABLE CITIES AND COMMUNITIES

Goal 11: Make cities inclusive, safe, resilient and sustainable

PUBLIC ENGAGEMENT

PR students set up reading corner for Vision Home children

With the theme, 'Empowerment through Reading', 13 students from Group 8 of UTAR Public Relations (PR) CSR Project 2020 conducted a CSR project for children at Vision Home, Ipoh on 14 March 2020. Supervised by UTAR PR lecturer-cum-project advisor Diong Fong Wei, the students successfully set up a reading corner at Vision Home to instil love and interest of reading among the orphans. During the preparation, UTAR students visited SK Sentosa, Kampar for a book donation drive collaboration; hoping to engage the community with CSR initiatives. Through this collaboration, they successfully collected 134 books within a week for Vision Home. The students specifically created a few interactive yet educational games for the children, including flashcard games, book wrapping and mural painting. In addition, the members presented a short sketch, "Snow White" because they believe using motions to tell a story can trigger the children's interest in reading. The manager of Vision Home, Asher Amos expressed his gratitude to UTAR PR students during the launching ceremony as the outcome of the reading corner was beyond his expectation. He believed that the new reading corner would bring improvements to the children in the aspect of academic and communication. He thanked the university students for bringing liveliness to the dull and ordinary room.

Research in numbers: SDG11	Course units on SDG11	SDG11 related activities
79 publications	128 course units	116 activities 19,612 participants

RESEARCH

Street SAFE - Road fault monitoring and reporting

Maintaining roads have become challenging as road users are on the rise. Tough weather conditions and high traffic make road surfaces deteriorate swiftly. Manual detection of these defects is not efficient. Due to the rise of smartphone use, the accelerometers in the smartphone are employed for road fault classification. Supervised machine learning classification models of data pertaining to a pothole, speed bump, hazard line, smooth road, uneven road, turn, and hard stop are trained with the Random Forest (RF) and Support Vector Machine (SVM) algorithms, which is then utilized in StreetSAFE (Smartphone Assisted Fault Examination), a machine learning aided system to detect road faults and report them in real time. Using statistical parameters, the system is found to able to distinguish road surface conditions. The system can potentially predict road damage, facilitate maintenance and resource management.

Strategic asset management among road agencies in Malaysia

Roads are considered as a foundation for the Sustainable Development Goals (SDGs) as it brings together communities socially and economically. An efficient and resilient road network system ensures that every individual has an equal chance of enjoying economic growth. At the end of 2010, Malaysia has approximately 236,802 km of roads nationwide. Many road networks are more than twenty years and many of the road assets are in distress and in need of maintenance. This situation is exacerbated by limited fund allocation for road maintenance and rehabilitation. A holistic, structured and flexible asset management strategy will play an important role in assisting asset managers to obtain the required funding to meet their objectives. Formulation of an asset management model from this study will guide asset managers in developing sound asset management strategies when seeking funding allocation for meeting their objectives. The research output will improve the understanding of the road asset management as a strategic partner within an organisation that contributes to the successful delivery of organisational objectives.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Goal 12: Ensure sustainable consumption and production patterns

PUBLIC ENGAGEMENT

Waste management lessons for refugee children with Fireflies Project

Good practices are best taught at a young age, and an interactive upcycling workshop under the Fireflies Project, conducted by UTAR Sustainable Development Club on 15 February 2020, at refugee centre, E-lluminate, Taman Connaught was indeed educational to teach the 21 refugee children the importance of a zero-waste environment. The project was also part of UTAR's initiative to promote United Nation's Sustainable Developmental Goals (SDG).

The children were taught ways to turn a plastic bottle into a reusable container, and saw the children using their creativity creating their own unique plastic bottle container. The activity aimed to enhance the children's awareness on upcycling and zero waste environment as well as to understand SDG12, which is to ensure sustainable consumption and production patterns.

Research in numbers: SDG12	Course units on SDG12	SDG12 related activities
47 publications	143 course units	10 activities 789 participants

RESEARCH

The impact of global financial crisis on informational efficiency: Evidence from price-volume relation in crude palm oil futures market

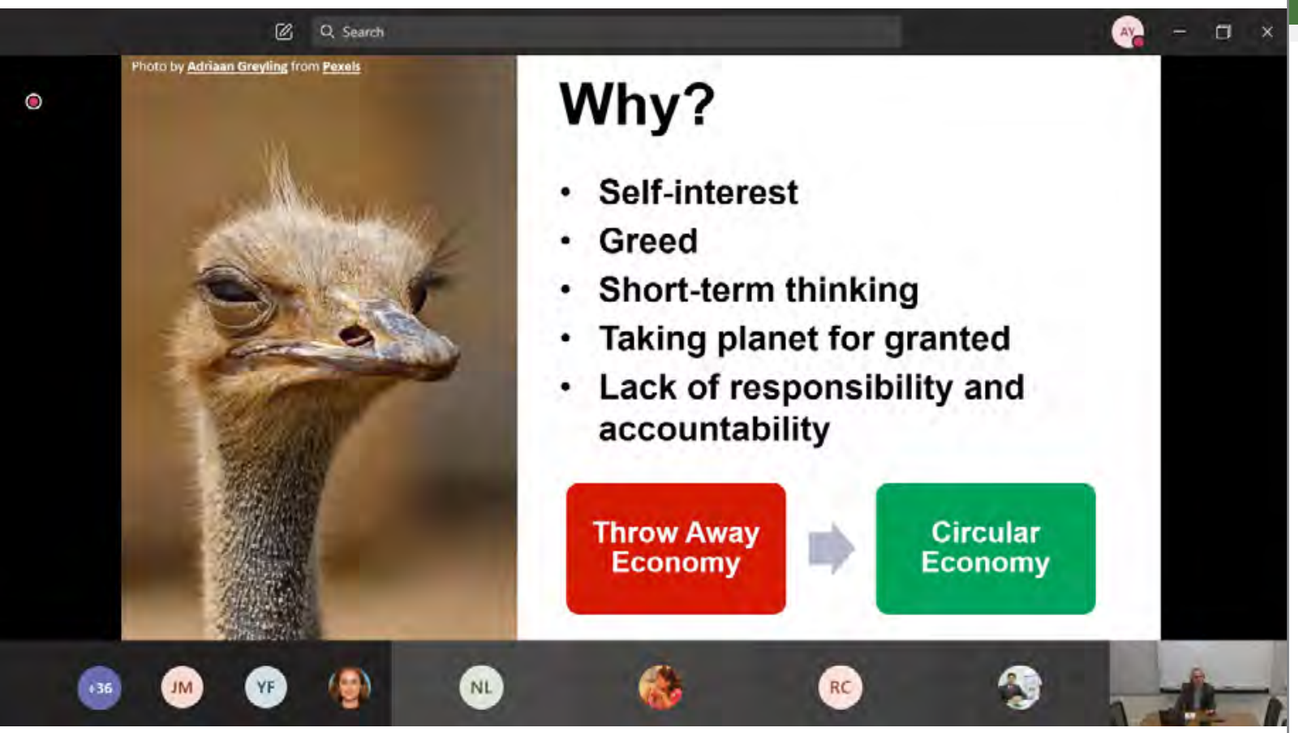
This study examines price-volume relation in crude palm oil (CPO) futures market during the pre-crisis, crisis and post-crisis periods. Based on daily data from January 2000 to July 2017, the cross-correlation function (CCF) provides four findings: First, volatilities of past trading volume and current return are correlated in pre- and post-crisis with an inconsistent sign, supporting the nature of noise trader demand. Second, in the pre-crisis period, both volatilities are negatively correlated within a short time span. Third, during the crisis period, there is no volatility spillover between both series. Fourth, in the post-crisis period, both volatilities of past trading volume and current return are positively correlated within a long time span, in addition to volatility spillover from the current return to the future trading volume which also happens within a short time span. Notably, significant volatility spillovers from trading volume to return across the crisis change the sign of correlations with a longer time span, supporting the "heterogeneity of traders" hypothesis. This study suggests that market participants have become risk-averse, particularly after the crisis. As a result, there has been an increase in volatility persistence which reduces the level of informational efficiency.

Investigation on the use of food waste derived biosorbents on nitrate removal from water

The project investigates the application of food waste-derived biosorbents on the removal of nitrate from water. Biosorbents have been proven to be effective in removing cationic contaminants from water. Nevertheless, the investigation on the removal of non-metal anionic contaminants, such as nitrate and phosphate, is scarce. The current method for the removal of nitrate from water is biological treatment method. However, it is worth noting that the conventional biological treatment method not only requires frequent careful monitoring but also the efficiency of the system is highly sensitive to the loading of nitrate, nutrient and other compounds. This leads to a research question that alternative treatment methods that are less sensitive and low cost should be investigated to improve this issue.

13 CLIMATE ACTION

Goal 13: Take urgent action to combat climate change and its impacts



PUBLIC ENGAGEMENT

PRME Director reviews SDGs to address climate change

2020 has been a year plagued with a plethora of problems, from the worldwide pandemic to the Australian bushfire and Lebanon explosion; 2020 has been a rough year for all. However, one issue that has been overshadowed by all these problems, yet still increasingly prevalent than ever, is the global climate change. This issue, although rampant, seemed to be less discussed and known by many. Thus, to enlighten people on the severity of this ongoing problem, the Centre for Entrepreneurial Sustainability (CENTS) in collaboration with the Faculty of Accountancy and Management (FAM) organised a public webinar titled, "Exploring the UN Sustainable Development Goals (SDGs) and Practical Way of Addressing Them" on 18 August 2020 via Microsoft Teams. Hosting the webinar was Dr Mehran Nejati, the senior lecturer and director of United Nations Principles for Responsible Management Education (PRME) & Sustainability at Edith Cowan University School of Business and Law while moderating it was CENTS Chairperson Dr Mohammad Falahat Nejadmahani. The webinar aimed to educate people on the reasons global warming occur and how businesses and institutions can help combat this problem.

Research in numbers: SDG13	Course units on SDG13	SDG13 related activities
18 publications	27 course units	6 activities, 728 participants

RESEARCH

Adsorption of SO2 and H2S by sonicated raw eggshell

In this study, raw eggshell was sonicated in presence of N,N-dimethyl-formamide (DMF) and tested for its capacity to adsorb SO2 and H2S. The flow rate was kept constant at 300 ml/min throughout the study. Sonication was carried out at different temperature (30 °C, 60 °C and 80 °C) with a constant contact time of 3 h. It was found that sonication at higher temperature (80 °C) had the best adsorption capacities for both SO2 (2.4 mg/g) and H2S (1.85 mg/g) respectively. The BET surface area of sonicated raw eggshell particles was about 3.39 m2/g. The reading was higher compared to raw eggshell. Moreover, in the process study, the sorbents were tested with 40% of relative humidity and at 2 different reaction temperature i.e. 100 °C and 200 °C. Increasing the reaction temperature and the relative humidity in the inlet gas further increased the adsorption capacities for both SO2 and H2S. The results show that sonicated eggshell particles can be valorised as sorbents for SO2 and H2S.

Effects of cellulase-xylanase treatments on dietary fiber properties, prebiotic activity and bioprotein production of palm decanter cake

The oil palm industry is the backbone of Malaysia's economic and social development. There is approximately 426 palm oil mill in Malaysia. An average palm oil mill produces about 160- 200 tons of decanter cake monthly. The recalcitrant lignocellulose rich biomass is high in insoluble dietary fibre content which limits the accessibility of chemicals or bioreagent for further applications. Low digestibility and limited nitrogen resource are the major constraints of using palm decanter cake to replace conventional feed for pet, livestock or microbial cultivation. These challenges may be overcome by imposing enzymatic treatments on waste. Enzymatic treatment with commercial microbial cellulase and xylanase is an environmental-friendly way to hydrolyze the recalcitrant lignocelluloses to smaller molecules like simple sugars. In the past, such treatment on oil palm biomass was targeted on biofuel application. We postulate that palm decanter cake with a high amount of insoluble neutral detergent fibre can be hydrolyzed to improve the solubility and digestibility besides liberating oligo-saccharides that possess the prebiotic activity and fermentable sugar for single-cell protein production. The main objectives of this project are: To reduce the insoluble dietary fibre of palm decanter cake through cellulase-xylanase treatments; to quantify prebiotic activity; to evaluate the potential for single-cell protein production to and to assess the in vitro digestibility of the enzymatic-treated and untreated palm decanter cake. The tangible outcome of this project will be: optimized conditions are identified to produce enzymatic treated palm decanter cake with improved dietary fibre properties, higher digestibility, higher prebiotic activity score and improved fermentability for single-cell protein production. Valorizing decanter cake provides an economical solution for solid waste management and reduces environmental pollution problem concomitantly which could meet the global sustainable development goal.

14 LIFE BELOW WATER

Goal 14: Conserve and sustainably use the oceans, seas and marine resources

PUBLIC ENGAGEMENT

Conserving seahorses to save the seas

Efforts to encourage the joint effort of the public to preserve seahorses were further emphasised in a virtual talk titled, "Save our Seahorses", organised by the Department of Student Affairs (DSA) Kampar Campus, with support from the Eco-friendly Campaign, on 2 December 2020, via ZOOM. Also in line with Sustainable Development Goal 14: Life Below Water, which focuses on conserving and sustainably using the oceans, seas and marine resources for sustainable development, invited speaker Dr Adam Lim Chee Ooi enlightened participants with information about the seahorses and their importance to the seas, and pointed out that the species of seahorses have been threatened by overfishing, destruction of habitat, by-catch, and ocean plastic pollution. The Project Leader and Chairperson of Save Our Seahorses (SOS) Malaysia and the National Seahorse Expert - Malaysia for the iSeahorse Project, highlighted that saving seahorses is an important step to save the seas, because seahorses are ambassadors of the ecosystem they inhabit and stand as flagship species, and their preservation is important for ecological, cultural, biological, economical, and medicinal reasons. Towards the end of the virtual talk, he listed a number of ways that participants can offer to the conservatory effort.

Research in numbers: SDG14	Course units on SDG14	SDG14 related activities
4 publications	15 course units	1 activities 93 participants

RESEARCH

Characterising the performance impacts of target surface on underwater pulse laser ranging system

Laser-based object detection has been recognised as the most reliable technique for applications such as night vision, 3D (3-Dimensional) imaging, and especially underwater object detection. The key information is extracted from the reflected laser pulse after interacting with the target which surface directly affects the system performance. Due to the variety of the target types, it is necessary to investigate the surface characteristics and their effects on the performance of an underwater pulse laser ranging system. In this paper, the influence of target surface characteristics namely the type of materials, colours, and roughness on the reflectance and system performance are investigated through theoretical analysis using the Bidirectional Reflection Distribution Function (BRDF) and Laser Detection and Ranging (LADAR) model. An underwater peak detection pulse laser ranging system is developed to validate the results of a theoretical study. Both experimental and theoretical results clearly show that the system performance depends on the reflectance caused by the three characteristics of the target surface. This comprehensive research provides a handy reference with regards to the surface material, colours, and roughness for future improvement or correction in this domain.

Potential use of live mealworm feeding for giant freshwater prawn, Macrobrachium rosenbergii: Health, growth performance, feed utilization and nutritional content

Aquaculture is the fastest growing global food production industry. The giant freshwater prawn, Macrobrachium rosenbergii, is becoming an increasingly important aquaculture species throughout the tropics. This species is especially popular throughout Asia for its good taste and ability to be integrated with farms such as rice or fish production, as well as being an alternative to marine shrimp production that have been affected by diseases. It has been reported that for this industry to continue expanding, it will become necessary to adopt more sustainable practices. In particular, identifying alternative food to the increasingly costly and less available marine-based diets represents an essential part in achieving this goal. On the other hand, large amounts of food and non-profitable side streams from industrial processes are currently wasted, but this could be used as feed for insects, which can convert diverse waste streams into protein. Edible insects are therefore gaining attention among the research community. The nutritional components of mealworms can be classified as "high in" and "source of" according to the thresholds for World Health Organisation and Food and Agriculture Organisation of the United Nations food labels. Considering that feeding costs represent the major operational costs of a modern prawn farm, any savings in feed costs can translate to substantial savings for the industry, therefore the development of a sustainable and health-promoting feed for giant freshwater prawn is imperative. In the past two years, several studies have shown that mealworm meal, to a certain extent, can be utilised as a fishmeal alternative for marine shrimps and fish. Yet no scientific data is available on feeding the giant freshwater prawn with live mealworm. This study is aimed to investigate the potential use of live mealworm feeding for giant freshwater prawn M. rosenbergii. The growth performance, feed utilisation, immune response and nutritional content of the prawn will be studied. This study also aims to produce high-quality mealworm with food/agricultural waste to examine if administration of live mealworm feeding with and without probiotic enrichment benefit the giant freshwater prawn.

15 LIFE ON LAND

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

PUBLIC ENGAGEMENT

UTAR Bird Sanctuary conserves the Herons

The UTAR Bird Sanctuary is located on a small island in the middle of the pond, which is also viewable from the West Lake residential area. This island within UTAR is known to be the breeding site for five species of herons, namely the Grey Heron, Purple Heron, Black-crowned Night Heron, Cattle Egret and Little Egret. A signboard was set up in 2012 during the 10th anniversary to introduce the five species of herons to the visitors. Sign boards were also set up in the area to remind the visitors to not disturb the birds. Survey to monitor the heronry population is conducted every July from 2010 to 2020.

Research in numbers: SDG15	Course units on SDG15	SDG15 related activities
11 publications	15 course units	12 activities 774 participants

RESEARCH

Epigenetic changes and their relationship to somaclonal variation: A need to monitor the micropropagation of plantation crops

Chromatin modulation plays important roles in gene expression regulation and genome activities. In plants, epigenetic changes, including variations in histone modification and DNA methylation, are linked to alterations in gene expression. Despite the significance and potential of in vitro cell and tissue culture systems in fundamental research and marketable applications, these systems threaten the genetic and epigenetic networks of intact plant organs and tissues. Cell and tissue culture applications can lead to DNA variations, methylation alterations, transposon activation, and finally, somaclonal variations. In this review, we discuss the status of the current understanding of epigenomic changes that occur under in vitro conditions in plantation crops, including coconut, oil palm, rubber, cotton, coffee and tea. It is hoped that comprehensive knowledge of the molecular basis of these epigenomic variations will help researchers develop strategies to enhance the totipotent and embryogenic capabilities of tissue culture systems for plantation crops.

Characterization of centromere-specific proteins in oil palms: Towards systematic haploid plant production

Oil palm is one of the most important oil-food crops, and various kinds of breeding techniques have been applied to increase oil contents and/or improve oil constitution of the fruits. However, application of haploid breeding, which has several advantages such as shortening of breeding time, is quite limited in oil palms, because it is very difficult to regenerate haploid plants from cultured gametophyte cells such as pollens in anthers or eggs in ovules. Under these circumstances, a phenomenon called "Chromosome (or genome) Elimination" has emerged as a possible approach for haploid production. To apply this technique to oil palms, the basic information on the "centromeres" on chromosomes is essential, but no such studies have been made in oil palms. In this study, therefore, we aim to elucidate the centromere structure of oil palms by characterizing centromere proteins, particularly centromere-specific histone H3 (CENH3). CENH3 is a key protein for centromere function in almost all eukaryotes, and spontaneously or artificially altered CENH3 causes chromosome and/or genome elimination, resulting in haploid formation. Therefore, we first identify CENH3 gene(s) and/or EST (cDNA) in the databases of oil palms (Elaeis guineensis and E. oleifera), and deduce their amino acid sequences. After expression of the candidate genes is confirmed by RT-PCR, we raise antibodies against E. guineensis and/or oleifera CENH3 (anti-EgCENH3 and EoCENH3, respectively) to investigate the centromere-localization, by injection of synthetic polypeptides designed based on the amino acid sequences deduced from cDNA. The antibodies are also used to isolate the centromere DNA sequences by immunoprecipitation and DNA sequencing. Based on the data obtained from two Elaeis species, we attempt to isolate CENH3 cDNA from the relatives such as Phenix species. The CENH3 affinity for the centromere DNA sequences of oil palms could be estimated by comparing the amino acid sequence to those of two Elaeis CENH3. If some relatives have CENH3, the amino acid sequence of which is diverged significantly from those of Elaeis ones, misloading of the CENH3 would occur in the hybrids between them, resulting in chromosome elimination and haploid formation.

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Goal 16: Promote just, peaceful and inclusive societies

PUBLIC ENGAGEMENT

Webinar highlights opportunities in GBA and OBOR

UTAR, in collaboration with China-ASEAN Business Association (CABA), organised a webinar titled "Doing Business in Hong Kong and China - Legal compliance, Tax and Financial Planning" via Zoom and Facebook live on 21 October 2020. The webinar was moderated by Singapore Institute of International Affairs Senior Fellow and Principal Advisor for Pacific Research Center of Malaysia Dr Oh Ei Sun. Present to deliver the talk was Founding Director and member of Sino Asean Fiduciaries (HK) Limited and Sino Singapore Corporate Services Pte Ltd Alex Chow. During the webinar, Alex Chow first gave a brief introduction on One Belt One Road (OBOR) and Greater Bay Area (GBA), followed by the seven areas of Greater Bay Area development and its mission as well as its six basic principles, and finally, the advantage of doing business in Hong Kong, explaining that Hong Kong is the heart of Asia due to its strategic location for business and it has a very simple and competitive tax system.

Research in numbers: SDG16	Course units on SDG16	SDG16 related activities
14 publications	77 course units	4 activities, 519 participants

RESEARCH

Roles of institutional quality on the relationship between tourism and economic development in Malaysia

This research intends to examine the roles of institutional quality on tourism-led growth and growth-led tourism hypothesis in Malaysia in both short-run and long-run analysis. This study uses yearly data from 1996 to 2015 to verify whether institutional quality significantly affects the relationship between tourism and economic growth in Malaysia. It provides a comprehensive dataset by investigating all the institutional quality dimensions including control of corruption, government effectiveness, regulatory quality, rule of law, voice and accountability, political stability and absence of violence in addition to the aggregate value and average value of these dimensions. The findings provide empirical supports that institutional quality such as control of corruption and government effectiveness do play important roles in the tourism and economic growth in Malaysia. In this essence, any policy planning that enhances the corruption and government effectiveness of Malaysia could promote tourism development and economic growth in Malaysia.

The effects of institutional quality on private investment

Institutional quality is important to support market efficiency. United States' 2008/2009 subprime crisis teaches us a lesson as to how crucial institutions are in reinforcing regulation in a country's financial or banking system. In the aftermath of the 2008/2009 global financial crisis (originated from the U.S's subprime crisis) and the European sovereign debt crisis, developed economies like Greece, Ireland, Portugal, Spain, Japan etc. have been facing severe sovereign debt situation and hence public spending have been limited by the compliance towards austerity measure. Given the public financial constraint, the attraction of private investments is of utmost importance for policymakers due to its significant contribution to (regain) output (Khan & Reinhart, 1990), economic growth, and economic development because it is associated with higher efficiency, significant job creation etc. (Ruzima & Boachie, 2018). Therefore, policy-makers in many countries widely recognize its importance and focus on strategies to promote and attract private investments for their nations' growth. However, it is observed that there are vast distortions in the returns to private investment across nations. The traditional barriers to investment such as income taxes, investment taxes and others alike can only explain part of the said distortions. Institutional variables (institutions) that influence the process of governments' decision-making, however, also play an important role in determining the feasibility and hence the initiation of investment.

17 PARTNERSHIPS FOR THE GOALS

Goal 17: Revitalize the global partnership for sustainable development

PUBLIC ENGAGEMENT

Green Bank Programme advocates recycling

UTAR collaborates with Go Greenonline Sdn Bhd to initiate the Green Bank Programme, which saw the first Green Bank set up in UTAR Kampar Campus. The collaboration was established in 30 March 2020, and since then, the total amount of recyclable wastes collected is 1817kg. The wastes collected consisted of papers, plastic products, metal products, electronic products, glass products, clothes and even car batteries. Participants who contributed to the programme benefitted from understanding the importance of recycling. In addition to that, the programme also successfully promoted waste segregation practice among UTAR staff and students, and hopes to continue carrying out projects parallel to the Sustainable Development Goals (SDGs).

Research in numbers: SDG17	Course units on SDG17	SDG17 related activities
5 publications	88 course units	37 activities 11,613 participants

RESEARCH

A multiple classifiers system for anomaly detection in credit card data with unbalanced and overlapped classes

Frauds and default payments are two major anomalies in credit card transactions. Researchers have been vigorously finding solutions to tackle them and one of the solutions is to use data mining approaches. However, the collected credit card data can be quite a challenge for researchers. This is because of the data characteristics that contain: (i) unbalanced class distribution, and (ii) overlapping of class samples. Both characteristics generally cause low detection rates for the anomalies that are minorities in the data. On top of that, the weakness of general learning algorithms contributes to the difficulties of classifying the anomalies as the algorithms generally bias towards the majority class samples. In this study, we used a Multiple Classifiers System (MCS) on these two data sets: (i) credit card frauds (CCF), and (ii) credit card default payments (CCDP). The MCS employs a sequential decision combination strategy to produce accurate anomaly detection. Our empirical studies show that the MCS outperforms the existing research, particularly in detecting the anomalies that are minorities in these two credit card data sets.

IoT data design for smart cities big data analytics

The Internet of Things (IoT) paradigm is an emerging technology that connects billions of heterogeneous "smart objects" through wireless connections. The next generation of smart cities applications (e.g. intelligent transportation, smart home, smart healthcare, smart grid etc.) depend on the ubiquitous sensing capabilities of wirelessly connected sensors and actuators that can help us to observe, measure, understand and act on surroundings of our physical world through the embedded devices in the environment. The capability of reasoning and understanding our physical world is essential to the intelligence of smart services in the environment. This ubiquitous sensing results in smart cities application producing a large volume of data in diverse formats, originating from different platforms. The data need seamless translation, assimilation, integration, interpretation, storage and efficient processing.

AWARDS & RECOGNITION

The call for sustainable actions continues to inspire people of all ages to do their parts. In UTAR, staff and students demonstrate their dedication towards achieving sustainability through the various activities and researches conducted to benefit the community and environment, and as means of giving back to society. These contributions of theirs are highly appreciated and the awards given recognize their effort towards achieving the Sustainable Development Goals. Among the many, here are some of the noteworthy awards:

UTAR duo emerged as Malaysia champion of Schneider Go Green 2020

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Proud winners, Chai (sixth from right) and Chin (fifth from left) posing with their trophy

UTAR Lee Kong Chian Faculty of Engineering and Science (LKC FES) final year Chemical Engineering student Chai Yi Jun and Faculty of Accountancy and Management (FAM) final year Global Economics student Chin Yee Xin emerged as Malaysia's Champion in the Schneider Electric Go Green: A Global Student Competition, organised by Schneider Electric held at Petaling Jaya on 4 March 2020. The competition, which aimed to look out for bold ideas that can shape the future of Schneider Electric's industry and its company, saw the duo participating in the "Sustainability and Access to Energy" category with the team's name as "Amazingly, it works". The idea of team "Amazingly, it works" was about the utilisation of food waste to generate energy in the form of electricity and fertiliser that could eventually have great contribution to the society and the environment. In their proposal, titled "Fonergy, Solution to Your Food Waste Energy", they raised the issue of serious global food waste which was about 1.3billion tonnes annually. These food wastes can be served as the food source for the microorganism to undergo anaerobic digestion in microbial fuel cell to generate electricity. The leftover sludge can be further processed into organic fertilisers. The idea proposed by team "Amazingly, it works" realised the concept of "waste to wealth".

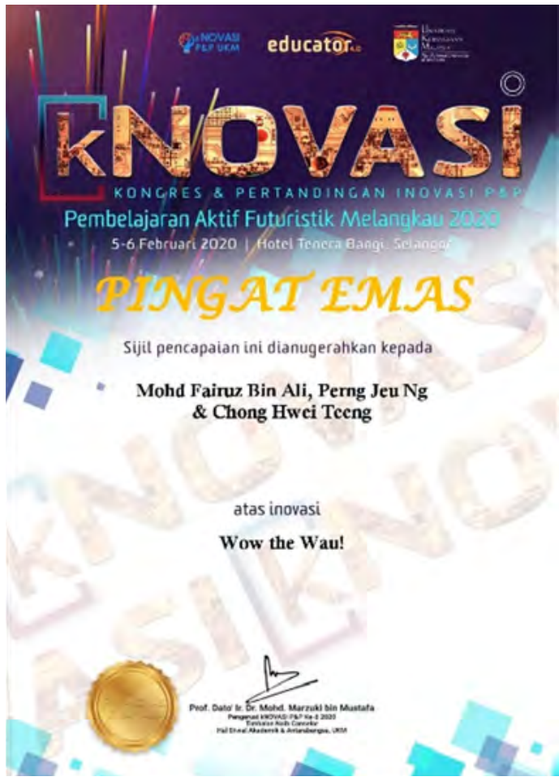
Gold Award for preserving Wau through mobile game

11 SUSTAINABLE CITIES AND COMMUNITIES

The award-winning project "Wow the Wau", by three Faculty of Creative Industries (FCI) academics Mohd Fairuz bin Ali, Chong Hwei Teeng and Ng Perng Jeu, was awarded again with Gold Award at kNovasi 2020 held at Tenera Hotel, Bangi on 5 and 6 February 2020. The project, an Android-based application content, aimed to present the traditional Malaysian game called Wau, stemmed from their research study which aimed to educate people on the history and myth of Wau culture, while at the same time promoting the uniqueness and significance of Wau through mobile games. The project provided an ingenious solution to preserve the value of the traditional game, Wau. It also carried the national symbol, concordance with the evolving digital game technology worldwide. The design and the gameplay mechanics of "Wow the Wau!" innovate the original method of playing Wau, allowing a new set of experience inspired by local origins for people to learn and enjoy. As a result, this application could play an immense role in preserving and sustaining the traditional game Wau and its historical values. The research, as well as the development of this mobile game, was seen as a breakthrough in digital technology as it is yet to be produced and made available on digital platform market especially as a game.

From left: Fairuz, Chong and Ng displaying the award

The Gold Award won by Fairuz, Chong and Ng


kNOVASI
KONGRES & PERTANDINGAN INOVASI P&P
Pembelajaran Aktif Futuristik Melangkau 2020
5-6 Februari 2020 | Hotel Tenera Bangi, Selangor
PINGAT EMAS
Sijil pencapaian ini dianugerahkan kepada
Mohd Fairuz Bin Ali, Perng Jeu Ng & Chong Hwei Teeng
atas inovasi
Wow the Wau!
Prof. Datoʼ Ir. Dr. Mohd. Marzuki bin Mustafa

LKC FES academic won the MTSF Science and Technology Award for the year 2020

Lee Kong Chian Faculty of Engineering and Science (LKC FES) Ir Prof Dr Lim Yun Seng won the Malaysia Toray Science Foundation (MTSF) Science and Technology Award for the year 2020, along with cash prize of RM30,000, for his innovative research work on "Innovative Controllers of Energy Storage System for Solving Energy Trilemma (A Smart Grid Technologies)". He was selected as one of the two recipients of award, which is given to two deserving Malaysian scientists/researchers each year in recognition of his/her outstanding achievements/discoveries/contributions in Science and Technology. The co-winners of the award were Dr Chua Kein Huat and Ir Dr Wong Jianhui.

Through the funding received from the government and British Council (AAIBE, CREST and Newton Fund), Prof Lim and his team successfully built the first working utility-scale grid-integrated Energy Storage System (ESS) at the rating of 400 kW and 780 kWh in Malaysia on UTAR Campus (commercial building) under a real operating environment. A number of new controllers were developed to reduce the daily peak demands of the building under the intermittent power output of renewable energy sources as well as solving power quality issues caused by the penetration of photovoltaic systems.

With the new controller, UTAR is able to save RM18,500 for electricity bills per year due to the reduction of monthly maximum demand charges. The utility company can save about RM91,000 per year from the deferment of network reinforcement and power plants. In addition, about 16 tonnes of CO_2 can be avoided per year due to the relatively low maximum demands on power networks. With such ESS, TNB can avoid any increase in electricity price (RM/kWh) for its customers, hence propelling the growth of the nation's economy. This project was carried out in collaboration with Newcastle University (UK) and industries such as Hoppecke and ERS Energy.These controllers can bring benefits to the three areas of energy trilemma, known as Environmental Sustainability, Affordability of Electricity and Security of Supply. A number of patents were developed from this work in addition to many high-impact journal papers being published in the top 5% of the international journals.

SDG Merit award and SDG Special Mention Awards for outstanding students

Four students were awarded with SDG Merit and SDG Special Mention Awards for their sustainability effort and outstanding achievements in helping the community.

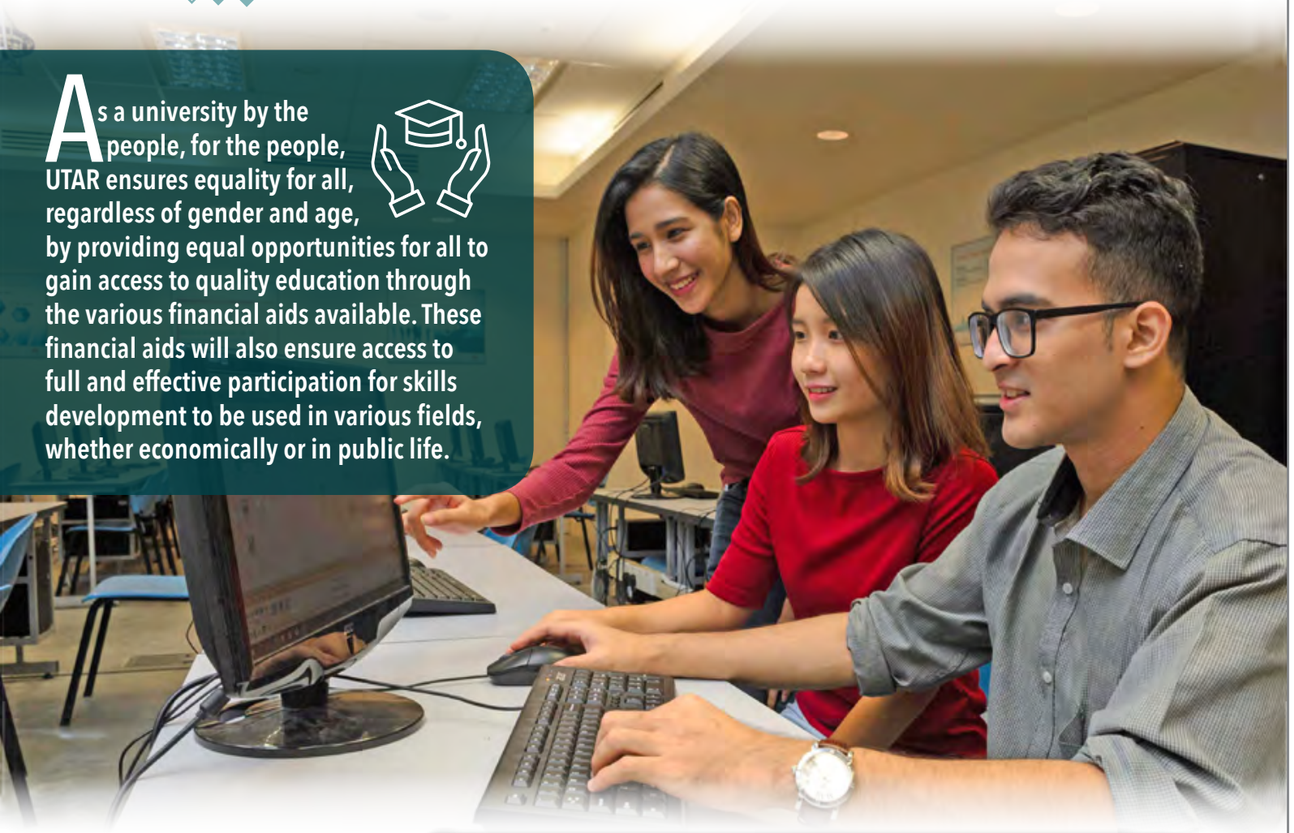
Bachelor of Science (Honours) Biomedical Science student Anwar Ariff bin Mohd Khairie was awarded the SDG Merit Award for his effort in ensuring the safety of students and community of Kampar, as also emphasised in Goal 16. He and his team combatted an exhibitionist, or also commonly known as flashers, and conducted an investigation to locate the hidden position of the flasher; a thick bush near the pavement. They also took the initiative to cut the bush to prevent another incident. On a part-time basis, Ariff volunteers as a RELA member and has been serving since Jun 2019. He carries out his duty once or twice a week and at times with the Polis DiRaja Malaysia (PDRM).

Bachelor of Accounting (Honours) student Choo Pao Ling was the first award recipient for SDG Special Mention Award, and was awarded for her active contribution in the Orang Asli Project 5.0, conducted from 10 to 12 January 2020 at Kampung Ulu Jelintoh, Gopeng,Perak. The project achieves goal 3, and provides the community with the support they need for continuous development. It also promotes inclusive and equality for all, by ensuring that the voices and needs of the community is heard. The project saw the team organising a *gotong-royong* session to educate the community on the importance of cleanliness, and building a reading corner for the villagers to promote reading among the children. They also collaborated with Crisis Relief Squad of MCA (CRSM) to conduct health screening for the villagers, which aimed to educate them on ways of taking care of their health. Blood test, blood pressure test and BMI test were done, and the villagers were briefed on their health condition.

The second award recipient of SDG Special Mention Award was Bachelor of Engineering (Honours) Chemical Engineering student Lim Chong Meng, who actively contributed in the "Fireflies Project". Lim was the chairperson for the "Fireflies Project", which is targeted to help refugee children. The project aimed to educate and equip children with fundamental knowledge of financial management and practice the zero-waste environmental knowledge as part of UTAR's initiative to promote the SDGs. While educating the children, the project also empowers them by teaching them self-sufficiency skills. SDG 4 (Quality Education) and SDG 10 (Reduced Inequality) are closely related to the Fireflies Project.

The third award recipient of SDG Special Mention Award, Master of Engineering Science student Teoh Han Wei, was awarded for organising the "SDGs Competition 2019: Stand up for the Change", held in conjunction with the International Young Leaders Conference 2019. Themed 'Youth Empowerment and Inclusion in Achieving Sustainable Development Goals', the competition was held on 25 October 2019 and 26 October 2019 at UTAR Sungai Long Campus. The competition aimed to create awareness towards Sustainable Development Goals (SDGs) among tertiary students in Malaysia. It served as a platform for students to present their ideas and solution in relations to sustainability, and to recognise the students' contribution towards achieving sustainability.

SCHOLARSHIPS & FINANCIAL AID



As a university by the people, for the people, UTAR ensures equality for all, regardless of gender and age, by providing equal opportunities for all to gain access to quality education through the various financial aids available. These financial aids will also ensure access to full and effective participation for skills development to be used in various fields, whether economically or in public life.

UTAR TOP ACHIEVER SCHOLARSHIPS

This Scholarship is awarded to the applicants with outstanding academic performance upon admission to pursue their studies at UTAR Foundation and undergraduate programmes.

- **UTAR Top Achiever Scholarships Foundation**
- **UTAR Top Achiever Scholarships Undergraduate** (Non FMHS)
- **UTAR Top Achiever Scholarships Undergraduate** (FMHS, non MBBS)
- **UTAR Top Achiever Scholarships Undergraduate** (FMHS, MBBS)

Over RM100million internal scholarships have been imbursed to over 13,600 students

Over RM19.5million external scholarship have been imbursed to over 600 students

Other internal scholarships

- Nursing Scholarship (UTAR Degree)
- Nursing Scholarship (Diploma in Nursing)
- UTAR-UEC Scholarships
- UTAR-The Star Education Fund
- UTAR-Sin Chew Daily Scholarship
- UTAR-Sport Scholarship
- UTAR-Talent Scholarship
- Mr. Ng Chin Kiat S.M.J. Scholarship
- Tan Sri (Dr) Lim Goh Tong–UTAR Scholarship Fund
- Datuk Sim Mow Yu–UTAR Scholarship Fund

UTAR Zero Interest (0%) *Student Loans*

Students who are pursuing the UTAR foundation or undergraduate degree programmes are eligible to apply for the UTAR INTEREST-FREE loan for each year of study up to a maximum of RM15,000 per year. The closing date for the submission of the application is four weeks after the commencement of every new trimester.

- **UTAR Student Loan**
- **UTAR Student Bridging Loan**

Other Financial Aid

- Perbadanan Tabung Pendidikan Tinggi Nasional (PTPTN)
- Koperasi Jayadiri Malaysia Bhd (KOJADI)
- Kuok Foundation Half Loan & Half Grant
- Ng Teck Fong Foundation Zero Interest Loan

Internal loans imbursed to over 1,300 students amount to over RM9million

External loans including PTPTN loan imbursed to over 75,600 students amount to over RM1billion

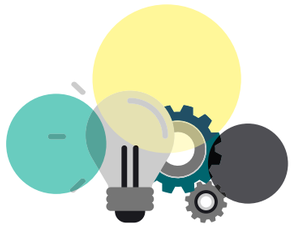
Postgraduate Programmes Financial Aid

- **EPF Education Withdrawal**
- **KOJADI Education Loan**
- **Alumni Rebate**
- **Postgraduate Research Assistantships**

Over 9million scholarships imbursed to over 300 postgraduate students under Research Project Assistantship in the year 2020

For more information, please visit the UTAR Division of Examinations, Awards and Scholarships (DEAS) website at *deas.utar.edu.my/Financial-Aid.php*

SOFT SKILLS DEVELOPMENT PROGRAMMES



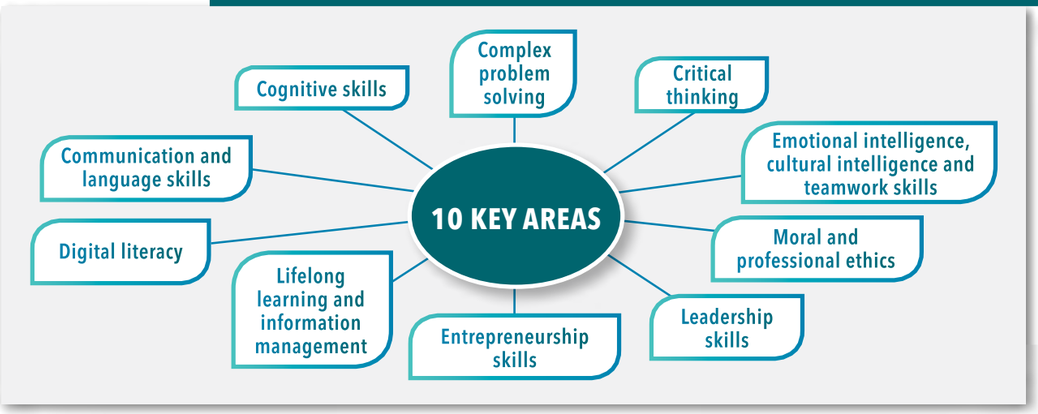
UTAR SOFT SKILLS DEVELOPMENT CERTIFICATE (USSDC)

The Department of Soft Skills Competency (DSSC) offers short programmes to equip students with the necessary soft skills and life skills to enhance their competitive edge in the job market and excel in life. The department also coordinates the University's compulsory unit on co-curricular.

With its vision of providing holistic education, the University looks beyond developing students' academic performance by providing them with other skills that enhance their contributions to the workplace and society.

Soft skills are essential skills in the workplace. Students with excellent soft skills can fit into most environments because they are adaptable, committed and persevering, and display the right attitude. Such qualities cut across all disciplines. In order to perform well and advance in one's career, one needs to have high levels of soft skills in dealing with people. In short, technical skills need to be complemented with soft skills.

Soft skills take years to develop. Students are, therefore, encouraged to start developing their soft skills while pursuing their academic studies. DSSC engages experienced trainers and also collaborates with organisations from the public and private sectors to conduct the following key areas of soft skills and life skills programmes for students:



DSSC also organises a wide range of activities, such as Speakers' Corner, UTAR New Village Community Project, and Overseas Study Tours and Student Exchange Programmes.

With effect from January 2009, UTAR has introduced UTAR SOFT SKILLS DEVELOPMENT CERTIFICATE (USSDC), a certification system to recognise students' achievements and efforts on improving themselves in the above areas of soft skills and life skills.

For more information, please visit *softskill.utar.edu.my*

UTAR COMMUNITY AND VOLUNTARY ENGAGEMENT PROGRAMME (UTAR CARE PROGRAMME)

UTAR Community and Voluntary Engagement Programme (UTAR CARE Programme) was introduced in January 2021 as an effort to cultivate and recognise students' contribution and efforts in the community and voluntary projects.

The UTAR CARE transcript will record students' contribution in community / volunteering projects within their study period in UTAR (from Foundation Studies to Postgraduate Studies), which includes University Social Responsibility (USR) projects, Knowledge Transfer Program (KTP), Student-initiated Community Project and Voluntary Services to the university.

The new system is expected to increase the participation of students in the Community Outreach Project/ Voluntary Work. With the 5 tier grading system, students will have targets and motivations to earn service hours to reach the highest tier (Tier 5) before their completion of study.

Objectives

√ New System
UTAR CARE Programme represents a new system that recognises students' achievements towards community engagement.

√ Developing interpersonal skills
Undergraduates who have a high level of involvement in community service would show positive changes in behaviour, values, aspirations and career preparations. From the social aspect, they also learn empathy, and cultivate positive attitude and higher level of internalised moral standards. Volunteering also gives students the opportunity to practice crucial skills like teamwork, communication, problem-solving, project planning, task management and organisational skills to prepare them better for future workplace.

√ Real World Learning
Students are given opportunities to experience out-of-the-classroom learning, where they are exposed to current issues faced by the communities in the real world.

√ Expanding Network
Students are also given a platform to expand their network with various parties such as the local communities, local authorities, NGOs, government agencies and even industry players.

√ Enhancing Employability
Many companies have a strong social responsibility core and showing one's charitable side displays a good cultural fit. Candidates who volunteer stand out in a positive way because their passion and involvement with the community is evident. Volunteering can add depth to a candidate's experience and helps one to stand out.

Grading System for UTAR CARE Programme

Star Rating	Total Hour of Contribution
1-star ★	20-39 hours
2-star ★★	40-59 hours
3-star ★★★	60-79 hours
4-star ★★★★	80 hours or above
* 5-star ★★★★★	100 hours or above

* In order to obtain a 5-star rating, students must join at least 1 community activity from each category of SDGs below:
I. People, Dignity, Justice (SDGs 1, 2, 3, 4, 5)
II. Planet (SDGs 6, 12, 13, 14, 15)
III. Prosperity (SDGs 7, 8, 9, 10, 11)
IV. Peace, Partnership (SDGs 16, 17)

For more information, please visit *softskill.utar.edu.my/UTAR_CARE_Programme.php*

UTAR AT A GLANCE

2 campuses
3.7 million square feet of built-up area, the equivalent of 275 Olympic-size swimming pools

15
9 faculties, 3 centres and 3 institutes

120+
programmes from foundation studies, undergraduate to postgraduate

35
research centres

72,000+
alumni

20,000+
students

2,000+
academic and administrative staff

130+
industry advisors

100+
external examiners from 20 economies

78
student clubs and societies

304,200+
volumes of books, publications and numerous online resources

9
endowed chairs in key research areas since 2009

37
economies where our international students come from

490+
memoranda signed with industry partners and universities from 30 economies for collaborative activities

60+
international and national awards received by students in 2020

Around 95%
graduate employability rate (within 9 months after graduation) as at 2020

UTAR has gained recognition from numerous leading professional bodies:

- √ Asian Institute of Chartered Bankers
- √ Board of Architects Malaysia
- √ Board of Engineers Malaysia
- √ Board of Quantity Surveyors Malaysia
- √ Board of Valuers, Appraisers, Estate Agents and Property Managers
- √ CPA Australia
- √ Financial Planning Association of Malaysia
- √ Institute of Chartered Accountants in England and Wales
- √ Malaysia Board of Technologists
- √ Malaysian Association of Company Secretaries
- √ Malaysian Institute of Accountants
- √ Multimedia Super Corridor Status
- √ Royal Institution of Chartered Surveyors
- √ Royal Society of Chemistry
- √ Society of Actuaries
- √ The Alliance on Business Education and Scholarship for Tomorrow a 21st century organization
- √ The Association of Chartered Certified Accountants
- √ The Chartered Institute of Building
- √ The Chartered Institute of Logistics and Transport
- √ The Chartered Institute of Management Accountants
- √ The Chartered Tax Institute of Malaysia
- √ The Institute of Chartered Secretaries and Administrators
- √ The Malaysian Institute of Certified Public Accountants
- √ The Society of Logisticians Malaysia

All figures are correct as at September 2021

THE World University Rankings

World University Rankings 2022	#1001-1200
Emerging Economies University Rankings 2022	#401-500
Asia University Rankings 2021	#119
Young University Rankings 2021	#147
University Impact Rankings 2021	#201-300
Impact Rankings 2021 - SDG4: Quality Education	#74
Business & Economics Rankings 2022	#601+
Computer Science Rankings 2022	#601-800
Engineering Rankings 2022	#601-800
Physical Sciences Rankings 2022	#801-1000
Social Sciences Rankings 2022	#601+

QS World University Rankings

World University Rankings 2022	#801-1000
World University Rankings 2022 *Employer Reputation*	#323
Asia University Rankings 2022	#167
Graduate Employability Rankings 2022	#201-250
Business & Management Studies 2021	#401-450
Engineering - Electrical & Electronic 2021	#451-500

UI GreenMetric World University Rankings

World's Most Sustainable University 2020 **#106**

SETARA 2019 Very Competitive Mature University

5-Star
(Very Competitive)
in SETARA 2018/2019 (Mature University)
Malaysia Integrated Rating for Higher Education Institutions by Ministry of Higher Education Malaysia

D-SETARA

Tier 5
(Excellent)
in D-SETARA for Engineering

Tier 4
(Very Good)
in D-SETARA for Health Sciences

Discipline-Based Rating System (D-SETARA) for Higher Education Institutions

MQA Swaakreditasi Self-Accreditation

Self-accreditation Status
awarded by the Malaysian Qualifications Agency of the Ministry of Education

MBOT

MBOT Supportive University/College Award
awarded by the Malaysian Board of Technologists (MBOT)

Premier Digital Tech Institution™

Premier Digital Tech University Status
awarded by the Malaysia Digital Economy Corporation (MDEC)

星洲教育奖 Sin Chew Education Awards

Outstanding Educational Institution 2018/19: Private Universities/Colleges Category

Outstanding Educational Institutions Award
(Private Universities/Colleges Category)
awarded by Sin Chew Education Award 2019

Sin Chew Business Excellence Awards 星洲企業楷模獎

CSR Excellence Award 2017

Corporate Social Responsibility Excellence Award
(CSR Excellence Award Category)
awarded by Sin Chew Business Excellence Award 2017

A University where
"Confucius meets Einstein"

"All of science is nothing more than the refinement of everyday thinking."

Albert Einstein
1979-1955

"He who learns but does not think is lost. He who thinks but does not learn is in great danger"

Confucius
551BC - 479BC

"Without an endless exercise of thinking and learning, how could both Einstein and Confucius manage to stand tall and outshine their contemporaries and even posterity as models of inspiration and innovation?"

Universiti Tunku Abdul Rahman (UTAR), amid the constant convergence of civilisations, strives to contribute to the sustainable development of humanities, science, engineering and technology with an unrelenting mind on progressiveness, ethics and sparks of wisdom from the East and the West.

UTAR Kampar Campus, Perak

UTAR Sungai Long Campus, Selangor

Education Journey at UTAR

1. Participate in **Orientation**
2. Attend **Classes** & Meet **New Friends**
3. Join **Clubs**, **Societies** & **Sport Activities**
4. Register for **UTAR Soft Skill Development Certificate**(USSDC)/ **UTAR CARE Programme**
5. Become a **Peer Helper**/ **UTARambassador**/ an **Active Member** of Student Bodies
6. Participate in **Undergraduate Research Scheme** (URS)
7. Undergo **Industrial Training** & Finish **Capstone Project**
8. Join **Student Exchange Programme**
9. Finish **Programme** & Attend **Convocation**
10. Beginning of **Your Lifetime Journey** (Work/Continue Study/Start a Business)

UTAR offers more than 120 programmes in the following fields of study.

Accounting, Business & Economics, Actuarial Science, Mathematics and Process Management, Agricultural & Food Sciences, Arts, Social Sciences & Education, Chinese Studies, Creative Industries & Design, Engineering, Technology & Built Environment, Information & Communication Technology, Life & Physical Sciences, Medicine & Health Sciences

Contact us

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About Programme : study.utar.edu.my

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softskill.utar.edu.my/SDG@UTAR.php

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