



Open University Research Sessions 2021 (OURS 2021)

16th and 17th September 2021



**THE OPEN UNIVERSITY
OF SRI LANKA**

Book of Abstracts
Open University Research Sessions 2021
OURS 2021

16th & 17th September 2021

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MESSAGE FROM THE VICE-CHANCELLOR

I am indeed happy to contribute this message to the Open University Research Sessions (OURS) 2021, which is one of the significant annual events in the university calendar. Research has a clear potential to make significant contributions to the quality of higher education. Therefore, universities have an obligation to make the research-teaching nexus as strong as possible. Annual OURS provides an opportunity for sharing of knowledge created through research across disciplines.

The Annual Research Session publishes the results of multidisciplinary research covering areas of Open and Distance Learning, Education, English Language Teaching, Natural Science, Engineering Technology, Humanities and Social Science and Management Studies. It is open for the publication of Research Articles, Reviews, and Research Communications in all disciplines. The OURS provides a forum for OUSL academics as well as researchers in the other state universities and Non-State Sector Higher Educational Institutions (NSHEI's) to publish high-quality research from broader disciplines.

Today, economies of developed countries are mainly based on scientific creativity and innovations. Economic targets of a country can largely be achieved through a dynamic and progressive education system that gears towards creating policy makers as well as scientists. Developing countries like Sri Lanka, need approaches that facilitate the generation, application, and diffusion of knowledge at the local level. Rather than unquestioningly adopting solutions developed elsewhere, an emphasis on strengthening local capacity to generate, apply, and disseminate knowledge can help put into place an ongoing process of action and reflection. Subsequently, it encourages respect of the existing knowledge base of a community, raises the community's confidence in its ability to devise, implement and assess solutions and helps to systematize and expand local knowledge. I strongly believe that OURS 2021 undoubtedly stimulates this platform.

Developing and enhancing human skills and capabilities through education, research, learning, and meaningful work are key drivers of economic success of individual well-being and societal cohesion. The global shift to a future of work is defined by an ever-expanding cohort of new technologies, by new sectors and markets, by global economic systems that are more interconnected than in any other point in history and by information that travels fast and spreads wide. Despite the current high degree of uncertainty, this research forum uses a unique combination of qualitative and quantitative research approaches to expand the knowledge base to overcome those challenges. I strongly believe that the OURS 2021 will provide insights into the latest research and best practices of delivering quality Open Flexible and Distance Learning (OFDL) and will also be a stepping-stone for further development of OUSL's national and international advocacy campaigns.

While congratulating the presenters and thanking the organizing committee, I wish the Annual Research Sessions of the OUSL 2021 all success.

Prof. P.M.C. Thilkarathne

Vice-Chancellor

PREFACE

The Open University Research Sessions 2021 (OURS 2021) is held from 16th – 17th September 2021 on a fully online platform. It commences with the inauguration on Thursday 16th of September and continues until 17th September 2021. The inauguration session, invited speeches and all presentations will be presented online. By holding the conference on an online platform during a global pandemic, we ensure that our commitment of Open Distance Learning is upheld.

This year we received 209 abstracts and extended abstracts for reviewing and 137 abstracts were selected for presentation following a rigorous and blind peer review process. The abstracts received covered a wide range of sub themes which include, Open and Distance Learning (ODL), Education, English Language Teaching (ELT), Engineering and Technology, Health Sciences, Biological Sciences, Agriculture, Physical Sciences, Humanities and Social Sciences, Management, and Law. This volume contains the abstracts that were accepted for presentation.

The Chief Guest at the inauguration of OURS 2021 is Prof. H. D. Karunaratne who is a Senior Professor and the Chair of Business Economics at the Department of Business Economics, Faculty of Management and Finance, University of Colombo. The invited speakers include Prof. Nalin de Silva, Senior Professor and Chair of Chemistry at the Department of Chemistry, University of Colombo and Prof Mario López-Gopar, Professor of Language Education and Applied Linguistics, Universidad Autónoma Benito Juárez de Oaxaca (UABJO), Mexico. They will deliver the keynote addresses. We are very grateful to all of them for taking time off from their busy schedules to be with us at the sessions.

Another highlight of OURS 2021 conference in this year is the panel discussion on Post pandemic higher educational experience and Gender (in)equality. The focus of this panel will be on doing higher education in times of transition and uncertainty like now, where our lives are disrupted due to the COVID 19 pandemic.

Organizing an event of this nature needs a collaborative and dedicated effort of all the members of the organizing committee of OURS 2021. Therefore, on behalf of the Senate Sub-committee for OURS 2021, I thank all the authors who submitted abstracts and extended abstracts to the conference, all reviewers for their intellectual input which has helped shape and uplift the intellectual quality and rigour of the research presented over the next two days and also the language editors, theme conveners and the Session Chairs of OURS 2021.

We appreciate the service rendered by the members of the Senate Sub-committees for the OUSL Research Awards and the OUSL Best Online Course Award for selecting the awardees. The secretarial assistance provided by Ms. Jitha Nipunika and Ms. Vajini Subodha are greatly appreciated.

We also wish to record our thanks to the Vice-Chancellor, Professor P.M.C. Thilkarathne for his ready support in carrying out our work to make this event a success. We also thank him for encouraging us and supporting our decision to move the conference online.

We thank Prof. Gayathri Jayathilake and the staff of CETMe for graphic designing the invitation card, certificates, cover page of the conference proceedings and banners. My special appreciation is extended to Mr. Samith Daladawatta at CETMe and Mr. J.P.P.Tharanga at the Department of Computer Science, OUSL for maintaining and updating the OURS 2021 web page. Very special thanks for Prof. Harshana Rambukwella, Director-PGIE for his ready support in facilitating us with ZOOM accounts.

I need to extend a very special appreciation for the excellent team effort of “OURS 2021 Online Working Group” for their efficiency and willingness to make OURS 2021 online conference a reality under a high risky pandemic situation and lock-down condition in the country . The untiring effort of Dr. Uthpala S. Premarathne, Dr Lahiru Wijeynayake, Prof. Gayathri Jayathilake, Dr. T. Saminda P. Fernando, Mr Lal Medawattegedara, Ms Mayanthi Jayakody, Dr. Nayana Nilakarawasam, Dr Chandani Ranasinghe, Dr. Malinda Punchimudiyanse, Dr Dushantha Alwis, Ms Vindya Angamma/AD-CRC, Mr. J.M.U.T. Jayamanna/Director-IT, Mr. J.P.P. Tharanga, Mr. Kanishka I. Tennakoon, Mr Charith Siriwardena, Mr Krisahantha Lokuge./Web Administrator and Mr Chameera Chandrarathna is highly recognized.

Finally, let me wish all the presenters whose research and ideas will be showcased here and, also the participants. I hope OURS 2021 will be intellectually stimulating and academically productive two days of discussion.

Prof. S.R Weerakoon

Senior Professor and Chair of Botany

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Address of the Chief Guest

Nexus Between the Covid-19 Pandemic and Economic Crisis: A Human Resource Development Perspective

Data in relation to health sector does not remain the same, it could change, if not every second, at least in every minute, but as of 1st September 2021, the total number of Covid infected cases in Sri Lanka reported as 444,130 and there had been 9,400 deaths. For the purpose of comparison, 3,828 new cases per day, 215 deaths per day, and 437 deaths per 1 million people had been recorded. Accordingly, in terms of the number of new deaths, Sri Lanka ranked 13th in the worldometer. Compared to the movements of some of the demographic indices of Sri Lanka, these trends reflect the severity of the pandemic in the country. Compared to the world population, population in Sri Lanka is only 0.27%, and -97,986 net migration is recorded per year. The total population of Sri Lanka had continuously declined from 184,428 in 1995 to 89, 516 in 2020, this made population rank of Sri Lanka to rise from 49 in 1995 to 58 in 2020. Therefore, the impact of Covid-19 health crisis on demographic situation, strength of human resources, labour market, and human resource development and management practices of Sri Lanka in particular, will be unprecedented and irrevocable.

Considering the overall economic impact, the conditions created by the current pandemic is far different and extremely harmful. Unlike the earlier micro-level disasters (droughts, floods, landslides, irruption of garbage dumps, etc..) that had taken place, Covid-19 health crisis has dealt a triple blow on the local economy. To highlight a few, the supply chain disruptions pushed up the rate of inflation and the rate of unemployment making life extremely harder for average citizens. There have been demand side disruptions mainly because of the delay in making investment decisions; it has been due to wait-and-see attitude of the management of the local firms. Further, there has been a visible reduction in informal sector activities, diversion of demand for imports from intermediate goods to pandemic related goods and services, decline in exportable services such as labour migration, operation of ports and airports. Disruptions to banking services have led to reduction in foreign currency receipts to the country and more importantly, there has been a drastic decline in worker remittances and tourist arrivals aggravating the dollar crisis. The government has mostly relied upon traditional fiscal measures to mitigate the negative impact, yet these have been less effective.

The impact of Covid-19 pandemic is different when compared with other similar shocks, in both health and economic dimensions. Therefore, new mechanisms must be urgently developed to overcome the insurmountable challenges and to mitigate its extremely negative impact on human resource development and modern day management practices. Disruptions to education, training and human resource development should be minimized. Developing alternative methods to collect information, utilizing correct, accurate information in decision-making, continuous planning, changing behavioural patterns, unifying decision-making process and

coordinating actions are essential in facing the current challenges successfully. The role played by the government, public sector and private sector institutions, media, professionals, as well as individuals are crucial at this juncture and it will determine the destiny of Sri Lanka.

Prof. H. D. Karunaratne

Senior Professor and Chair Professor of Business Economics
Faculty of Management and Finance,
University of Colombo

Keynote Address 1

Electrospun nanomaterials for drug delivery, tissue engineering and cancer therapy

Electrospun polymeric nanofibers have proven to be a versatile strategy in drug delivery system designing, tissue regeneration applications and cancer therapy. The high surface-to-volume ratio of the fibers can enhance cell binding and proliferation, drug loading, and mass transfer processes. The most important and studied areas of electrospinning lies in the fields of drug delivery and tissue engineering. Electrospinning technique allows designing of drug delivery systems with modified drug release profiles for various active substances ranging from active pharmaceutical ingredients, inorganic particles and macromolecules. Various classes of drug types including anti-inflammatory, anti-microbial, anti-cancer, cardiovascular, antihistamine, gastrointestinal, palliative and contraceptive drugs can be loaded into novel polymeric blends as well as multilayered nanofibers. Electrospinning also plays a major role in designing artificial tissue scaffolds (ex: skin scaffolds, bone tissue scaffolds) for regenerative medicine applications. Use of electrospun artificial scaffolds allows an alternative to the autologous split skin grafts avoiding the generation of a secondary wound from donor site and avoids unnecessary extra pain to the patient. Electrospinning technique may have the potential to be enhanced and therein lies opportunity for future research in this field.

Prof. K.M. Nalin de Silva

Senior Professor and Chair of Chemistry

Centre for Advanced Materials and Devices (CAMD)

Department of Chemistry, University of Colombo

Keynote Address 2

Decolonizing “English” Language Teaching in COVID Times: Insights from a Praxicum Carried Out by Mexican Student-Teachers

Through educational language policies relying on colonial and neoliberal discourses of “progress,” “development,” and “success,” English has been added to elementary-school curricula in both outer circles or English postcolonial contexts (e.g., children learning English in Sri Lanka or India) and in expanding circles or so-called English as a foreign language (EFL) contexts (e.g., children learning English in Mexico and South Korea) (Enever, 2016; Sayer, 2015). The “addition,” or imposition, of the English language is linked to discriminatory practices, social inequality, hegemonic power and colonial legacies which position European languages and peoples as better than *others* (Chun, 2015; López-Gopar, 2016; Motha, 2014). Hence, for the last two decades, different researchers and teacher educators have called for the decolonization of English language teaching through critical approaches (Canagarajah, 1999; Motha, 2020; Norton & Toohey, 2004; Pennycook, 2016). This call can become a reality if in-service and pre-service teachers get on board and bring to life decolonizing actions in actual classrooms, whether “physical” or “virtual,” the latter being the case during the current COVID-19 pandemic, as seen, for instance, in Mexico.

Within this panorama, the purpose of this presentation is to showcase a decolonizing “English” language teaching praxicum at the elementary-school level and carried out by Mexican student-teachers. Due to the COVID pandemic, their teaching praxicum was conducted solely via online platforms where they met with children three times a week during one academic year. Through the development of critical thematic units, they used “English” as an excuse to address current social issues, renegotiate affirming identities, resist the colonial matrix of power, and reposition languages, ways of knowing and being. Utilizing a decolonial theoretical lens (López-Gopar, 2016; Mignolo, 2000; Walsh, 2000) and based on the recursive analysis of the data collected from the student-teachers’ praxicum (e.g., student-teachers’ diaries, reflective writing samples, screenshots, children’s work samples, audio and video recordings of the classes), this presentation will zoom in on critical moments and the student-teacher’s reflections on these moments in which the spark of decolonization seems to ignite. It will be concluded that decolonizing ELT should be conceived as moments or instances rather than a grand change should we want to validate the work done by teachers and student-teachers in real classrooms.

Prof Mario López-Gopar

Professor of Language Education and Applied Linguistics
Universidad Autónoma Benito Juárez de Oaxaca, (UABJO)
Mexico

PROCEEDINGS

OPEN AND DISTANCE LEARNING (ODL)

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OPEN AND DISTANCE LEARNING (ODL)



DOES PARTICIPATION IN PEER ASSISTED STUDY SESSIONS IN THE ENTRY YEAR IMPROVE THE ACADEMIC PERFORMANCE OF STUDENTS? A CASE STUDY IN ODL

**G. Bandarage¹, E.A.D.N.D. Edirisinghe², J.C.N. Rajendra³,
K.D.V.F. Siriwardana^{4*}, R.U. Tantrigoda¹, J. Wattavidanage²**

¹Department of Chemistry, ²Department of Zoology, ³Department of Physics, ⁴Department of Mathematics, The Open University of Sri Lanka

Participation in Peer Assisted Study Sessions (PASS) is found to have improved academic performance of students due to the development of sound study habits and enhanced motivation in learning. One may expect to increase the intrinsically low graduation rates in an Open Distance Learning (ODL) programme by improving overall academic performance of students. With this vision, in 2013 the Open University of Sri Lanka (OUSL) introduced PASS sessions for six first year courses and made registration in one of them mandatory for students enrolled in the BSc programme. It was expected that developed study habits and motivation acquired through this one course will improve the academic performance in all other courses. The objective of this study was to find any evidence to support the impact of participation in PASS on accomplishment of the academic goals of students throughout their study in OUSL. Since Grade Point Average (GPA) is taken as a measure of overall academic performance of a student, we have studied the binary association of GPA with the attendance of PASS of students at their graduation. Out of 615 students who had registered in the BSc programme for the 2013/2014 academic year in the Colombo Regional Centre, 61 students who had graduated in 2016/2017 academic year were included in the study sample. In this study, the binary associations indicated that the probability of a student obtaining a GPA ≥ 3 at graduation is significantly high given the student has attended at least ten PASS sessions during his/her first year ($p < 0.05$). It is also confirmed through the positive association of participation in PASS with overall GPA ($p < 0.05$) at graduation calculated using a multivariate analysis, applying Binary Logistic Regression.

Keywords: Academic Performance, GPA, ODL, Participation, PASS sessions

* Corresponding Author: kdsir@ou.ac.lk



KOLB'S EXPERIENTIAL LEARNING MODEL REFLECTED IN ODL SUCCESS STORIES: A CASE STUDY ON SELECTED OUSL ALUMNI

*M.K. Jayakody**

Centre for Educational Technology and Media (CETMe), The Open University of Sri Lanka

The Open University of Sri Lanka is the only national university that is exclusively dedicated to the Open Distance Learning (ODL) method of knowledge development and delivery in the island. Its current approximate student population of 35,000 is particularly heterogenous, and this characteristic differentiates it from the conventional universities in the country. As a result, the learning process of each student is dissimilar to another, depending on their lifestyles. Accordingly, each must develop a study practice that suits and allows him/her to perform well in the selected study programme. At a time when the demand for the ODL system has progressively increased, it seemed apt to discover certain strategies followed by the OUSL alumni and locate the consequences that led to them. In doing so, David Kolb's Experiential Learning Model seemed a fitting paradigm on which to reflect when observing their stances. The objectives of this study were to identify how and to what extent the four stages of David Kolb's Experiential Learning Model are reflected on the dominant strategies adopted by OUSL alumni in achieving their learning goals, and to explore the practicality of the said stages when an undergraduate discovers and develops his/her dominant style of studying. This study was conducted with four OUSL alumni representing bachelor's degree programmes offered by the OUSL. The data provided via interviews were analysed against the said paradigm to discover how its stages were reflected on their dominant approaches. The study relied on a qualitative method of data analysis following the format of a case study. The derived data were analysed using the six-phase framework proposed by Virginia Braun and Victoria Clarke (2012). The results and discussion were presented as narrations. Accordingly, each dominant approach depended on the individual's personal and professional capacity and availability of time. A common pattern was visible in how each learner located the most suitable approach in achieving their goal, and their experiences reflected the four stages of Kolb's Experiential Learning Model. This similarity between how they persevere their goals and the four stages could be considered an encouragement for potential possibilities of being a successful learner in the Open Distance Learning system.

Keywords: Dominant approaches, Kolb's Experiential Learning Model, ODL

**Corresponding author: mkjay@ou.ac.lk*



FACTORS LEADING TO REMOTE LEARNING IN THE COVID 19 EPOCH: UNDERGRADUATES' AND POSTGRADUATES' PERSPECTIVES

*U.D.I.C. Udawaththa **

Uva Wellassa University of Sri Lanka

The usage of remote learning escalates daily because of numerous inexplicable factors. The real intention and reasons for this usage is a topical area of analysis that will benefit all parties engaged in online learning and teaching. Contemporary factors such as a diversified educational environment, self-paced learning, pressure from social media and learning packages offered by telecom partners are pragmatic and timely dynamics that determine the usage of remote learning in the Sri Lankan environment. This study's main objective was to identify the factors that may play a significant role in remote learning during the COVID 19 period. Structured five-point Likert scale questionnaires were distributed over one week among a convenience sample of 170 undergraduates and postgraduates at Sri Lankan universities with an 87% responsive rate. The collected data was analysed by using the computer software IBM SPSS Statistics 20. The demographic factors in the first part of the questionnaire were analysed using a frequency test and a further reliability test while convergent validity and discriminant validity were examined. The Confirmatory factor analysis approach (CFA) was followed to identify factors that lead to remote learning. The study revealed four factors affect the usage of remote learning by Sri Lankan undergraduates and postgraduates during COVID 19: the diversified learning environment, self-paced learning, pressure from social media and the learning packages offered by telecom partners. Educational institutes can use the findings to identify suitable diversified educational environments with convenient methods for learning such as introducing guest lectures, and offering short courses and multi-disciplinary courses, while social media facilitators and telecommunication partners in Sri Lanka can use the findings for their professional and commercial enhancements. Future researchers can use these findings for empirical model building purposes since the factors are postulated for the Sri Lankan context by this research.

Keywords: Covid 19, Diversified educational environment, Learning package, Learning, Self-paced, Social media

**Corresponding author: isuchandeepea@gmail.com*



A BEHAVIOURAL STUDY ON THE CHANGE OF ADULT LEARNERS' LEARNING PATTERNS DUE TO THE CHANGE IN THE LECTURE DELIVERY MODE

D.U. Ranasinghe*

Centre for Educational Technology and Media, The Open University of Sri Lanka

The Sri Lankan education system relied largely on face-to-face teaching and learning before lockdowns and isolations were enforced to control the Covid-19 pandemic. Consequently, most teaching and learning activities had to be shifted to the virtual and online modes almost immediately. It was a new experience for most learners as well as teachers and they had to change their learning and teaching patterns almost at once. The objective of this paper is to observe the learning patterns of the students who were following the Diploma in Second Language Teaching at the National Institute of Language Education and Training before the pandemic and during the pandemic. A learning pattern is interpreted as a coherent whole of learning activities that learners usually employ their beliefs about learning, and their learning motivation, a whole that is characteristic of the learners in a certain period of time in this study. Moreover, learning patterns are observed under nine variables which are participation in lectures, the number of direct learning hours, note-taking, participation in practical sessions and group activities, teacher-student interaction, student-student (peer) interaction, methods of self-study, finding and referring additional readings, and paying attention to the lessons. Before the pandemic, the Diploma course was offered in a face-to-face teaching and learning environment. However, during the pandemic, the lectures were delivered via the Zoom video conferencing tool. Accordingly, this paper investigates the ways in which the students' learning patterns changed due to the shift from a face-to-face learning mode to an online mode. Thirty students belonged to 20-30 age group were following the Diploma during 2020-2021 and they all participated in the research. A mixed-method was deployed and the data was collected through questionnaires, in-depth interviews, and participant observations. Questionnaires were distributed via email and WhatsApp meanwhile the interviews were conducted via telephone calls. The analyzed data show that the learning patterns of the students have changed in terms of (i) learning activities that they used to employ, (ii) belief about learning, and (iii) motivation for learning due to the shift of lecture delivery mode.

Keywords: Change, Face-to-face learning, Learning patterns, Lecture delivery mode, Online

**Corresponding author: duran@ou.ac.lk*



AGRICULTURE



ASSESSMENT OF SOIL PROPERTIES AND YIELD UNDER DIVERSE CROPPING SYSTEMS IN ALFISOLS FOR MAIZE (*Zea mays* L.) CROP

A.M.S.U.M. Attanayake^{1*}, D.M.S. Duminda², C.S. De Silva³

^{1,3}*Faculty of Engineering Technology, The Open University of Sri Lanka*

²*Faculty of Agriculture, Rajarata University of Sri Lanka*

Maize (*Zea mays* L.) is the most important coarse grain highland crop, which is largely cultivated after paddy in Sri Lanka. Maize is cultivated mainly in Dry and Intermediate zones. Utilization of synthetic inputs to gain higher yields without adverse effects has become a major conundrum. The main objective of this study was to compare the final grain yield of maize between conventional, reduced and organic systems with great attention to soil fertility dynamics within its first transition year. The experiment was carried out at the Faculty of Agriculture, Rajarata University of Sri Lanka during the *Yala* season of 2019. Soil samples were analyzed for available phosphorous, ammonium nitrogen and nitrate nitrogen. The final grain yield and yield parameters were collected. The ANOVA procedure in SAS was used to distinguish treatment effects. With time stages, nitrate nitrogen and available phosphorous, fluctuation among different input systems were significantly different ($p < 0.05$) while ammonium nitrogen only significant with input system effect. Nitrate nitrogen and available phosphorous reveals significant increase within organic input system from the first transition year. Significantly, the highest yield was obtained from the conventional system and Maize did not produce expected yield with both organic and reduced input systems. Lower nutrient availability at critical growth stages of maize may have influenced the crop growth and yield in the first transition year. Overall, further studies are crucial to confirm soil fertility dynamics as well as to determine the response of the maize crop to diverse input systems within the first transition year.

Keywords: Grain yield, Input systems, Maize, Soil fertility

*Corresponding author: sach950618@gmail.com



**ASSESSMENT OF SOIL PROPERTIES AND YIELD UNDER
DIFFERENT INPUT SYSTEMS IN ALFISOLS FOR RICE (*Oryza sativa*
L.) CROP**

A.M.S.U.M. Attanayake^{1*}, D.M.S. Duminda², C.S. De Silva¹

¹*Department of Agricultural and Plantation Engineering, Faculty of Engineering
Technology, The Open University of Sri Lanka*

²*Department of Agricultural Engineering & Soil Science, Faculty of Agriculture,
Rajarata University of Sri Lanka*

The typical conventional agriculture systems characterize Sri Lankan agriculture which descend from the green revolution. Rice (*Oryza sativa* L.) is the staple food crop in Sri Lanka which is cultivated in larger extent in both *Yala* and *Maha* seasons. Mostly developed rice varieties depend on chemical inputs for higher yield, but prolonged use may create adverse impacts on soil health. Our main objective was to compare the final grain yield of rice between conventional, reduced, and organic input systems with great attention to soil fertility dynamics during *Yala* season within its' first transition year. The experiment was carried out at the Faculty of Agriculture, Rajarata University of Sri Lanka during *Yala* season 2019. Soil samples were analysed for different fertility related parameters. The final grain yield and yield parameters were collected. The ANOVA procedure in SAS was used to distinguish treatment effects. With time stages, soil pH, ammonium nitrogen, nitrate nitrogen, available phosphorous and microbial biomass carbon fluctuation among different input systems were significant ($p < 0.05$). Nitrate nitrogen and available phosphorous reveals a significant increment within the organic input system. Conventional (100% DOA) and reduced (50% DOA + 50% organic fertilizer) input systems were produced similar yields without statistical significance. The results suggest that there is a potential to replace inorganic chemical fertilizers by 50 % with organic manure without much impact on the yield. Overall, long term investigations are crucial to confirm soil fertility dynamics and final grain yields of rice crop within its' transition period.

Keywords: Grain yield, Input systems, Rice, Soil fertility

*Corresponding author: sach950618@gmail.com



GROWTH, PHYSIOLOGY, AND WEED ABUNDANCE IN RICE (*Oryza sativa* L.) UNDER DIVERSE INPUT SYSTEMS IN THE DRY ZONE OF SRI LANKA

P.D. Ariyasena^{1*}, D.A.U.D. Devasinghe², D.M.D. Disanayake², C. S. De Silva¹

¹Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka, ²Research Unit of the Faculty of Agriculture, Rajarata University of Sri Lanka

The Inorganic inputs are applied to the crops to maintain productivity in the dry zone which is the central rice-growing region in Sri Lanka. However, owing to the negative impacts of this conventional crop production model, there is a substantial interest in moving towards sustainable alternative input systems. Therefore, this research was conducted to establish better crop management strategies for organic and low input systems. A field trial was conducted at the Rajarata University of Sri Lanka to compare the growth, physiology, and weed abundance in rice under three input systems; organic, conventional, and integrated, taking 2019 Yala season as the trail of the second season of a long-term cropping system. The experimental design followed was Randomized Complete Block Design (RCBD) which used six (6) replicates of each treatment. Three treatments were based on three input systems as T1- conventional input system (100% inorganic fertilizer recommended by the Department of Agriculture (DOA), T2- integrated system (50% N supplied by inorganic fertilizer and 25% N supplied by organic fertilizer application) and T3- organic system. A significant difference ($p < 0.05$) in rice shoot biomass among the three input systems was identified at panicle initiation and harvesting stages. The organic system showed the lowest values compared to the other two systems. There was a significant difference ($p < 0.05$) in plant height between the three input systems at panicle initiation, 50% heading and harvesting stages and the organic system showed the lowest values at all stages. The organic system had the highest weed count at all three crop stages while no significant difference was noticed between the integrated and conventional systems. No difference was observed in final grain yield at 14% moisture between the conventional (4.85 tonnes/ha) and integrated systems (4.66 tonnes/ha), but the organic system had the lowest value (2.73 tonnes/ha). Overall results indicate that reducing inorganic fertilizers by 50% with the combination of organic manure as in the integrated system gives a final grain yield similar to as the conventional system of new improved varieties like Bg300 in high potential areas like Anuradhapura. Also, organic systems can show low crop growth and yield due to inadequate nutrients supplied by organic materials and due to the high weed density during the first year of transition.

Keywords: Conventional, Crop growth, Organic, Physiological, Rice, Weed abundance

**Corresponding author: prabathari@gmail.com*



ESTIMATION AND MAPPING SOIL ORGANIC CARBON IN PADDY GROWING SOILS OF MONARAGALA DISTRICT, SRI LANKA

E.M.D. Perera¹, C.S. De Silva¹, R.R. Ratnayake^{2}*

¹Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka

²National Institute of Fundamental Studies, Kandy, Sri Lanka

Soil carbon sequestration is prominent and the most effective natural way to reduce the atmospheric concentration of CO₂ and slow down global warming. The paddy ecosystem is considered one of the most important carbon pools as it stabilizes more carbon under water-logged conditions and has a great potential in sequestering atmospheric carbon dioxide. The present study was carried out in paddy growing soils of Monaragala district, Sri Lanka, to identify the carbon sequestration capacity and the spatial distribution patterns of soil carbon concerning the different paddy growing soil types and the climatic conditions. This study adopted conditional Latin hypercube sampling (cLHS), designed to determine sampling locations and the total 35 soil samples were collected representing the paddy growing areas of the district and analyzed for the soil carbon content by using CHN elemental analyzer. The Regression kriging interpolation technique was utilized in Arc- GIS environment to predict the spatial distribution patterns of soil carbon. According to the results, soil carbon content varied from 1.2% to 2.1%, with mean value of 1.6%. The highest soil carbon content stocks (1.7% - 2.1%) were observed in south-western and western side in Monaragala district. The highest soil carbon content (1.9% - 2.1%) was observed in the Sevanagala DS division in DL1b agro ecological sub region. This agro ecological sub region is characterized by two detectable peaks in the rainfall distribution. The soil organic matter content in the soil varies with the soil types. Soil with a high organic matter content generally has a lower bulk density and increased soil organic carbon stock. Soil organic carbon stocks were calculated based on the carbon concentration of soil, the actual depth of sampling and the bulk density of soil. The mean SOC stock was varied from 15.2 Mg ha⁻¹ to 55.6 Mg ha⁻¹ with mean value of 31.1 Mg ha⁻¹ for the topsoil layer. The major soil types of the area, Reddish Brown Earths (RBE) and Immature Brown Loam soil, Alluvial soil, Reddish Brown Earths (RBE) & Low Humic Gley soil and Miscellaneous land units were reported with 39.3 Mg ha⁻¹, 37.2 Mg ha⁻¹, 29.4 Mg ha⁻¹, and 26.7 Mg ha⁻¹ SOC stock values respectively. The output generated from this study will provide the baseline information on the current status of SOC stocks in paddy soils of Monaragala district and it will be useful for the establishment of national carbon accounting system in Sri Lanka.

Keywords: Agro- ecological zones, Paddy, Soil carbon stock, Soil organic carbon

**Corresponding author: ranuka.ra@nifs.ac.lk*



MANAGEMENT OF OKRA MOSAIC VIRUS AND IT VECTOR: OKRA LEAF HOPPERS (*Empoasca devastans*) THROUGH PLANT EXTRACTS

D.Gururaj¹, S. Rajeshkanna², C.S. De Silva^{1*}

¹Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, Open University of Sri Lanka

²Regional Agriculture Research and Development Centre, Kilinochchi, Sri Lanka

Okra mosaic virus disease (OkMV) is a major biotic constraint on okra (*Abelmoschus esculentus*) cultivation in Sri Lanka. Diseased plants show characteristic symptoms of mosaic and vein yellowing on leaves and small and yellowish green fruits. Yield loss due to this virus is quite high, up to 80-94 percent is reported under heavy infection. Effective and efficient control of the pest can be done using chemicals, but it is hazardous for the environment due to their toxicity. There is a need to search for alternative approaches without toxicity problems that are eco-friendly and not capital intensive. Plant metabolites and plant-based pesticides appear to be one of the better alternatives as they are known to have minimal environmental impact and danger in contrast to the synthetic pesticides. This experiment was conducted for the management of Okra mosaic virus through the Okra leaf hoppers (*Empoasca devastans*) control. There were 5 treatments used in the experiment to study the impact of these treatments on vegetative and yield parameters of okra (variety Haritha) in the farmer's field in Mullaithivu. The treatments were synthetic insecticide (Thiamethoxam) and three different plant extracts from neem (*Azadiracta indica*) seeds, garlic (*Allium sativum*) bulbs and Ginger rhizome extracts. Highest rate incidence of okra mosaic virus was found in the plots with no plant extract management. Though all the plant extracts produced better performance than the chemical, neem seeds extract treated plants had the lowest rate of incidence of this virus, with maximum plant height, fruit length, fruits diameter and highest yield. According to present findings neem seeds extract showed promising results in minimizing Okra mosaic virus.

Keywords: Mosaic virus, Okra, Plant extract, Vector

*Corresponding author: csdes@ou.ac.lk



EFFECT OF SILICON ON NUTRITIONAL QUALITY AND YIELD PARAMETERS OF TOMATO (*Solanum lycopersicum*) GROWN UNDER WATER STRESS CONDITION

H.P.S. Subhashini¹, N.R.N Silva², C.S. De Silva^{1*}

¹Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, ²Horticultural Crops Research & Development Institute, Gannoruwa, Sri Lanka

This experiment was aimed to determine the effect of application of different Silicon amounts on quality parameters of Tomato var. Rajitha under water stress condition. Treatments of the experiment are 75 mg Si and no water stress (T1), 75 mg Si and water stress 50% (T2), 150 mg Si and no water stress (T3), 150 mg Si and water stress 50% (T4), no Si and no water stress (T5), no Si and water stress 50% (T6) and replicated 5 times. A pot experiment was conducted for a period of 6 months at a plant house located in Horticultural Crop Research and Development Institute (HORDI) Gannoruwa, Sri Lanka. The experimental design was a Complete Randomized Design (CRD) with factorial treatment structure. Water stress and Silicon were taken as factors. Silicon was added as $MgSiO_3$ and water stress was imposed by maintaining a moisture level equivalent to 50% of field capacity. The results of this experiment showed that the water stress reducing tomato quality parameters. However, application of $MgSiO_3$ increase nutritional quality in water stress treatments. Water stress 150 mg Si treatment plant (0.7ppm) were having better potassium level than water stress no Si treatment plant (0.433ppm). Water stress 150 mg Si treatment plants (4.195ppm) were having higher Calcium level than water stress no Si treatment (2.88ppm) and water stress 150 mg Si treatment plant fruits (2.511ppm) were having higher Magnesium level than water stress no Si treatment plant fruits (2.32ppm). Further, the application of $MgSiO_3$ had improved yield parameters such as number of flowers, number of fruits, fruit weight and fruit yield. The findings of this experiment can conclude that the application of $MgSiO_3$ have a positive influence on quality on tomato under the water stress conditions.

Keywords: Nutritional quality, Silicon, Tomato, Water stress, Yield parameters

*Corresponding author: csdes@ou.ac.lk



EFFECT OF SILICON ON QUALITY PARAMETERS OF TOMATO (*Solanum lycopersicum*) IN WATER STRESS CONDITION

H.P.S. Subhashini¹, N.R.N Silva², C.S. De Silva^{1*}

¹Department of Agricultural and Plantation Engineering, The Open University of Sri Lanka, ²Horticultural Crops Research & Development Institute, Gannoruwa, Sri Lanka

This experiment was aimed to determine the effect of application of different Silicon amounts on growth of tomato under water stress condition. Treatments of the experiment are 75 mg Si and no water stress (T1), 75 mg Si and water stress 50% (T2), 150 mg Si and no water stress (T3), 150 mg Si and water stress 50% (T4), no Si and No water stress (T5), no Si and water stress 50% (T6). A pot experiment was conducted for a period of 6 months at a plant house located in Horticultural Crop Research and Development Institute, Gannoruwa, Sri Lanka. The experimental design was a Complete Randomized Design (CRD) with factorial treatment structure. There are 6 treatments and 5 replicates. Water stress and Silicon were taken as factors. Silicon was added as $MgSiO_3$ water stress was imposed by maintaining a moisture level equivalent to 50% of field capacity. The results of this experiment showed that the water stress reducing quality parameters. However, application of $MgSiO_3$ increase quality parameters in water stress treatments. Water stress 150 mg Si treatment plants (73.334%) were have higher seed germination than water stress no Si treatment (56.668%). Highest firmness observed in 150 mg Si water stress treatment plant fruits (6.3kgf). Highest Total soluble solid (TSS) observed in water stress 150 mg Si treatment plants fruits (4.7). Water stress negatively influence some quality parameter such as leaf relative water content, fruit diameter, fruit length, seed quality, fruit keeping quality and seed germination. However, the results showed water stress have some positive effect of tomato fruit quality parameter like TSS and Firmness. The findings of this experiment can conclude that the application of $MgSiO_3$ have a positive influence on quality on tomato (var. Rajitha) under the water stress conditions.

Keywords: Quality parameters, Silicon, Tomato, Water stress

*Corresponding author: csdes@ou.ac.lk



THE EFFECT OF GAMMA IRRADIATION ON MICROBIOLOGICAL PROPERTIES OF CHILLI POWDER, CHILLI FLAKES (*Capsicum annuum* L.) AND BLACK PEPPER POWDER (*Piper nigrum* L.)

K.D.Y.S. Fernando^{1*}, W.S.M. Senevirathne¹, R.D.R. Ranasinghe²

^{1*}*Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka*

²*Sri Lanka Gamma Center, Sri Lanka Atomic Energy Board, Biyagama Export Walgama, Malwana, Sri Lanka*

In food industry and home kitchens, chilli powder, chilli flakes (*Capsicum annuum* L.) and black pepper powder (*Piper nigrum* L.) are commonly used as spices in Sri Lankan cuisine due to their sensory quality and health promoting properties. Among the variety of preservation methods used for the self-life extension and microbial safety, the mere drying process is unable to improve the quality and safety of these spices. In order to increase the microbial safety, as a minimal processing technique, gamma irradiation was introduced. Hence, the objective of this study was to evaluate the effect of gamma irradiation to extend the shelf life of chili powder, chili flakes and black pepper. Chili powder, chilli flakes and black pepper powder were exposed to gamma irradiation doses at 0 kGy, 1 kGy, 3 kGy, 5 kGy, 7 kGy and 10 kGy using the dose rate of 4.17 Gymin⁻¹ by the ⁶⁰Co gamma irradiator and the variation of microbial enumerations was evaluated to assess the effectiveness. The results revealed that the total plate count of chilli powder, chilli flakes and black pepper powder reached the recommended safety level at 7 kGy, 3 kGy and 7 kGy respectively. The yeast and mould count of chilli powder and chilli flakes reduced to the recommended safety level at 3 kGy while black pepper powder reached this level at 1 kGy. The total coliforms in chili powder, chili flakes and black pepper powder decreased to the recommended safety level at 5 kGy, 1 kGy and 3 kGy respectively. One of the fecal coliforms, *Escherichia coli* was observed only in black pepper powder control sample but it was successfully eliminated at 1 kGy irradiation dose. Therefore, the application of gamma irradiation on chilli powder, chilli flakes and black pepper powder at 7 kGy, 3 kGy and 7 kGy respectively was sufficient for achieving the microbial safety level suitable for the human consumption of these spices.

Keywords: Black pepper powder, Chilli flakes, Chilli powder, Gamma irradiation, Microbial properties

*Corresponding author: yashra321@gmail.com



DEVELOPMENT OF A NATURAL CURRY CUBE USING PUMPKIN SEED POWDER

E.T.N. Fernando^{1,2}, N.S. Weerakkody^{1}, U.A.S.K. Edirisinghe²*

¹*Faculty of Engineering Technology, The Open University of Sri Lanka*

²*Department of Agriculture and Food Technology, University of Vocational Technology, Rathmalana, Sri Lanka*

Pumpkin seeds are full of useful nutrients such as amino acids, plant sterols, unsaturated fatty acids, phenolic compounds, tocopherols, cucurbitacin and valuable minerals. All these biologically active compounds are very important for healthy life. The aim of this study was to develop a curry cube using pumpkin seeds. The curry cubes were prepared using dehydrated pumpkin seed powder 40%, 45%, 50%, 55%, 60%, 70 % with soya oil, coriander and fennel. The three best formulas were selected for further studies after the determination of binding and solubilization properties of the cube in the water. The most suitable ingredient mixture was identified by evaluating the sensory attributes such as appearance, color, taste, texture, odor, and overall acceptability using 30 untrained sensory panelists. Pumpkin seed powder 70% and soya oil 20% showed significantly higher ($P < 0.05$) values on tested sensory attributes. Proximate parameters were recorded as $23.5 \pm 1.4\%$ of protein, $30.6 \pm 2.9\%$ of crude fat, $14.5 \pm 0.5\%$ of carbohydrate, $14.7 \pm 2.8\%$ of crude fiber, $16.7 \pm 5\%$ of ash, and $9 \pm 0.5\%$ of moisture with the pH level 5.6 ± 0.06 . Furthermore, yeast, mold, and coliform count were not detected during the two months of the storage period. The total plate count in CFU/g, after the first month and second month, was determined as 2×10^{-2} and 2.2×10^{-2} respectively. This study revealed that the pumpkin seed powder-based cube can be recommended to store for two months and could be used as a replacement for artificial flavor enhancing chemical compounds.

Keywords: Artificial flavor, Natural curry cube, Pumpkin seed powder

*Corresponding author: nweer@ou.ac.lk



EFFICACY OF DIFFERENT PARTS OF CLOVE (*Syzygium aromaticum*) FOR THE MANAGEMENT OF RICE WEEVIL (*Sitophilus oryzae* L.)

P. Bandara^{*}, M. Senevirathne

*Department of Food Science and Technology, Faculty of Applied Sciences,
Sabaragamuwa University of Sri Lanka*

The rice weevil (*Sitophilus oryzae*) is the most disastrous insect pest of stored rice which causes both qualitative and quantitative losses. Usually, insecticides and fumigants are used to control them but the negative impact on eco-system has triggered the world to search eco-friendly and safe alternatives. This study aimed to assess the repellent activity of powder and extract of clove (*Syzygium aromaticum*) bud, stem, and leaf against *S. oryzae*. The contact repellent activity of ethanolic, hexane and ethyl acetate extracts of bud, stem, and leaf powder were tested by filter paper impregnated method using ten adult weevils (10-14 days old). A 1 ml of each extract with 25%, 50% and 75% concentration were used as treatment and respective solvent was used as the control. The number of insects settled on each half of the filter paper was recorded during 24 hours, and the percentage repellent activity was calculated. The contact and fumigation repellent activity were tested using 20 weevils by 200,400 and 600 mg of each powder up to 24 hours using modified cup bioassay method. Percentage repellent activity and repellency classes were calculated using the number of weevils escaped from the bioassay chamber. Among three extracts, ethanolic extract showed the highest repellent activity (91.11%, 57.78% and 50.00%) for 75% concentration of bud, stem and leaves respectively after 24 hours. The bud powder showed the highest contact repellent activity (93.33 ± 1.67) in both 400 and 600 mg concentrations after 24 hours. All the concentrations of bud powder showed more than 50% of repellent effect after 2 hours of treatment while stem powder had the same effect after 6 hours of treatment. Similarly, the bud powder at 600 mg concentration showed the highest repellent effect (73.33 ± 1.67) in fumigation repellent test after 24 hours of treatment. Hence, the results indicated the potential of both the powder and extracts of clove bud and stem as eco-friendly and effective alternatives for *S. oryzae* management.

Keywords: Extracts, Fumigation, Repellent activity, *Sitophilus oryzae*, *Syzygium aromaticum*

**Corresponding author: nuwanpriyabandara23@gmail.com*



DETERMINATION OF ANTIOXIDANT ACTIVITY OF AQUEOUS EXTRACTS OF DEHYDRATED *Bacopa monnieri*

T.H.S. Dhanushka^{1*}, D.C.K. Illeperuma¹, K.D.P. Gunathilak²,
C.V.L. Jayasinghe², P.W.G.N.R. Jayasekara³

¹Department of Food Science and Technology, Faculty of Agriculture, University of Peradeniya, ²Department of Food Science and Technology, Faculty of Livestock Fisheries and Nutrition, Wayamba University of Sri Lanka
³Jayasekara Ayurvedic, Kandy, Sri Lanka

Lunuwila (Bacopa monnieri) contains a wide range of bioactive compounds that remarkably affect brain functions and enhance memory. Even though it is extensively used to prepare decoctions in traditional medicine, bitter flavour limits its consumption as a salad and use in the food industry. Dehydrating *Bacopa monnieri* and investigating the effect of aqueous extraction on antioxidant capacity of the decoctions, until the original volume reduced to one-eighth (1/8) and two-eighths (2/8), were the focus of this study. Dehydration at $50 \pm 1^\circ\text{C}$ for 12 h in a cabinet air dryer reduced the moisture content to $11.41 \pm 0.27\%$. Decoctions were prepared by heating the dehydrated samples at $60 \pm 5^\circ\text{C}$ in clay pots, the initial solid to water ratio is 6:100 (g/mL). Time required for a volume reduction of 1/8 and 2/8 was monitored and found to be 135 and 90 min respectively. Significantly higher ($p < 0.05$) DPPH radical scavenging activity (92.2 ± 0.5 and $89.1 \pm 0.6\%$ inhibition), lipid peroxidation inhibition activity (61.6 ± 1.1 and $50.8 \pm 0.4\%$ inhibition), total saponins (73.4 ± 1.1 and $48.4 \pm 1.2\%$) and total antioxidant capacity (8.23 ± 0.6 and 4.08 ± 0.9 mg AAE/mL extract) of 1/8 and 2/8 decoctions, respectively, were evident. There was no significant difference between ferric reducing powder between 1/8 and 2/8 extracts. Even though 2-fold or higher concentration was expected in 1/8 extracts than that in 2/8 extracts, 3.5, 21.4, 51.6 and 104.1% increase in DPPH radical scavenging activity, lipid peroxidation inhibition activity, total saponins and total antioxidant capacity, respectively, were evident. Yields of the two extracts were 0.110 ± 0.017 g/mL (1/8) and 0.078 ± 0.007 g/mL (2/8). Even though extraction in 1/8 resulted in a 15% more yield than that in 2/8, considering the energy efficiency, extraction of dehydrated *Bacopa monnieri* in 2/8 could be recommended for spray drying or any other applications in the food industry such as developing functional foods.

Keywords: Antioxidant activity, *Bacopa monnieri*, Decoctions

*Corresponding author: sandudhanushka002@gmail.com



ABOVE GROUND CARBON STOCK ESTIMATION OF INTERMEDIATE ZONE TEAK (*Tectona grandis*) GROWN IN SRI LANKA

W.M. Jinadari^{1*}, W.J.S.K. Weerakkody¹, W.V.T.D. Amarasinghe,²
C.K. Muthumala²

¹Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

²Research Development and Training Division, State Timber Corporation, "Sampathpaya", Sri Lanka

Teak is one of the most valuable and popular timber species in the world in terms of both durability and workability. The need of calculating the carbon storage of teak plantations is vital because it is a major forest plantation species of Sri Lanka, while a significant amount of stock is removed annually as clear-felling. Most teak plantations in Sri Lanka are distributed in the dry zone, even though teak in the intermediate zone also plays a major role in the Sri Lankan timber market. Above Ground Carbon (AGC) stocks of teak between climate zones are important for future forest reference level estimations. Agro-ecological regions are local climatic areas which depict a uniform agro-climate, soils, and terrain conditions. Therefore, this study aimed to estimate the difference in carbon stock in teak plantations based on their respective agro-ecological region. Data collection was performed mainly in two plantations situated in Intermediate Zone Low country1 (IL1) and Intermediate Zone Low country3 (IL3) agro-ecological regions and the age of the plantations was 60 years. Sampling points were selected randomly and each sampling points have 10 m x 10 m in size. Field data on Diameter at Breast Height (DBH) and total tree height were collected, and stem volume was calculated according to allometric equations suggested by Forest Inventory Manual of the Forest Department of Sri Lanka. AGC was estimated by the calculated stem volume and several selected parameters (i.e. biomass expansion factor and species-specific wood density) following IPCC guidelines. An independent t-test was used to test the differences of the AGC stock in different agro-ecological regions. AGC in IL1 and IL3 are 36 ± 34.4 and 43.1 ± 35.5 t/ha, respectively. Results further revealed that AGC has no significant difference between the two agro-ecological regions studied ($P > 0.05$). It can be recommended to increase the number of samples and replicates to be taken for further study. In addition, a comparison can be made with dry zone plantations for comparable results.

Keywords: Above Ground Carbon, Agro-ecological region, Intermediate zone, Teak

*Corresponding author: wijekoonjinadari@gmail.com



ASSESSING PADDY FARMERS' MOST PREFERRED PRODUCT QUALITY ATTRIBUTES FOR A POTENTIAL ECO-FRIENDLY FERTILIZER PACKAGE IN ANURADHAPURA AND KURUNEGALA DISTRICT, SRI LANKA

P.S.D. Vitharana^{1*}, U.K. Jayasinghe-Mudalige¹, A.P. Silva¹, J.A.S.N.S. Jayakodi¹, H.A.C.K. Jayathilake², R.S. Dharmakeerthi³, W.S. Dandeniya³

¹Department. of Agribusiness Management, ²Information Communication Technology Centre, Wayamba University of Sri Lanka

³Department of Soil Science, University of Peradeniya, Sri Lanka

The use of chemical fertilizers across all types of farmlands is reported to be at a very high level in Sri Lanka. Most of these chemical fertilizers are imported to the country at the expense of billions of money, and application of thousands of metric tonnes of these continuously on ad-hoc basis, has created numerous health and environmental issues. Alternatively, production of fertilizers through eco-friendly technologies (EFTs) to replace chemical fertilizer is highly warranted. This study focuses on farmers' most preferred "Product Quality Attributes" for a package of EFTs, including 'Bio-Fertilizer' and 'Bio-Char' developed through a multi-year comprehensive research study funded by the National Research Council of Sri Lanka. Those 22 quality attributes identified were classified into three major categories, i.e., 'Search', 'Experience' and 'Credence'. A questionnaire-based, face-to-face interviews were carried out with paddy farmers (n=85) who were registered with the project on long-term basis from Anuradhapura and Kurunegala districts to collect data. Each attribute was evaluated against a 10-point likert-scale and the scores provided were used to estimate Relative Importance Index (RII) for each attribute. The outcome of RII analysis revealed that those attributes contain in the 'Experience' category was perceived as the "most important" by farmers, including 'Market sustainability', 'Availability of technical guidelines', 'Easiness of handling', 'Possibility to improve productivity' and 'Keepability'. This highlights the phenomenon that if actions were taken to convert those seemingly experience attributes associated with EFTs into largely searchable attributes by way of proper labelling, packaging, branding and promotional activities supported by a standard certification system, It would really facilitate achieving the government objective of transforming into "organic agriculture" as this would minimize the possibility of highlighting potential market and public policy failures of organic fertilizer by those in the "well-established" marketing channels.

Keywords: Chemical fertilizer, Eco-friendly technologies, Farmer preferences, Organic agriculture, Quality attributes

**Corresponding author: piyumikadahanayaka@gmail.com*



DOWNWARD MOVEMENT OF EXCHANGEABLE POTASSIUM AND MAGNESIUM AFTER LONG TERM APPLICATION OF FERTILIZER UNDER DIFFERENT PLACEMENT TECHNIQUES: A CASE STUDY AT RANAWANA COCONUT ESTATE, KURUNEGALA

K.D.C. Premarathna^{13*}, M.K.F. Nadheesha¹, S.S. Udumann², C.S. De Silva³

¹Soils and Plant Nutrition Division, Lunuwila

²Agronomy Division, Coconut Research Institute of Sri Lanka,

³Department of Agriculture and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka

Coconut plays a major role in the Sri Lankan economy. Fertilizers are the main inputs incorporated into the soil to achieve the required yield. Fertilizers are of two main types in nature as inorganic and organic. An experiment was conducted at Ranawana estate in Kurunegala, which belongs to the IL1 agro ecological zone to compare fertilizer application techniques to increase the efficiency of nutrient uptake. After 7 years of continuous fertilizer application under three different placement techniques, each with inorganic and organic fertilizer practices, soil samples from each treatment were randomly collected from five depths at 0-20, 20- 40, 40-60, 60-80 and 80-100 cm to investigate and compare the downward movement of exchangeable K^+ and Mg^{2+} ions. The three different fertilizer placement techniques used were the surface application, trench application and basin application. There were 6 treatments in total with two types of fertilizer combinations under each fertilizer placement technique. The experimental site consisted of sandy loam to sandy clay loam soil with some quartz, few feldspars and iron stone gravels that belong to Red Yellow Podzolic great soil group, comes under Kurunegala soil series which is most suitable soil for coconut cultivation. Collected soil samples were analyzed for pH, electrical conductivity (EC) and exchangeable K and Mg ions at different depths. Data were analyzed using the General Linear Model with Minitab 17 statistical software at the 5% significance level and the 95% confidence level. EC data revealed a movement of ions from the top to bottom layers with significant variations while the pH changes through the depths were not significantly different. The highest K^+ concentration (0.78cmol/kg^{-1}) and the highest EC value ($185.82\ \mu\text{s/cm}^{-1}$) were observed in the first depth of inorganic and organic manure application of the surface method while the highest Mg^{2+} (1.80cmol/kg^{-1}) concentration was in the inorganic fertilizer application of the trench method. Furthermore, the leaching tendency of the Mg ion was comparatively higher than that of K in Kurunegala soil series.

Keywords: Coconut, Fertilizer, Leaching, Placement techniques

**Corresponding author: dushanipremarathna006@gmail.com*



DEVELOPMENT AND QUALITY EVALUATION OF MUFFINS INCORPORATED WITH *BEDI DEL* (*Artocarpus nobilis*) SEED FLOUR

U. Menaka, I. Wijesekara *

Department of Food science and Technology, Faculty of Applied sciences, University of Sri Jayewardenepura, Sri Lanka

Bedi Del is the only endemic species of the genus *Artocarpus* found in Sri Lanka and it belongs to the family Moraceae. Its fruits and seeds have been used from the prehistoric era. However, the nutritional composition, physicochemical properties, sensory properties and the value addition of the *Bedi Del* seeds have not been investigated yet. Most of the *Bedi Del* seeds are wasted during the seasons without getting any advantage. Hence this research attempts to develop muffins using a combination of rice flour and *Bedi Del* seed flour. *Bedi Del* seeds were dried in the sun and seeds were ground into fine particles. Afterwards, the moisture and crude protein content was examined according to the dry oven method and Kjeldhal method respectively. The soluble protein, total lipid, reducing sugar and crude fibre content were examined using modified methods. All experiments were conducted in triplicate and collected data were analyzed using MINITAB 17 package. According to the proximate analysis; moisture, crude protein, soluble protein, total lipid, reducing sugar, total ash and crude fibre content of *Bedi Del* seed flour were $4.47\pm 0.11\%$, $12.92\pm 0.49\%$, $1.48\pm 0.23\%$, $16.23\pm 1.05\%$, $13.79\pm 1.02\%$, $2.50\pm 0.07\%$ and $1.47\pm 0.05\%$, respectively in dry weight basis. The total phenolic content was 70.08 ± 0.66 (mg/GAE/L ext.) and it predicts the potential health benefits. Moreover, the functional properties of the flour such as the water holding capacity and oil holding capacity were 0.81 ± 0.06 (g/g) and 0.89 ± 0.06 (g/g), respectively. According to the sensory analysis the 20% *Bedi Del* seed flour incorporated muffins were selected as the best sample. Furthermore, the nutritional composition of the developed muffins were investigated by comparing it with control (the 100% rice flour) muffin. The proximate analysis of the selected *Bedi Del* flour incorporated muffin; moisture, crude protein, soluble protein, total lipid, reducing sugar, total ash and crude fibre content were $17.09\pm 0.07\%$, $6.80\pm 1.03\%$, $2.38\pm 0.05\%$, $20.66\pm 0.03\%$, $20.32\pm 0.28\%$, $2.91\pm 0.03\%$ and $1.24\pm 0.06\%$, respectively. Collectively, underutilized *Bedi Del* seed flour can be utilized as a potential candidate to incorporate into rice flour muffins.

Keywords: *Artocarpus nobilis*, *Bedi Del*, Muffins, Value-addition

*Corresponding author: isuruw@sci.sjp.ac.lk



ANTIFUNGAL ACTIVITY OF TRUE CINNAMON (*Cinnamomum zeylanicum* Blume) ESSENTIAL OIL AGAINST POSTHARVEST PATHOGENS, ASPERGILLUS, PENICILLIUM AND FUSARIUM

A.A. Wijeweera^{1*}, L.K.T.S Jayasekara², A.Y.L. Fernando², W.G.S.M. Kumari³

¹National Cinnamon Research and Training Centre, Department of Export Agriculture, Palopitiya, Sri Lanka

²Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka

³Department of Botany, Faculty of Science, University of Ruhuna, Sri Lanka

Approximately 30% of fruit and vegetable harvest is lost worldwide due to postharvest diseases. Fungi are considered as major postharvest pathogens since conditions during storage and transportation of harvest are favored by fungal pathogens. The present practice of application of synthetic chemical fungicides on food crops has now been a growing social concern. Therefore, alternatives for synthetic fungicides are investigated by exploring natural sources with antifungal activity. In this study we have investigated the antifungal activity of cinnamon essential oils on three postharvest pathogens, *Aspergillus* sp., *Penicillium* sp. and *Fusarium* sp. isolated from symptomatic onion, citrus, and potato. The identity of isolated fungi was confirmed by their colony characters and microscopic characters of hyphae and reproductive structures. The antifungal activity of undiluted cinnamon oil from the bark and leaf was determined by using the agar well diffusion method. Oils from both bark and leaf inhibited the growth of *Aspergillus* sp., *Penicillium* sp. and *Fusarium* sp. The diameter of the inhibition zone was considered as a measure of antifungal activity. Antifungal activity of bark oil (diameter, 2.2 ± 0.25 cm) was significantly higher than that of leaf oil (diameter 1.7 ± 0.05 cm) at $p > 0.05$. The antifungal activity of oils against three fungal species was significantly different. The growth of *Fusarium* sp. was more affected (diameter 2.4 ± 0.5 cm) compared to *Aspergillus* sp. (diameter 1.9 ± 0.05 cm) and *Penicillium* sp. (diameter 1.6 ± 0.01 cm). The Minimum Inhibitory Concentration (MIC) was determined by a plate assay in which potato dextrose agar medium was supplemented with 100 ppm (0.1 ml/ml), 50 ppm (0.5 ml/ml), 25 ppm (0.25 ml/ml), 12.5 ppm (0.0125 ml/ml), 5 ppm (0.005 ml/ml) concentrations of bark and leaf oil and showed MIC of cinnamon oils for *Aspergillus* sp., *Penicillium* sp. and *Fusarium* sp. lies below 5 ppm. The overall results highlight the antifungal activity of cinnamon oil against three tested post-harvest pathogens and its potential effectiveness for other fungal pathogens.

Keywords: Antifungal activity, Cinnamon bark oil, Cinnamon leaf oil, MIC, Well-diffusion

*Corresponding author: achiniawije@gmail.com



A NEW BUCKING APPROACH TO IMPROVE TEAK (*Tectona grandis*) GRADING: A CASE STUDY IN KURUNEGALA DISTRICT

B.M.L.S. Balasooriya^{1*}, W.V.T.D. Amarasinghe², W.J.S.K. Weerakkody¹, C.K. Muthumala²

¹*Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka*

²*Research Development and Training Division, State Timber Corporation, "Sampathpaya", Sri Lanka*

Defective teak log sales under saw grade are less profitable and conversions of saw grade logs (S) into prime grade logs (PR) by removing defects are highly profitable. But that conversion leads to the loss of some amount of timber yield which might result in an economical loss. The possibility of removing defects to increase grade quality and fulfil the market requirements is still unclear. Therefore, this study aimed to approach a bucking technique to improve the grade quality of teak. Data collection was done at Wiharakanda and Athugalpura plantations in Kurunegala district. Length of the log and mid circumference (under bark) were recorded by using distance tape with the visually observable defects namely buttresses, knots, bends, hollows, bends and splits. Log volume calculation using Huber's formula and sales prices; normal price (A), sales price within the production region (P1), and sales price outside the production region (P2), were calculated based on the guidelines of State Timber Corporation. The statistical significance of prices between S grade and PR grade logs were determined. A systematic survey was conducted using thirty teak purchasing shops including vendors and saw mills to investigate the market requirement of logs. The mean lengths of saw grade logs from Wiharakanda and Athugalpura were 6.45 ± 0.38 m and 6.37 ± 1.14 m, respectively. According to the survey 43% of log vendors prefer teak which is classified under super luxury class. All teak log vendors were buying teak at free sale price, without auctioning and 75% of respondents preferred teak from Dry zone viz. Kurunegala, Ampara, Puttalam districts. Most commonly observable deformities at the logging sites were knots, piths, holes and buttresses. Meanwhile, 71% of vendors preferred to buy logs with 1.5-0.7 m mid girth and 6 m or above length. It can be concluded that there was a significant difference in sales price (P1 and P2) between saw grade logs and converted prime grade logs via new bucking method at $P < 0.05$ level and finally saw grade logs with defects can be sold as prime grade logs by removing deformities. Since results are highly site specific, this study should be conducted for different sites of different agro ecological regions to develop more universal bucking approach.

Keywords: Bucking, Defect logs, Grading, Teak

*Corresponding author: lahirubalasooriya33@gmail.



NUTRITIONAL PROPERTIES AND HYDROLYZING RATES OF RICE GROWN WITH BIOFILM BIO-FERTILIZER (BFBF)

I. Rathnayaka^{1,2}, C.S. De Silva¹, S. Maheepala¹, G. Seneviratne³, R. Liyanage^{2*}

¹Department of Agricultural and Plantation Engineering, Faculty of Engineering, Technology, Open University of Sri Lanka

²Laboratory of Nutritional Biochemistry, National Institute of Fundamental Studies, Kandy, Sri Lanka

³Laboratory of Microbial Biotechnology, National Institute of Fundamental Studies, Kandy, Sri Lanka

Rice (*Oryza sativa* L.) is the staple food for a larger proportion of the world population. Excessive use of chemical fertilizer (CF) in rice cultivation, especially urea is one of the causes of global warming and ground water pollution. Biofilm Biofertilizer (BFBF) has been developed as an environmentally friendly alternative for reducing excessive use of CF in rice cultivation. This study compared the nutritional properties and hydrolyzing rates of the rice grown with BFBF and CF. Rice samples of Bg94/1 grown with six fertilizer treatments: different ratios of BFBF and CF, T1–100% CF, T2–80% CF, T3–80% CF+BFBF, T4–65% CF, T5–65% CF+BFBF and T6–Control: normal soil were analyzed. All the analysis was carried out in triplicates, and data were analyzed by using one-way ANOVA. Based on the results, moisture, ash, crude fat contents among the treatments varied from 10.2% (T4) to 12% (T1), 2.1% (T1) to 5.1% (T4), and 1.0% (T1) to 2.7% (T4), respectively. Protein content was in the range between 5.6% (T2) to 7.3% (T4). Available carbohydrate content varied between 68.3% (T4) to 74.8% (T1). The mineral profile of rice showed that no harmful trace elements exceeded the acceptable level. A significantly higher level of Zn was observed in T5. Total dietary fibre (TDF) content ranged between 6.8 to 3.1g/100 g belonging to T2 and T1, respectively. Moreover, when the rice samples were hydrolyzed, the lowest maltose releasing rate was observed in T4. The results of the present analysis revealed that rice grown with 65% CF+BFBF have satisfactory level of macro and micronutrient composition. Protein, TDF and zinc content in rice grown with 65% CF+BFBF treatment were significantly higher than those in the rice grown with 100% CF and the control sample. Therefore, it could be concluded that the 65% CF+BFBF is an eco-friendly and economically viable recommendation for rice farming in Sri Lanka.

Keywords: Biofilm Biofertilizers, Chemical fertilizers, Nutritional properties, *Oryza sativa*, Sustainable agriculture

*Corresponding author: ruvini.li@nifs.ac.lk



DIFFERENCES OF CHEMICAL CONSTITUENTS IN THREE PHYSIOLOGICAL STAGES OF CEYLON CINNAMON (*Cinnamomum zeylanicum* Blume)

A.A. Wijeweera¹, S.R. Hettiarachchi^{2*}, J.W. Hewage³, S.H. Wadumethrige³, G.G. Jayasinghe¹

¹National Cinnamon Research and Training Center, Palolpitiya, Sri Lanka

²Department of Chemistry, The Open University of Sri Lanka

³Department of Chemistry, University of Ruhuna, Sri Lanka

The variation of chemical constituents of bark and leaf oils of Ceylon Cinnamon, *Cinnamomum zeylanicum* with respect to physiological stages, namely flushing, flowering and fruiting, were studied. We maintained both genetic and ecological factors similar by using two accessions of Ceylon Cinnamon cultivated at a field in the agro-ecological zone, IL1a. There was a significant difference in the leaf oil contents within three stages: flowering (2.31%), fruiting (1.47%) and flushing (1.01%). Bark oil content in flowering stage (1.81%) was significantly higher than flushing (0.78%) and fruiting (0.91%) stages. The interaction between variety and physiological stage showed no effect on oil contents. Concentration of the major constituent, total cinnamaldehyde, among flowering (63.99%), fruiting (65.74%), and flushing stages (70.16%) in bark oil was also similar. The eugenol content in bark oil was significantly higher in both flowering (12.11%) and fruiting (11.92 %) stages compared to the flushing stage (8.36 %) and while a similar trend was observed in benzyl benzoate content. Alpha linalool was similar in three stages, while caryophyllene content was significantly higher in flowering stage compared to the other two stages. Eugenol content in leaf oil among three stages, flowering (76.73 %), fruiting (79.98%), and flushing (81.01%) was similar, and further, it was not different between two accessions. Cinnamaldehyde and cinnamyl acetate were accounted for a sum of about 5% of the oil, and were different in three stages, while alpha linalool percentage was considerably higher in both fruiting and flushing stages compared to the flowering stage. Caryophyllene and benzyl benzoate were higher in the flowering and flushing stages compared to the fruiting stage. This analysis concludes that there was a significant dependency of oil contents on physiological stages despite no difference between two genotypes was observed with respect to the three different physiological stages. Furthermore, the effect of genetic factor on the differences of chemical constituents of either bark oil or leaf oil in three stages was also similar between two accessions. In general, considering the quality of oils, harvesting at flowering or fruiting stages are better compared to the flushing stage.

Keywords: Accessions, Cinnamon, Growth parameters, Oil content, Physiological stages

*Corresponding author: srhet@ou.ac.lk



AN ASSESMENT OF THE AGRICULTURAL DROUGHT VULNERABILITY USING REMOTE SENSING TECHNIQUES: WITH SPECIAL REFERENCE TO ANURADHAPURA DISTRICT

P.K.V.S. Dananjaya*

Department of Economics and Statistics, Sabaragamuwa University of Sri Lanka

The agricultural sector could be named as one of the major sectors contributing to the development of the country's economy. However, this sector is affected by various hazards, and drought is one of the major hazards. Hence, it is necessary to identify the drought-prone areas to mitigate adverse impacts on agriculture. This study focused on the identification of drought-prone areas by using remote sensing techniques. The selected area for the study was the Anuradhapura district, which belongs to the dry zone and it is the second-largest district of paddy cultivation in the country. In the district, most of the agricultural activities rely on the irrigated water. Hence, drought is a major problem for the district, and it is necessary to identify highly vulnerable areas for the drought within the district to apply mitigation activities. This study used Normalized Difference Vegetation Index (NDVI) and Vegetation Condition Index (VCI) to Identify vulnerable areas for the drought. The study used Landsat satellite images from 2006 to 2011 that cover 10 Maha and Yala seasons. VCI was calculated for each growing season for each year. All calculated VCI overlaid using the Weighted Sum Overlay method in ArcMap 10.4 to create drought vulnerability maps. When the VCI value is less than 30%, it means that area is vulnerable to drought, if the value is equal to or greater than 50%, it means the area is not or less vulnerable to the drought. Three maps were generated for Maha, Yala, and both seasons. According to the results, during both seasons, (Yala & Maha) 12.29% of the land area belongs to the severe drought zone and 33.76 % under the moderate zone and the rest belongs to the no drought zone. During both seasons, more than 45% of the land is under the agricultural drought vulnerability zone. By identifying these severe drought-prone areas, government officers can introduce drought resilience methods such as agricultural methods and developed crops resilient to the drought conditions.

Keywords: Agricultural drought, NDVI, Remote sensing, VCI

*Corresponding author: chandusridananjaya@gmail.com



EFFECT OF PREINCUBATION STORAGE PERIOD AND FLOCK AGE ON HATCHABILITY OF EGGS OF COBB 500 BROILER STRAIN

U.L. Ranawaka, P.K.J. de Mel*

*Department of Agricultural and Plantation Engineering,
The Open University of Sri Lanka*

Broiler meat production is a fast-growing industry in Sri Lanka since broiler meat has become a vital component in the Sri Lankan diet. Broiler meat production is highly dependent on amount and continuity of supply of day-old broiler chicks which is determined by the hatchability of breeder eggs. In the Sri Lankan scenario preincubation storage of eggs and breeder flock age are two critical factors which influence hatchability. Therefore, the present study was carried out to determine the suitable storage period for eggs and to reveal the most productive flock age of a breeder stock. The experiment was carried out with broiler strain Cobb 500 in the hatchery of New Anthony's Farms (Pvt) Ltd at Lunugama. In this study the effect of six storage periods (0, 3, 6, 9, 12 and 15 days) and four group of flock age (25, 32, 49 and 60 weeks) on hatchability of eggs were evaluated. Completely randomized design with the 4 x 6 factorial arrangement was adopted for the experiment. A total of 3600 carefully selected fertile eggs, a batch of 900 eggs from each age group were used for the experiment. A batch of 900 eggs was arranged into the six different storage periods of 150 eggs per storage period of 0, 3, 6, 9, 12, and 15 days. The eggs under 0-day storage were set for the incubation on the same day of collection of eggs and rest of the five groups were stored for 3, 6, 9, 12, and 15 days under 18°C temperature and 75% relative humidity. At the end of indicated storage period the relevant batch of eggs was set for the incubation under recommended conditions. On 18th day of incubation eggs were candled and fertile eggs with developing embryo were transferred to the hatcher. On hatching, day old hatched chicks under each treatment were counted separately and hatchability was evaluated. All effects and interactions were tested for significance ($P < 0.05$) by using Microsoft Excel and GLM procedure of Minitab 17 version software. The Duncan multiple range test was performed to separate the mean differences between treatments. The result revealed that there is no significant interaction ($P > 0.05$) effect of two treatments of breeder flock age and storage duration. The effect of breeder flock age on hatchability is significant ($P < 0.05$). The highest hatchability was recorded by the 32 weeks old breeders (90.78%) while the lowest hatchability percentage was recorded by the 49 week old breeders (80.0%). There was no significant ($P > 0.05$) effect of storage period on hatchability.

Keywords: Flock age, Hatchability, Preincubation storage

*Corresponding author: pkmel@ou.ac.lk



THE EFFECT OF DIFFERENT PRE-WASHING TREATMENTS ON THE IMPROVEMENT OF THE QUALITY AND SHELF LIFE OF MECHANICALLY DEBONED CHICKEN MEAT

W.A.K.R. Kumarasinghe¹, P.R.M.K. Fernando¹, J.K. Dissanayake², S.M.C. Himali^{1*}

¹Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

²CIC Poultry Farm (Pvt) Ltd. CIC Poultry Processing Plant, Badalgama, Sri Lanka

Mechanically deboned chicken meat (MDCM) is produced from edible chicken parts which have no or less economical value. MDCM is highly vulnerable to lipid oxidation and spoilage due to high content of polyunsaturated fatty acids and free heme groups. Therefore, this study was conducted to investigate the effect of washing the chicken parts with natural antioxidants and antimicrobial agents on the quality and shelf life of MDCM products, considering the potential health hazards associated with synthetic antioxidants and other preservatives. Four different pre-washing treatments with 2% (v/v) lactic acid (LA), 8% (w/v) phosphate (PW), 25% (v/v) ginger extract (GE) and 25% (v/v) turmeric extract (TE), and water (control) were used to evaluate their effectiveness in inhibiting lipid oxidation and improving the quality and shelf life of MDCM. Accordingly, 2- thiobarbituric acid reactive substances (TBARS), pH, colour, water holding capacity (WHC) and microbiological properties of MDCM stored under -2°C were measured. Sample produced by LA pre-wash showed considerably lower ($P<0.05$) lipid oxidation in the fifth week. Treatment with TE had the highest ($P<0.05$) a^* and b^* values for colour. Pre-wash treatment with PW had the highest ($P<0.05$) WHC, and the lowest ($P<0.05$) value was obtained from the LA treatment in the fifth week. The total viable plate counts belonging to the pre-wash treatments of LA, PW, TE, GE reduced by 8%, 6%, 4.5%, 2% respectively on the day of initiation ($P<0.05$). In the fifth week, the control sample showed the highest total viable plate count ($P<0.05$) and the LA treated sample showed the lowest ($P<0.05$). There were no Salmonella counts recorded in any of the treatment groups throughout the storage period. This study revealed that 2% (V/V) lactic acid (LA) could be successfully used to improve the quality and shelf life of MDCM with low lipid oxidation.

Keywords: Lipid oxidation, Mechanically deboned chicken meat, Shelf life

*Corresponding author: smchimali@agri.pdn.ac.lk



INFLUENCE OF DIFFERENT LEVELS OF NITROGEN FERTILIZER AND IRRIGATION ON RADISH (*Raphanus sativus*) UNDER INCREASED TEMPERATURE CONDITION

R.P.D.N. Kumara^{*}, C.S. De Silva, H.K.L.K. Gunasekara

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka

Radish (*Raphanus sativus*) is one of the highly consumable vegetables throughout the world and it plays a major role in vegetable cultivation in Sri Lanka. Various environmental factors including temperature and water availability influences growth, development and yield of radish. Current changing climate specially increased temperature and water stress conditions have detrimental effects on radish resulting in lower yield with poor quality. Nitrogen fertilizer has an ability to compensate yield reduction due to high temperature and water stress of crops. The present study was conducted to evaluate the effect of temperature, different rates of nitrogen fertilizer and different field capacity levels on growth and yield of radish (*Rhaphanus sativus*). A pot experiment was carried out using variety *beralu* with three replicates in completely randomized design. Three nitrogen fertilizer rates were used as 100% of recommended nitrogen, 150% of recommended nitrogen and 200% of recommended nitrogen. Two temperature levels were used as ambient temperature (32-33 °C) and increased temperature (36-37 °C). And three levels of field capacity were used as 100%, 150% and 200% of field capacity soil moisture levels. Growth parameters were recorded in weekly intervals and yield parameters were determined at the end of the experiment when radish was harvested. According to the results of the study, under ambient temperature condition, 100% recommended level of nitrogen fertilizer was enough to obtain higher yield while it produced least results under increased temperature conditions. However, the treatment with 150% of nitrogen with irrigation level at 100% field capacity soil moisture level has shown higher yield under increased temperature conditions. Further, the results revealed that the increase of nitrogen fertilizer application, the growth dynamic, and yield of radish were increased at a range of recommended level of nitrogen to 150% of recommended nitrogen and then decreased gradually at a level of 200% of recommended level of nitrogen at increased temperature conditions.

Key words: Field capacity, Nitrogen, Radish, Temperature stress, Yield

**Corresponding author: dineshnuwan0110@gmail.com*



EFFECT OF SUPER ABSORBENT POLYMERS AND DIFFERENT IRRIGATION INTERVALS ON GROWTH AND YIELD OF TOMATO (*Lycopersicon esculentum* Mill) UNDER TEMPERATURE STRESS CONDITION

K.G.A.I. Rasanjali^{1*}, C.S. De Silva², L.K.R.R. Jayakody¹

¹Department of Botany, Faculty of Natural Science, The Open University of Sri Lanka

²Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka

Tomato is one of the popular crops all around the world and it plays an important role in Sri Lanka as an income generation source. Tomato can be cultivated in many areas of Sri Lanka. However, it is very sensitive to temperature stress and water deficit condition. Global climatic conditions varied in a rapid way and increments of temperature with longer drought seasons are common in many areas. Due to current adverse climatic variation, yield of tomato has reduced significantly. Therefore, effective cultivation adaptations are required to mitigate these impacts. Application of Super Absorbent Polymer (SAPs) is one of the technologies that can be used to overcome the effects of temperature stress and limited water availability. The current study is conducted to evaluate the influence of SAPs, and different irrigation intervals on growth and yield of tomato under ambient temperature (32 -33 °C) and increased temperature (36 -37 °C) conditions. Pot experiment was conducted at The Open University of Sri Lanka. The experiments were arranged in a completely randomized design with three treatments. Growth parameters of tomato were measured once per week and yield parameters were taken at harvest. All the data were analyzed using SAS 9.3 version and the Duncan multiple range test used to determine the differences in treatment means at $P < 0.05$. Results of this study reviewed that, interaction effect of SAPs, irrigation interval and temperature condition have a significant (<0.05) influence on growth and yield measurements of tomato. Application of SAPs positively influenced yield under both temperature conditions. When irrigation interval is extended, it results in a decreased yield due to limited amount of water. Under ambient temperature condition irrigation interval can be extended to 8 days while irrigation interval can be extended 5 days at increased temperature condition with application of SAPs. Treatment without SAPs, 8 days irrigation interval at elevated temperature condition resulted in the lowest yield due to impact of high temperature and low amount of water.

Keywords: Irrigation interval, Super absorbent polymers, Temperature, Tomato, Yield

**Corresponding author: rasanjali429@gmail.com*



BIOLOGICAL SCIENCES



INVASION OF *Parthenium hysterophorus*. L. WEED OVER OTHER COMMON WEEDS IN THE VAVUNIYA DISTRICT, SRI LANKA

K. Arjunan^{1,2*}, A. Nanthakumaran¹, S.K. Yatigammana², S. Devaisy¹

¹ Department of Bio-Science, Faculty of Applied Science, Vauniya Campus of the University of Jaffna, Sri Lanka

² Postgraduate institute of Science, University of Peradeniya, Sri Lanka

Parthenium is a highly invasive weed in Sri Lanka which was initially reported in Vavuniya district and intensely affected the environment. Therefore, this study was carried out to assess the invasion of *Parthenium* weed of the other weeds in the urban and suburban areas of Vavuniya district. A field survey was carried out to quantify the distribution of *Parthenium* and other species composition at 21 locations where *Parthenium* infestation was reported. At each sampling location 05 experimental quadrats with *Parthenium* infestation and five control quadrats without *Parthenium* infestation over different land use types (e.g: agricultural lands, village tanks, associated lands, road sides and barren lands) were used to study the variation in the association of native floral species in *Parthenium* dominated locations. Invasive Alien Species (IAS) provincial profile map of Vavuniya District, Northern Province was used as the secondary data for this study. The Shannon diversity index (H) was used to characterize the species diversity of weeds. *Parthenium* in the study area was noticed to have higher Absolute Density (AD), i.e., 2 plants per square meter whilst *Tephrosia purpurea* (0.3), *Cleome viscosa* (0.25), *Ocimum canum* (0.35) were identified with moderate AD. The rest of the species, such as *Tridax procumbens*, *Leucas zeylanica*, *Mimosa pudica*, *Calotropis gigantea*, *Amaranthus spinosus*, *Emillia javanica*, *Stachytarpheta jamaicensis*, *Lantana camera*, *Dichrostach cinerea*, and *Vernonia cinerea* showed values less than 0.25. The Relative Density (RD) of the *Parthenium* weed was recorded as the highest (~26%) whilst the rest were less than 11%. Accordingly, *Parthenium* was the most dominant IAS in the study area and it appears to suppress the growth of the other species. The quadrats lacking *Parthenium* observed with the well distribution of the other species. The species richness and species evenness of *Parthenium* was found to be in the range of 0.36–0.72 and 0.60–0.98 respectively. Infestation of the *Parthenium* was higher in the Vavuniya town area where the rainwater usually collects.

Keywords: Invasion, *Parthenium*, Vavuniya district, Weed Density

*Corresponding author: arjunan17@hotmail.com



PRELIMINARY INVESTIGATION OF WOUND HEALING POTENTIAL OF THE LEAVES AND BARK OF *Ziziphus oenoplia* (L.) Miller

W.M.P. Samarasinghe¹, K.H. Jayawardena², C. Ranasinghe^{1*},
S. Somaratne³, G.M.K.B. Gunaherath¹

¹Department of Chemistry, The Open University of Sri Lanka

²Department of Zoology, The Open University of Sri Lanka

³Department of Botany, The Open University of Sri Lanka

The leaves and bark of *Ziziphus oenoplia* are claimed to be a prudent treatment for wounds, especially fresh cuts, in Ayurvedic and indigenous medicine. The present study was carried out to investigate the wound-healing potential of the leaves and bark of *Z. oenoplia*. Hexanes, dichloromethane, ethyl acetate and methanol extracts of leaf and stem bark of *Z. oenoplia* were obtained by sequential extraction of the dried plant material with respective solvents in an orbital shaker at room temperature (30±2 °C) for 24 hours. Each extract was subjected to scratch wound assay (SWA) at a concentration of 20 mg/L on Madin-Darby Canine Kidney (MDCK) cells along with two negative controls, 1% dimethyl sulfoxide (DMSO) in 20% Dulbecco's Modified Eagles Medium (DMEM) and 20% DMEM and two positive controls, lupeol (25 µM) and asiaticoside (25 µM). The results are presented as mean percentage wound closure ± standard deviation. Mean comparisons were performed using ANOVA/LSD post hoc test and $p < 0.05$ was considered significant. Of these eight extracts, enhanced wound closure was shown by the hexanes, dichloromethane and ethyl acetate extracts of leaves (78%, 80% and 81%, respectively, at 24 h) and the hexanes extract of bark (76% at 24 h). Bioactivity-guided fractionation of the hexanes extract of leaves led to the identification of a fraction having enhanced wound healing activity at a concentration of 5 mg/L (86% at 24 h). The presence of lupeol in this fraction was tentatively identified by co-TLC. The isolation of lupeol and bioassay guided fractionation of dichloromethane and ethyl acetate extracts are underway. This study validates the traditional claim of *Z. oenoplia* as a treatment for wounds, particularly the leaves for the fresh wounds.

Keywords: Madin-Darby Canine Kidney cells, Scratch Wound Assay (SWA), Wound healing activity, *Ziziphus oenoplia* (L.) Miller

*Corresponding author: crana@ou.ac.lk



EXTRACTION AND CHARACTERIZATION OF CHITOSAN FROM THE SHELLS OF MUD CLAM (*Geloina coaxans*), COCKLE (*Gafrarium tumidum*) AND FRESHWATER MUSSELS (*Lamellidans sp*)

M.R.R. Ahammed¹, R.G. Sanuja^{2*}, B.D.M. Mihiran¹

¹*Department of Aquaculture and Aquatic Resources Management, University College of Anuradhapura, Sri Lanka*

²*Department of Fisheries and Aquaculture, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Sri Lanka*

Chitosan is a deacetylated derivative of chitin, the second most commonly available structural polysaccharide on earth. Chitin is a main component of cell walls of yeast, mushrooms and other fungi, exoskeleton of insects, crustaceans, marine zooplanktons and gastropod shells. Bivalves, as clams, cockles and mussels are the second largest class of molluscs are totally aquatic and the non-edible part of their bodies, the shells which are available in abundance, have no use and are commonly regarded as waste, but they are rich source of chitosan, which is useful in agriculture, preparing biodegradable consumable materials and as a medicine. The objective of the present study was to analyze the chemical properties of chitosan extracted from the shells of Mud Clam (*Geloina coaxans* - A) Cockle (*Gafrarium tumidum* - B) and freshwater mussels (*Lamellidans sp.* - C). Freshwater Mussel shells were collected from the Nuwarawewa reservoir of the Anuradhapura District. Clams, & cockle shells were collected from the Kinniya bay and Kalpitiya areas respectively. Chitosan was extracted by demineralization, de-potenzation, followed by deacetylation. The percentage of chitosan yield, moisture percentage, ash percentage, nitrogen percentage, water binding capacity and FT-IR reports of the chitosan samples extracted from above three bivalve species were compared. For the above mentioned three species of *Geloina coaxans*, *Gafrarium tumidum*, and *Lamellidans sp.* yield was 23.51%, 36.08%, and 28.81%; moisture was respectively 1.59%, 1.55%, and 3.40%; ash was respectively 39.27%, 52.4%, and 45.88%; nitrogen was 23.8%, 48.96% and 34.98%; Water binding capacity (WBC) was 219.85%, 213.17%, and 257.49% respectively. According to the above results, chitosan isolated from the cockle shells was of best quality when comparing with the other two bivalve shells. There is a possibility of using bivalve shell waste to produce good quality chitosan, as crustacean shells and cephalopods internal skeletons, and that is evident from the results of the present study. The application of this low-cost techniques to isolate chitosan, from bivalve shells which are being discarded, will enhance the production of commercially valuable resource of chitosan.

Keywords: Bivalve shells, Chitin, Chitosan, Deacetylation

*Corresponding author: sanujaranasinha@gmail.com



GROWTH AND YIELD PERFORMANCES OF RICE (*Oryza sativa* L.) VARIETIES UNDER NANO-MICRONUTRIENT FERTILIZERS, NANO-CuO AND NANO-ZnO

C.L.T. Sandanayake¹, S.R. Weerakoon,^{1*} S. Somaratne,² N. Karthikayan³

¹Department of Botany, The Open University of Sri Lanka

³Department of Physics, The Open University of Sri Lanka

Rice (*Oryza sativa* L.) is the second most important staple food in the world. There is a dire need for higher rice yield to meet the ever-increasing demand with the rise in population despite the hampering impact of climatic changes. Nanotechnology plays a potential role in the food security by strengthening agricultural sustainability and provides an alternative for conventional fertilizers. Therefore, the present research was carried out to determine the effects of nano micronutrient fertilizers; nano-CuO, nano-ZnO on the growth and yield of selected rice varieties, Bg360, BW364, *Kaluheenati* and *Kuruluthuda*. Nano-fertilizers used in the study were synthesized by Sol-gel and thermal decomposition methods. Nano-ZnO, nano-CuO and nano CuO-ZnO composite treatments were applied as foliar spray at concentrations of 30 mg L⁻¹ (T1), 60 mg L⁻¹ (T2), and 120 mg L⁻¹ (T3) and double deionized water served as the control (T0). The synthesized nano-fertilizers were applied during the growth stage [at 48-58 Days After Sowing (DAS)] and milking (filling) stage of grains [100-105 DAS] while the plants were provided with appropriate levels of N, P, K fertilizers, as recommended by Department of Agriculture. A Complete Randomized Block Design was employed with three blocks and five replicates in each block. Plant growth related parameters (plant height, number of tillers, number of leaves and chlorophyll content) were recorded at 30 DAS, 60 DAS and 90 DAS. The yield characters (Number of panicles per plant, Number of grains per panicle, 100-grain weight and panicle length) were recorded at the harvesting stage. Descriptive statistics such as mean and standard error of mean and inferential statistics were performed on the data obtained. ANOVA with interaction terms was performed to assess the significant differences between the treatments. The descriptive analyses show an increase in growth and yield of the rice varieties under the application of nano-fertilizers. ANOVA suggests significant effect ($p \leq 0.05$) of nano-CuO and nano-ZnO on the growth and yield of rice varieties used in the study. Both traditional as well as inbred rice varieties indicated yield response to applied nano-fertilizers. Highest yield performances were recorded with nano-ZnO at 60 mg L⁻¹, nano-CuO at 60 mg L⁻¹ and nano CuO-ZnO at 60 mg L⁻¹ concentrations.

Keywords: Micronutrients, Nano-fertilizer, *Oryza sativa*, Traditional and Inbred rice varieties

*Corresponding author: shyamaweerakoon@gmail.com



A COMPARATIVE STUDY ON SOME PHYSIOCHEMICAL PROPERTIES OF FRESH AND IN-USED OIL USED BY STREET FOOD VENDORS IN THE WIJERAMA AREA, GANGODAWILA, NUGEGODA IN SRI LANKA

U. Dinithi*, P. Abeyesundara

Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka

Despite the proven health risks that are associated with them, deep-fried street food is very popular among Sri Lankans due to their low prices and convenience. The quality of frying oil used by street food vendors has a direct impact on the safety of fried street food. This study was conducted to assess the quality of fresh and in-used frying oil used by street food vendors in the Wijerama area in Nugegoda, Sri Lanka. Twenty-four (12 fresh and 12 in--used) oil samples were collected from 12 street food vendors and analysed for their physicochemical properties such as iodine value, peroxide value, acid value, moisture level and insoluble impurity level. All experiments were performed in triplicates and the data was analysed using One-way ANOVA with Turkeys' Honestly Significant Difference Test or paired sample t-test ($P < 0.05$). All the street food vendors were found to be using palm oil for frying. The Iodine values of all fresh samples were below the specific required level (50-54) except for one sample while the in-used samples indicated numbers that ranged between 19 and 42. The acid values of 5 fresh oil samples exceeded the maximum allowable limit (0.6 mg KOH/g) while the acid values for in-used samples ranged between 0.54 and 2.19 mg KOH/g. The peroxide values of all fresh and in-used samples were in the range of 7.40 to 10.11 mEq/Kg and 11.46 to 17.21 mEq/Kg, respectively. The moisture levels of all the fresh samples ranged between 0.12-0.23% and were above the maximum allowable level (0.1%). Meanwhile, the moisture levels of the in-used samples were in the range of 0.20 - 0.52%. The standard deviation for the mean value of insoluble impurities was greater than 100%. Finally, the data suggests that some street food vendors in the study area use fresh frying oil that is non-complying with SLSI/Codex standards. Further, the data revealed that compared to fresh oil samples, all in-used oil samples were highly degraded with respect to the tested parameters. Therefore, it is highly recommended to impose strict rules and regulations to control the quality of frying oil as well as to minimize malpractices during food processing in street food vending.

Keywords: Fried-foods, Oil quality, Street-foods

*Corresponding author: umeshadinithi94@gmail.com



A PRELIMINARY SURVEY ON SPECIES DIVERSITY AND HABITAT DISTRIBUTION OF AMPHIBIANS IN GANNORUWA FOREST RESERVE, KANDY, SRI LANKA

B. Pathirana¹, K.M.S. Ruvinda^{2*}, T. Kotigala¹, K.M. Gunatunga¹, S.B. Herath¹

¹*Department of Zoology, Open University of Sri Lanka*

²*Department of Zoology & Environmental Management, University of Kelaniya, Sri Lanka*

Sri Lanka is considered as an amphibian hotspot, yet the amphibian diversity in isolated and anthropogenically impacted landscapes is poorly known due to inadequate scientific exploration. To fill this gap, the present study was conducted at Gannoruwa Forest Reserve (GFR), to assess the amphibian diversity, habitat distribution and anthropogenic impacts on them. The visual encounter survey was conducted from December 2019 to October 2020, covering the altitudinal ranges and six major habitat types in GFR i.e., Naturalized abandoned plantation (AP), Grassland (GL), Mahogany plantation (MP), Nutmeg plantation (GP), the Natural Forest on the summit (NF) and Swamp area (SA). A total of 13 species of amphibians belonging to four families were documented during the study period and out of these, 11 (84.6%) were endemic to Sri Lanka. Genus *Pseudophilautus* represented 75.5%; the remaining 6 species altogether recorded less than 25% of the total abundance. *Pseudophilautus zorro* was the most abundant species, representing 55.1% of the recorded individuals. *Pseudophilautus fergusonianus* and *Pseudophilautus cavirostris* occurred with very low abundance. *Hydrophylax gracilis*, *Indosylvirana temporalis* and *Lankanectes corrugatus* was recorded only in the SA. The Shannon-Wiener diversity index followed the decreasing order; SA (2.07) > GL (1.48) > NF (1.24) > AP (1.22) > NP (0.97) > MP (0.56), in surveyed habitats. The highest level of evenness was found in the GL area (0.92) indicating a near-equal distribution of abundance across the species. The SA indicated the highest richness (10 species), the highest number of species occurrence (64 individuals), and the highest Shannon-Wiener index (2.07) among all habitat types due to the availability of critical breeding habitats for amphibians to maintain healthy amphibian species diversity. A higher percentage abundance of amphibian distribution (76.9%) was observed from 500m to 550m altitude, which may indicate a correlation with the existence of SA. Previous studies and personal communication revealed that the threat of alien invasive plant species, lack of a stable water source and harmful anthropogenic activities such as unauthorized specimen collection, setting fires to grassland, forest clearance in the borders, has been identified as major threats to amphibians' conservation in GFR.

Keywords: Amphibian hotspot, Anthropogenic impact, Endemic, Shannon-Wiener Index, Species abundance

*Corresponding author: sudeshr@kln.ac.lk



BIOACTIVITY STUDIES ON CRUDE EXTRACTS OF FUNGI ISOLATED FROM *Ceriops tagal* AND SURROUNDING SOIL FROM SRI LANKAN MANGROVE ENVIRONMENT

W.C.C.N. Fernando¹, C. Ranasinghe^{1*}, M.M. Qader²

¹Department of Chemistry, The Open University of Sri Lanka

²Institute for Tuberculosis Research, College of Pharmacy, University of Illinois at Chicago, USA

Mangrove associated microbes are highly adapted to tolerate harsh environmental conditions. They are considered as under-explored rich sources of secondary metabolites with biological activities such as antitumor, antibacterial, antifungal, antiviral, anticancer, antioxidant and enzyme inhibition. This preliminary investigation aims to identify the biological activities of three endophytic fungi isolated from the leaf of the mangrove plant *Ceriops tagal* and a fungus isolated from its submerged soil. Pure fungi were cultivated on a large scale in sea water incorporated Potato Dextrose Agar medium. Crude extracts of pure fungal cultures were tested for their antioxidant activity by 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay and cytotoxicity was assessed by brine shrimp lethality assay. Of the four fungi which showed antioxidant potential, one endophytic fungus belonging to the genera *Penicillium*, showed higher antioxidant potential having a lower IC₅₀ value (8.24 ppm) than the positive control (ascorbic acid; 10.00 ppm). All four fungal extracts showed cytotoxic activity (100% mortality) at concentrations above 500 ppm. while the two endophytic fungi (*Penicillium* sp.) showed cytotoxicity at a lower concentration of 125 ppm. HPLC separation and further purification of one crude extract led to the isolation of three major fungal metabolites. These were identified by spectroscopic analysis followed by 2D NMR dereplication studies as terrain, emodin and ergosterol which were already reported to be of biological significance.

Keywords: Antioxidant activity, Cytotoxicity, Fungal metabolites, Mangrove associated microbes

*Corresponding author: crana@ou.ac.lk



AWARENESS OF COMMON ZONOTIC DISEASES AMONG THE NEW BSC DEGREE REGISTRANTS OF THE OPEN UNIVERSITY OF SRI LANKA IN 2020

V.S. Kulatunga¹, L.P. Fernando², U.A Jayawardena¹, C.D. Jayasinghe^{1*}

¹Department of Zoology, The Open University of Sri Lanka

² Faculty of Humanities and Sciences, Sri Lanka Institute of Information Technology, Malabe, Sri Lanka

The present study evaluates the awareness of common zoonotic diseases among the new BSc degree registrants of the Open University of Sri Lanka (OUSL) in 2020. A cross-sectional study using a structured online questionnaire was employed for a cohort of new BSc registrants (N=83) who participated in the virtual orientation session in December 2020. Data was analysed using the Pearson Chi square test (χ^2) with the significant value as $p < 0.05$. According to the survey, 83.2% of respondents were aware of zoonotic diseases and the transmission routes. Among the respondents, 86.8% and 85.6% agreed that zoonotic diseases can be treated and prevented, respectively, while 67.5% agreed that zoonotic diseases can be controlled. A majority of the respondents were aware of COVID 19 (92.8%), Swine flu (89.2%), Brucellosis (80.8%), SARS (82%) and Rabies (74.7%) as being zoonotic diseases, and a higher proportion of female respondents identified bovine tuberculosis ($p = 0.004$) and Q fever ($p = 0.028$) as zoonotic diseases. Bovine tuberculosis ($p = 0.04$) was identified by students of the biological sciences compared to that of computer science students. Interestingly, Brucellosis ($p = 0.05$), Cryptosporidiosis ($p = 0.01$), Cysticercosis ($p = 0.024$), Giardiasis ($p = 0.012$), HIV ($p = 0.032$) toxocarasis ($p = 0.05$) and Rabies ($p = 0.004$) were identified as being zoonotic diseases by pet owners compared with non-pet owners. The attitudes and practices towards disease prevention showed higher scores in practices such as avoiding direct contact with animals (91.1%), rearing pets indoors (85.6%), and eating unwashed fresh fruits and vegetables (75.9%) and ensuring the regular vaccination of pets (86.8%), while avoiding eating raw meat (55.4%), ensuring proper discharge of animal faeces (51.8%) and hand washing after petting the animals (54.2%) scored low. A significantly higher percentage of female respondents agreed that avoid eating raw meat ($p = 0.004$), and unwashed fresh fruits and vegetables ($p = 0.004$) can prevent zoonotic diseases. Overall, this study revealed that the level of awareness on zoonotic diseases among the new BSc registrants was satisfactory. However, a larger study population may infer a different outcome. This study may impact the BSc new registrants in increasing their awareness of zoonotic diseases.

Keywords: BSc new registrants, Cross sectional study, OUSL, Questionnaire, Zoonoses

*Corresponding author: cdjay@ou.ac.lk



GLYCEMIC, LIPIDEMIC AND IMMUNOMODULATORY EFFECTS OF FENUGREEK (*Trigonella foenum Graceum*) SEED CONSUMPTION ON MALE ALBINO WISTAR RATS

P.S. Samarakoon, C.D. Jayasinghe, U. A. Jayawardena, N. Nilakarawasam*

Department of Zoology, The Open University of Sri Lanka

Fenugreek (*Trigonella foenum Graceum*) is used as a spice and an herbal remedy for diabetes in many parts of the world. Even though; the anti-glycemic and anti-lipidemic potential of fenugreek has been studied elsewhere, comprehensive studies on the overall body's health are scarce. This study investigates the effect of fenugreek consumption on glycemic, lipidemic and immunomodulatory activity, together with a toxicity assessment for hepatotoxicity and nephrotoxicity using Wistar rats as an *in vivo* model. This study evaluates the activity of the fenugreek available in the Sri Lankan market and compares the efficacy of two different methods of fenugreek consumption as drinking seeds soaked in water overnight and as direct consumption of fenugreek powder to validate the methods. Hypercholesterolemic, male Wistar rats aged 3 months were orally administered with 1g/kg (body weight) dose of each treatment; seed-soaked water and powder-soaked in water (N=6 each), once daily for 28 consecutive days. Another group of 6 hypercholesterolemic rats, without fenugreek treatment, served as the positive control while non-cholesterolemic rats served as the negative control. Data analysis was done by using IBM SPSS version 20 through the non-parametric, Kruskal-Wallis H test, followed by post-hoc analysis. The phytochemical analysis unveiled the presence of reducing sugars, tannins, saponins and flavonoids, which was proportionately higher in seed-soaked water extract. Among treatments, the rats treated with aqueous method of fenugreek consumption showed the highest efficacy, in combating both glucose ($p=0.016$) and total cholesterol levels ($p=0.016$) significantly, compared to the controls. The total WBC counts of the fenugreek treated rats were higher than those of the control groups. Further, fenugreek consumption did not result in apparent toxic effects with respect to hepatotoxicity and renal toxicity on the tested *in vivo* model. Therefore, the results of the present study may provide a valuable insight to the development of aqueous extracts of fenugreek, to combat diabetes and hyperlipidaemia that have been a major risk factor for fatal non-communicable diseases.

Keywords: Antiglycaemic, Antilipidaemic, Fenugreek, Wistar rat model

*Corresponding author: nnila@ou.ac.lk



THE BEHAVIOURAL RESPONSE OF THE RED WATTLED LAPWING (*Vanellus indicus*) IN DIFFERENT HABITATS

T. Galappaththy, T.S.P. Fernando, U.K.G.K. Padmalal*

Department of Zoology, The Open University of Sri Lanka

Urbanization is one of the leading causes of the loss of biodiversity on a global scale. The novel urban ecosystems consist of species that can tolerate and adapt to the effects of urbanization. Presently the study of such species remains at a rudimentary level in Sri Lanka. The identification and investigation of a model urban species in the biodiversity hotspot of the Western Ghats and Sri Lanka will pave the way for future urban conservation efforts of Sri Lanka. This study focuses on the behavioural patterns of resting, foraging and locomotion of the Red-wattled Lapwing (RWL) (*Vanellus indicus*) at three study sites: urban, semi-urban and natural habitats; in Open University (OUSL), Polgasowita and Anawilundawa, respectively. Each study site was divided into three microhabitats. Ethograms and activity budgets were constructed based on the data collected from a single ringed adult pair at each microhabitat. Predetermined hours of the day were used for data collection; morning (MP), afternoon (AP) and evening (EP). Total observations amounted to 42 hours at OUSL, 36 hours at Polgasowita and 27 hours at Anawilundawa from February to August 2020. Analysis of the data was done using a non-parametric Kruskal Wallis test. Observations revealed an ascending trend of mean resting behavioural frequency from Anawilundawa to OUSL during MP, AP and EP. Furthermore, the highest mean foraging behavioural frequency was observed during MP of Polgasowita and low mean frequencies were observed throughout the day at OUSL. The lowest mean frequency of locomotion behaviour was observed during AP of Polgasowita and a generally higher frequency was observed during the MP of each study site. The use of stone pebbles as nest substrate and nesting on a concrete surface was observed in OUSL as an adaptation to the urban environment. This study concludes that there exists a difference in the behavioural patterns of foraging, locomotion and resting of the RWL in different habitats; urban, semi-urban and natural. This showcases the behavioural adaptation of the RWL to urbanization. Furthermore, the behavioural differences of the RWL may imply differences in physiology such as stress and aggression, parasitic load and pollution in different habitats.

Keywords: Activity budgets, Behaviour, Ethogram, Habitats, Red-wattled Lapwing, Urbanization

*Corresponding author: saminda@ou.ac.lk



EDUCATION



ENROLLING NON-CONVENTIONAL STUDENTS IN UNIVERSITIES: A CASE STUDY OF MANUFACTURING TECHNOLOGY DEGREE AT UNIVERSITY OF VOCATIONAL TECHNOLOGY

D.D.D. Suraweera, K.G. Alahapperuma *

University of Vocational Technology, Sri Lanka

University of Vocational Technology delivers level-7-degree qualifications of the National Vocational Qualification (NVQ) Framework of Sri Lanka. Diploma holders with NVQ level 5 or 6, or equivalent qualifications are enrolled to degrees. Diploma holders in Production, Automobile, Farm Machinery, Refrigeration & Air-conditioning etc., are enrolled for the degree in Manufacturing Technology. These diploma holders are considered as non-conventional students, as they do not enter university directly from secondary schooling; instead, they enrol based on tertiary qualifications. Objective of the study was to compare their initial performance with respect to entry qualifications. Theoretical competencies of diploma holders are expected to be lower than practical competencies. Therefore, core modules with high theoretical content were selected for further study. Secondary data of student performance in first two semesters of weekday programmes of 2011/12, 2013/14 and 2015/16 intakes were analysed using descriptive statistics. Average performance of all fields in Mathematics-1 of semester-1 is acceptable. However, average performance of diploma holders from Farm Machinery and Refrigeration & Air-conditioning fields is poor in Mathematics-11 of semester-2. Their performance levels of both semester-1 modules, Engineering Physics and Engineering Chemistry and semester-2 module, Thermodynamics are also poor. Performance of Mechanical and Automobile diploma holders in all concerned modules is clearly better. Therefore, those diploma holders are preferable candidates to be enrolled for Manufacturing Technology degree. Performance of diploma holders of Farm Machinery and Refrigeration & Air-conditioning fields is relatively poor. Hence, it is recommended to conduct a tailor-made foundation programme for them, if they are enrolled to the degree.

Keywords: Diploma holders, Entry qualifications, Non-conventional students, NVQ, University of Vocational Technology

**Corresponding author: gayanthi111@yahoo.com*



USAGE OF TECHNOLOGY IN THE CLASSROOM TEACHING

T. Kokul¹, Y. Raveendran^{2*}

¹Jaffna Hindu College, ² Vembadi Girls' High School, Jaffna, Sri Lanka

Technology plays an important role in everyone's life in this digital era. After the emergence of technology, all sectors have become advanced including Education. The purpose of this study is to identify the challenges faced by teachers on technology usage in classroom teaching. The research objectives aim to identify the difficulties faced by teachers in using modern technology- based teaching aids, to identify the barriers to technology integration in the classroom, to determine the influences of various technological aids in the classroom teaching and to identify the sources of acquired technology skills, teacher training and seminar provided by the education sector to use modern technology in the classroom. The target study population is the Jaffna Hindu College teachers (124). This college was selected as the school with the most physical resources in the northern province. A sample of 92 teachers were selected for this study. Sample size was determined based on Krejcie and Morgan's (1970) table and random sampling technique was adapted to select the sample. Google form was used as the main instrument to collect the data. Link of the Google form was sent to the teachers through the 'Viber' group of this school teachers' community. Additional data were collected from the 8 students' representatives (as one per grade) and school principal via structured interview. Analysis of data includes frequencies and Pearson correlations between the students' interest in classroom learning (dependent variable) and various technological aids in the classroom teaching (independent variable) in this study. Proper training and guidance to the teachers and adequate technology facilities in the classrooms motivate teachers to give better learning experience to their students. This study recommends increasing the technology usage in classroom teaching since it enhances the student's interest in learning. In addition, administration, department of zonal education and teachers' center should be provided the proper training on the usage of modern technology in classroom teaching.

Keywords: Classroom teaching, Educational technology, Teaching aids

**Corresponding author: t_yalline@yahoo.co.uk*



PROSPECTIVE TEACHERS' PERCEPTIONS OF THE NATURE OF SCIENCE

*M.V.K. Mallawa**

Siyane National College of Education, Veyangoda, Sri Lanka

The pre-service teacher education programme in National Colleges of Education has been developed to orient prospective teachers to the teaching profession. It is now widely recognized as one of the most promising practices in the education field as a whole. The purpose of this study was to explore the prospective science teachers' perceptions about the nature of science and how these perceptions change as they complete a two-year institutional training period. Seventy-seven prospective science teachers (Male 15, Female 62) were purposively selected from a population involved in a pre-service teacher education programme in the academic year 2017/2019. Data were collected using three techniques: the open-ended questionnaire, informal discussions and semi-structured interviews during three phases of the study. At the beginning of Phase I, prospective teachers brought different ideas about the nature of science and were unable to give at least a clear definition of the nature of science. They learnt science as a core subject in the secondary level classes, and thought science consists of fact-dominated information. When they followed the pre-service science curriculum engaging learner-centred activities, practical laboratory work, and teaching practice, they were equipped with subject matter knowledge and pedagogical knowledge necessary for effective science teaching. There were no observable changes in their perception of the nature of science at the end of Phase I. Prospective teachers, further equipped with knowledge and practicalities during phase II and phase III, showed a gradual change in their perceptions of the nature of science. At the end of Phase III, their responses showed the comprehensive knowledge they have acquired throughout the programme. Nearly all prospective teachers had positioned science as "a system with interrelated concepts" It could be concluded that changing prospective teacher perceptions should and can occur during their pre-service education period. It is recommended that pre-service teacher education programme needs to make a concerted effort to help prospective teachers improve their ability to understand the nature of science. It is prospective teachers' responsibility to gain a vast and complex body of scientific knowledge, pedagogical knowledge associated with different content to acquire exact perceptions of the nature of science.

Keywords: Perceptions, Pre-service teacher education, Prospective teachers

*Corresponding author: mallawa8@gmail.com



SUITABILITY OF GAMIFICATION AS A NEW MEDIA PLATFORM FOR PRIMARY EDUCATION IN SRI LANKA

S.N.B. Chandrasekara*

University of Kelaniya, Sri Lanka

Education is the most powerful and precious thing that someone has until death. Sri Lanka, has its own education system. Mainly, the traditional learning system, which is called face-to-face learning, is practiced throughout the country. In Sri Lanka, education is conducted in three stages. Primary, Secondary (Junior and Senior) and Colligate. Primary education is the most important of the three stages as it is the key to building a strong foundation. During this period, children learn the basic things of everything. Great attention must be needed to this period. New media is viral in society. Newborns are digital natives. They all have been connected with new media since their birth. One of the platforms of new media is gamification. Rather than traditional learning children like to learn with various activities both indoor and outdoor. Gamification is a new education system in contrast to traditional learning. Using gamification in education, children have the potential to learn more than they learn in a classroom. Using Gamification rather than traditional learning also has potential to motivate children to learn. The objective of the research was to identify the effectiveness of gamification in the field of primary education in Sri Lanka and to identify the most suitable gamification models. Quizzes and interviews were taken to collect primary data and research articles and the books were used to collect the secondary data. Most of the primary teachers are using new media and they use smartphones to connect with new media. Primary teachers are using the Zoom conferencing app to teach children and they use WhatsApp to share extracurricular activities. Primary teachers highly recommended video games to teach primary children. The category of Strategy game is the best to create educational video games. Through educational video games the children's knowledge improved and so did the level of reasoning ability. The process of the mind or brain increases and acquires learning opportunities and improves the intelligence and knowledge. The child is not just learning through educational video games, the child has fun and opportunities for relaxation of the mind. Children benefit from educational games with descriptive and colorful visuals, child-friendly games, creative and age-appropriate and curiosity, attractive games. Even in a pandemic era like the present, games can help students to continue learning. Therefore, video games (Gamification) are suitable for teaching children.

Keywords: Gamification, New media, Primary Education

**Corresponding author: namidabchandrasekara@gmail.com*



READING HABITS AND FACTORS AFFECTING READING HABITS OF ADVANCED LEVEL GRADE STUDENTS

*S.R. Fernando**, *W.R.W.M.A.U. Weerakoon*

The Open University of Sri Lanka

Reading is considered as one of the main pillars of the four language skills. In the modern context teachers and parents often complain that children have poor reading habits and it might be a reason for poor academic performances. Underutilization of the school library in the current study provides strong evidence of diminishing reading habits among students. The purpose of this research was to identify the reading habits among Advanced Level students of AIS International School and suggest appropriate measures for improvisation. Specific objectives of the research were to find out the types of information materials read, purposes of reading, time allocated for reading, preferred places and formats for reading, factors influencing reading and students' attitudes and perception toward reading. The study was conducted as a descriptive survey using a self-administered questionnaire. Total population sampling (n=120) was carried out which yielded a response rate of 66.7%. Descriptive statistics were used to interpret results. The findings revealed that story books (64%) were the most read material, followed by school text books (50%) and web pages (49%). Subject related magazines (18%) and newspapers (15%) were found to be the least read material. A majority has indicated that they read for leisure/pleasure/ entertainment (72%). However, collectively 77.5% read for different academic purposes such as finding information for assignments or gathering extra knowledge on subjects. Many, read occasionally whenever needed (38%), preferably at their homes (90%) and for some the time spent for reading depends on the purpose. A majority of the students preferred reading from a print book. The study revealed that recommendations from peers (65%) and self-desires to find information (66%) were the driving forces for reading. In addition, preparing for assignments was a motivational factor to read for 41% of the students. Most students perceived that reading is very much enjoyable and can affect their academic performances positively. Lack of time was found to be the major hindrances to the students' reading habits. Based on the findings, recommendations were made on how to improve reading habits of students, with the involvement of the school library.

Keywords: Motivation to read, Pleasure reading, Reading habits, School library

*Corresponding author: aaronrenato2014@gmail.com



MIXED METHODS RESEARCH APPROACH: STRENGTHS AND SHORTCOMINGS

K.D.R.L.J. Perera*

Faculty of Education, The Open University of Sri Lanka

The aim of this paper is to provide a brief outline of mixed methods research approach. It explores the strengths of mixed methods research approach and its shortcomings. The following research questions were designed to guide the review of literature: What are the strengths of mixed methods research approach? What are the shortcomings of mixed methods research approach? This study adopted a semi-systematic review approach. This literature review mainly focused on research articles and books that investigated the strengths of mixed methods research approach and its shortcomings. Most of the reviewed literature was published in online journals. The selected articles and books were read, and the findings following the reviewed literature are presented based on the research questions guiding the study. The Document analysis was done using the thematic analysis. When we consider the strengths of the mixed methods research approach, it moves past the paradigm was contributing a rational and realistic option. Further, the impact that is mainly important is merging both approaches, qualitative and quantitative. Some researchers highlighted that mixed methods indicate an approach in social science which promotes the combination of quantitative and qualitative methodological approaches. Also, this approach has the possibility of decreasing some of the issues linked with any method focused on the direction of resolving realistic issues in the “real world”. When considering the shortcomings, many current philosophers still reject pragmatism because of its rational weakening as a resolution to numerous philosophical arguments. There are also numerous realistic problems that influence mixed methods research. Most notably, employing various methods enlarges the amount of time essential to complete a study and the cost of carrying out the study. Therefore, by methodically mixing alternative methods in a certain study, a researcher can compensate for uni-paradigmatic limits. By lessening the divide between quantitative and qualitative researchers, mixed method research approach has a huge opportunity to encourage a collective accountability.

Keywords: Mixed methods research approach, Pragmatism, Shortcomings of mixed methods research approach, Strengths of mixed methods research approach

**Corresponding author: kdper@ou.ac.lk*



DIFFICULTIES ENCOUNTERED BY THE STUDENTS IN COMPLETING THE RESEARCH PROJECT IN UNDERGRADUATE DEGREE PROGRAMMES

***D.V.M. De Silva*, B.G.H. Anuruddhika, R.N.P. Rathnayake, K.A.C. Alwis, S.
Kugamoorthy, K. Ketheeswaran, D.D.I. Deepthini, D. Chathurika, W.M.S.
Weerakoon***

Faculty of Education, The Open University of Sri Lanka

The Open University of Sri Lanka conducts its programmes through Open and Distance Learning (ODL) mode. It is very important to identify numerous ways that can be implemented within ODL environment to support students continuously especially when doing research because research, by its nature, is a critical challenging task. This paper attempts to identify the difficulties that are faced by undergraduates when they are completing research projects. The study target group comprised all the undergraduates in the final year in B. Ed Honours in Natural Sciences, Drama and Theatre and Special Needs Education programmes in the Faculty of Education. Around 100 students who conducted their action research projects and two programme coordinators of the programmes participated in the study. The Research tools of the study included an online survey questionnaire for students and interviews for coordinators. Data were analyzed statistically using percentages and descriptively. The results revealed that 45.8% of the participants have difficulties in identifying the research problem. Around 42% have difficulties in finding relevant literature in their mother language. The study explored various common difficulties such as academic writing (51.4%); limited amount of library facilities in the regional and study centers (43%); difficulties related to meet the supervisors (84.7%); difficulties to manage the research work due to the family commitments and issues related to the occupation (86.1%); difficulties with time management (47.2%); difficult to travel long distance to the university (48.6%); less support from the school community and lack of resources (66.6%). The study also attempts to give some suggestions for developing the process of writing research proposals and completing research projects such as conducting Zoom meetings, providing learning resources through Learner management system (LMS); through email; through WhatsApp; Viber and other relevant modes which are suitable to ODL environment, enhance library facilities provide more practice in academic writing; provide supervisor-student meeting schedules at the beginning of the research to facilitate the completion of the research projects and to develop faculty level guidelines for action research project component of B.Ed programmes.

Keywords: ODL environment, Research project, Students' difficulties, Undergraduate students

**Corresponding author: dvsil@ou.ac.lk*



RIGHT TO EDUCATION OF DIFFERENTLY ABLED CHILDREN: A COMPARATIVE ANALYSIS BETWEEN SRI LANKA AND UNITED STATES

H.L.I. Udani, A.U. Imalsha*

Sri Lanka Law College, Colombo, Sri Lanka

Education empowers every human being to achieve their goals through their knowledge and ability. The United Nations Convention on the Rights of Persons with Disabilities declares that “In all actions concerning children with disabilities, the best interests of the child shall be a primary consideration.” During the COVID-19 pandemic the virtual learning environment has become well-known among the schools, universities and even nurseries. This online learning and teaching system is not yet familiar to differently-abled children in Sri Lanka. Therefore, this research intends to find out the effectiveness of the online education and the issues relating to the differently-abled children while they are learning online. In addition, investigation of other issues related to above said category, when they learn and face future challenges. Therefore, this research is mainly based on doctrinal legal research and the black letter approach, which were used to analysis the secondary data. They are the already set rules or the legislatures in protecting rights of the differently-abled children. Further, used the International and comparative research methodology in order to identify the challenges faced by differently-abled children along with to suggest solutions for protect equal educational rights of differently-abled children in Sri Lanka. Differently-abled children can be taught to improve their abilities based on the environment and aesthetics or they can be earned by themselves by presenting their abilities to the society. Collectively, all these will help them to face the future challenges in stronger way. Finally, this literature concludes that the theory-based education system is not very effective for differently-abled children and suggests practical or vocational training education systems to be followed.

Keywords: Differently-abled Children, Future Challenges, Right to Education

**Corresponding author: aimalsha@gmail.com*



PERCEPTIONS OF *BAHons (HINDI)* UNDERGRADUATES, GRADUATES AND UNIVERSITY TEACHERS ON METHODS OF ASSESSMENT

*H.D. Hirimuthugoda**

Department of Hindi Studies, University of Kelaniya, Sri Lanka

Assessment and evaluation are important steps of a process of education which is needed to test its outcomes. Methods of assessment used in the process of education can be formative and summative. Students and teachers can provide feedback about levels of satisfaction, motivation, autonomy and expectations regarding the academic experience. Responses of undergraduates and recent graduates are important in analyzing how the learning experiences have been received from the students' end. Recent graduates, having experience of employment seeking or at the industry, can provide pluralistic feedback about the receptions at different ends. University teachers of the curriculum can provide feedback of the academic and teaching experience. This research was intended to find what are the perceptions of *BAHons (Hindi)* undergraduates, graduates and university teachers on methods of assessment which are used within the existing curriculum and which can be used within a Foreign Language curriculum. The main objectives of this research are to identify the perspectives of students and teachers of the *BAHons (Hindi)* degree program about its educational approaches and to suggest appropriate methods of assessment to be defined in future curriculum revisions. This research has used the survey method as the main strategy to collect data and both quantitative and qualitative methods were used to analyze data. Considering the analysis of feedback, it was suggested at the end of the research that using end-semester exams and year-end exams for exam oriented summative assessment appropriately would be better without adhering to a single method. It was also discovered through feedback that using different, practical methods of assessments without limiting it to theory testing written examinations can motivate students, make them actively engaged in the process of learning and can be effective in assessing different competencies of undergraduates. In addition, giving constructive feedback and considering student characteristics in the process of assessment were identified as important through the suggestions of university teachers. Lastly, it could be concluded that flexibility, diversity and constructivism in methods of assessment are valued by the graduates, undergraduates and university teachers. This research can be important for revision of a Foreign Language curriculum, specially in terms of defining methods of assessment.

Keywords: Assessment, Degree Program, Education, Foreign Language Curriculum, Perceptions

*Corresponding author: hasaradh@kln.ac.lk



AN ANALYSIS OF THE EXTENT TO WHICH STUDENTS USE THE FACILITIES PROVIDED BY THE OPEN UNIVERSITY OF SRI LANKA

M. Munasinghe*, T. Mukunthan

*Department of Early Childhood and Primary Education, Faculty of Education,
The Open University of Sri Lanka*

Universities provide opportunities to students to enhance their knowledge skills and social status positively. The Open University of Sri Lanka provides facilities to local and foreign students to obtain their higher education qualifications and professional experiences. The Department of Early Childhood and Primary Education of the Open University of Sri Lanka has been conducting the Bachelor of Education (Hons) in primary education programme (B.Ed.) since 2019 to provide opportunities to enhance knowledge, attitudes, and skills in this field, to open avenues to get higher qualifications and professional training those who have missed the opportunities to enter any other state Universities. The main objectives of the study were to, investigate the extent to which the facilities provided by the University are being used; inquire student perception about course delivery methods, examine problems faced by students in the program and propose solutions to overcome the problems. The survey method was used as the research design in this study. Samples from students and university teachers were selected from twelve regional centers of the Open University of Sri Lanka using random sampling method. Descriptive analysis was used to analyze data. The findings revealed that 57% was employed and 73% has A/L qualifications. Considering the facilities provided by the University, 33% of the students' sample said that the library is used for obtaining knowledge, finding information through online/internet resources, and for referencing books. Majority agreed that lecture halls and study centers are adequate for studies. A few students said that they use temporary residential facilities and use university premises to study as small groups. A percentage of 90% was satisfied with counselling program and 90% agreed that orientation program was very useful. In their opinion 60% agreed that study material was given on time .and easy to follow lectures via zoom. Among the ideas they put forward as issues, 50% said that it was difficult to contact the university and 20% said that logging problems for lectures and reading e-learning materials and supplementary courses were another problem. As a result of that more than 50% students said it is difficult to write assignments on time. However, if the university plan to conduct online day schools it will be beneficial to a majority of the students. Relevant academics need to find solutions for these issues.

Keywords: B.Ed. Hons In Primary Education, Course Materials, E-Learning Materials, Supplementary Course, University Facilities

*Corresponding author: dmmun@ou.ac.lk



FOCUS GROUP DISCUSSION METHOD FOR THE PURPOSE OF CONTINUOUS PROFESSIONAL DEVELOPMENT OF GCE ORDINARY LEVEL ENGLISH LITERATURE TEACHERS IN SRI LANKA

W.M.G.U. Wijesundara , T.D.P. Jayamanne*

Post Graduate Institute of English, The Open University of Sri Lanka

This concept paper is based on a set of observations made during a larger research that investigated Sri Lankan GCE Ordinary Level English literature teachers' perspectives towards the use of curriculum materials in classrooms. In the aforesaid qualitative research, focus group discussion method was used where ten participants who had different affiliations with the targeted syllabus took part in focus group discussions moderated by researchers. Among the participants, two in-service advisers who also taught the syllabus, experienced and inexperienced state sector school teachers and private sector teachers were present. During the focus group discussions, it was observed that, while commenting on the matters raised by the moderator, the discussion modeled to be a springboard for GCE Ordinary Level English Literature teachers to talk about their practical issues that they were not given the opportunity to discuss openly due to the lack of professional support from the authorities. Furthermore, it created a rich learning environment where the teachers coming from different backgrounds shared their viewpoints, knowledge over the literature texts of which had a dearth of available information, unique teaching techniques that fitted diverse student groups and also remedial measures used in their own teaching contexts. Thus, while generating authentic data on the research topics, these discussions simulated a possible professional development process that could be used effectively in a wider teacher training context. On the other hand, recent research on Sri Lankan education system reveals that there is a need of professional development among teachers as an on-going practice and the institutional involvement in teachers' professional development needs to be expanded and regularized. Drawing on the observations done during the larger research, this paper suggests that using focus group discussion method, either through face to face discussions or through online forums, could create a productive professional development workshop culture where professionals and experts in the field can actively take part filling the existing continuous professional development gaps in the field of teaching literature.

Keywords: Focus group discussions, Issues common among literature teachers, Professional development, Teachers of English Literature, Teaching English Literature

**Corresponding author: wijesundara.gayani@gmail.com*



ENGINEERING AND TECHNOLOGY



MOBILE APPLICATION FOR REALTIME BUS TRACKING AND SEAT BOOKING

J. Lakshitha^{}, W.C Uduwela*

Department of Computer Science, The Open University of Sri Lanka

With the initiation of the expressway road system in Sri Lanka, new bus routes have been introduced to enhance the services given to passengers. The use of the expressway sometimes reduces the distance and time of the journey in comparison with the normal routes. However, due to the high user demand, some passengers are unable to secure a seat on the expressway busses, especially during office hours. Hence, they attempt to call the relevant buses to find the current bus location and make a seat reservation. Even though the drivers/conductors can manage reservations over the phone, it is difficult to respond to every passenger's phone call to update the current location of the bus. To avoid this problem, an automated system is proposed using Global Positioning System (GPS), Google map and Google Firebase technologies. The mobile application system is developed for Android devices as mobile phones are heavily used in Sri Lanka and most of them are Android devices. Using this system, passengers could track the real-time location with the available seat count in the bus and request for a seat reservation using the Android app. In addition, the bus driver/conductor could monitor the passenger's seat reservation location on the map. It is easier for the conductor to manage every passenger's request rather than responding to phone calls. This Android system can be suggested to save passengers' time spent on the road and to increase the income of the bus owners by efficiently managing the reservations.

Keywords: Firebase, Google Map, GPS Sri Lanka, Realtime location, Seat Reservation

**Corresponding author: judelakshithaousl@gmail.com*



HYBRID ENERGY STORAGE SOLUTION FOR STANDALONE PHOTOVOLTAIC SYSTEMS

S.W.D. Priyadarshana, I.A. Premaratne*

Department of Electrical and Computer Engineering, The Open University of Sri Lanka

Standalone PV (Photovoltaic) systems require an energy storage buffer to provide continuous power when solar irradiation is insufficient. The solar radiation becomes below the required level during partial shading conditions and rainy or overcast conditions. In the above cases, more power must be supplied from the energy storage to the load. Usually the storage consists of batteries. Fluctuation in weather conditions causes batteries to discharge quite often. This may decrease the operational life of the batteries. Also, when the load draws a burst of current such as in the case of motor start-up, batteries may degrade more than during a normal run an alternative way of supplying large bursts of current is to combine batteries and supercapacitors to form a hybrid storage system, where the battery can supply continuous power and the supercapacitor can provide instant power to the load. Thus, this was an effort to develop a prototype hybrid system to deliver power with more reliability. This HESS (Hybrid energy storage system) (HESS) monitors and optimizes the flow of energy from the PV to the battery -supercapacitor considering the peak current load, the pulse current load, and the constant current load. In addition, the controller was designed and implemented to fulfill the above objectives. According to the implementation solar irradiation was changed from 960W/m² to 500W/m², 960 W/m², 200 W/m² and back to 960 W/m² in 2 Minutes and reference voltage was 50V. The simulation results showed that the HESS can achieve higher specific power than the battery storage system. Thus, this implemented standalone solar storage system was well suited for industrial sector application as there are many inductive load devices employed in industrial factories. Due to this hybrid storage system, the power supply to an industrial plant can withstand against transient effects of loads. The solar intermittency problem also can be solved as the storage system can continue the power supply.

Keywords: Hybrid energy storage system, Photovoltaic, Supercapacitor

*Corresponding author: swdpriyadarshna@gmail.com



FLOOD MITIGATION OF A RURAL ROAD IN BATTICALOA DISTRICT

T. Kajenthiran, S. Premananthan, J. Pratheep, K. S. Weerasekera*

Department of Civil Engineering, The Open University of Sri Lanka

Flooding along Paddiruppu Vellavelly road is a major challenge faced by more than 40,000 people in Vellavelly division in Eastern province of Sri Lanka. Efforts were made to design and improve the existing road section to accommodate future traffic and arrest the flood problem using proper flood mitigations. The study area was affected during the past internal war, and it consisted of many undeveloped villages, paddy lands and this road is the only source to connect people with essential public utilities during constant flooding in rainy seasons, since there is no alternative transport. The current traffic volume studies were conducted and projected for future 20 years and flooding history of the study area was collected from relevant institutions and authorities. The peak hour volumes were identified, and the level of service concept was adopted to find out the number lanes required to cater the traffic in 20 years. The field surveys were done to obtain the formation line of the existing road and proposed formation line was identified by considering the high flood level. By considering the cost, it was decided to construct the road in flexible pavement and the thickness of each layer was calculated using the Method of Design by Road Note 29 of Road Research Laboratory, UK. The required CBR test values and maximum flooding levels were considered, and cost-effective thickness of different layers were obtained. It was suggested to elevate the road stretch from 0+060 km to 1+620 km with a maximum height of 1.475m. Proper drainage system was also suggested with the placement of 5 culverts with 2.5 x 2.0 m opening size to allow the water to discharge to the nearest river.

Keywords: Flexible pavement, Flood mitigation, Highway capacity manual, Rural road flooding,

**Corresponding author: kswee@ou.ac.lk*



PINEAPPLE LEAF FIBRE (PALF) BASED TEXTILE COMPOSITES FOR CLADDING BOARDS

P.U. Navodhya , C.N. Herath*

Department of Textile and Apparel Technology, The Open University of Sri Lanka

The aim of this project is to produce an eco-friendly composite using Pineapple Leaf Fibres (PALF) used as cladding boards in the construction industry. Conventionally used cladding boards are made from steel, wood, asbestos, PVC, polymer based cladding boards etc. and they have comparatively a high manufacturing cost, deteriorate due to moisture absorption, are not eco-friendly, are not biodegradable etc. Today, manufactures have focused on making eco-friendly products from waste materials, which are of a lower cost, are ecological, and which minimize the carbon footprint and global warming as well as promote waste management. Further, PALF based textile composites are light in weight, non-abrasive characteristic, bio-degradable and low manufacturing cost, as well as low energy consumption in manufacturing. Therefore, PALF based textile composites are very important for the construction industry. Pineapple Leaves, which are approximately one year old, were collected from Gampaha area for this experimental work and testing was done for the physical properties of PALF. PALF composite is made with two fibre compositions such as 40% fibers(wt%) and 50% (wt%) fibers using hand lay-up method and laid layer by layer alternatively in 0° and 30° directions. Fibers are also treated with 5% NaOH solution to improve the mechanical and chemical properties of PALF prior to laying. Polyester thermosetting resin was used to make the composite with PALF. Prepared composites were tested for tensile strength, Rockwell Hardness, compressive strength, flexural strength and moisture absorption properties. According to the experiments done on physical properties of PALF, it was found that they are composed of high fibre bundle tenacity, high single fibre strength, high moisture content and high moisture regain, low fibre density. Based on the experimental results obtained, PALF composites with 40% PALF (wt%) showed lower tensile strength, higher flexural properties, higher compression strength, higher hardness properties and lower moisture content as well as lower moisture regain than 50% (wt%) PALF based textile composite variant. In addition, it was reported that they have biodegradability, are nonabrasive and are of low weight. Taking this research into consideration, it is recommended that the maximum of 40% (wt%) PALF based textile composite with Polyester matrix is more suitable for cladding boards.

Keywords: Cladding boards, Eco- friendly composites, PALF composites, Pineapple leaf fibres, Textile composites

**Corresponding author: ushinaidhal@gmail.com*



COMPARATIVE STUDY ON GREEN BUILDING RATING SYSTEMS IN SOUTH ASIA

T.D. Denagama*

*Department of Construction Technology, University of Vocational Technology,
Sri Lanka*

The Green Building concept emerges with the Concept of Sustainable development due to excessive usage of natural resources in building construction and operation processes. A Numbers of green building rating tools were initiated by the different countries around the world in order to contribute to maintain greener built environment. With this trend, the South Asian region also started setting out own green rating tools. The main objective of this research is to conduct a comparative study on the local green building rating tools in South Asian region. Out of eight South Asian countries currently only three nations are practicing their own rating systems namely India, Pakistan and Sri Lanka. Hence this comparative study was conducted on the selected rating systems, SEED, GRIHA, IGBC, GREEN SL and Blue Green from those nations. Secondary data were collected from the journal articles, official websites and rating manuals. Comparison was done in three main steps, comparison of general details of the ratings, comparison of other important aspects related to the ratings and comparison on their categorical features in rating. Results indicate that both government and private entities in India and Sri Lanka are interested in setting a rating. Sri Lanka and India are the pioneers in establishing local rating tool. Both strengths and weaknesses of selected ratings have been identified in the research. As the conclusion study reveals, India, Pakistan and Sri Lanka had attempted and succeeded in improving green constructions which should be adhered to by the other South Asian nations to set up their own ratings, which will contribute to create a greener South Asia.

Keywords: Blue Green, Green Building Ratings, GREEN SL, GRIHA, IGBC, SEED

**Corresponding author: tdenagama@yahoo.com*



DEVELOPING A CONCEPTUAL FRAMEWORK TO IMPROVE COLOUR SUCCESS RATE OF BULK DYEING WITH NEW COLOURS AT TEEJAY LANKA PLC – A CASE STUDY

L.M.D. Lansakara, M.E.R Perera*

Department of Textile and Apparel Technology, The Open University of Sri Lanka

Dyeing is the second last step in the manufacturing process of fabric materials. Therefore, dyeing of fabric materials should be done with extra attention to get it right by the first attempt. In order to achieve the success in dyeing of fabric materials, different dyeing processes such as lab, intermediate and bulk dyeing are performed. When the Right First Time (RFT) dyeing concept is practiced, the accurate correlation of intermediate to bulk dyeing is very important. The main objective of this case study conducted at Teejay Lanka PLC dyeing plant is to develop a conceptual framework to issue optimum dye recipes for new colours from intermediate to bulk dyeing to improve the RFT dyeing performance. The total dyeing process of the dye plant was analysed and it was found that three (03) different dyeing processes are practiced. Five (05) different dye programmes were used to obtain the required colours. Out of the large number of fabric types used, three (03) fabric types with higher number of first bulk dyeing was selected for the study. Important parameters of colour such as Lightness (L), Chroma (C) and Hue (H) were determined using “Data Colour Tool” software which is based on “Munsell colour system”. Thirty-seven (37) colour processing routes (combinations of fabric types, machine groups and dye programmes) were analysed to identify the possible correlation between the material type, machine group and dye programme against the colour performance. Eleven (11) colour processing routes with lower pass percentages were selected for further study. Six (06) colour processing routes were eligible for the development of the conceptual framework. The colour readings were obtained by using the Munsell colour system for intermediate and bulk dyeing. The conceptual framework was developed by using the average variances of Lightness (L), Chroma (C) and Hue (H). In order to examine the accuracy of the developed conceptual framework, trials were carried out for the selected six (06) colour processing routes. As per the results, colour processing routes have shown a significant improvement. Further studies should be carried out to determine the effectiveness of the developed framework.

Keywords: Bulk dyeing, Colour processing routes, Dye programmes, Intermediate dyeing, Lab dyeing, Munsell colour system

**Corresponding author: meper@ou.ac.lk*



PLEASE TURN OVER (PTO), MUSIC NOTATION PAGE TURNER USING CONVOLUTIONAL NEURAL NETWORK

D.T.D.M. Dahanayaka* , R.J. Wimalasiri

Department of Mechanical Engineering, The Open University of Sri Lanka

Music is a universal language, and the musical instruments are universal artifacts. Composers, instrumentalists and singers use music notations for accurate performance. Musical notation, written using a set of specific symbols, is the language used by performers to express or communicate among musicians. These symbols are used to transcribe pieces of music and they elucidate which note to play and for how long. Typically, the notations are produced in the form of sheets of paper which are kept on 'notation stands' and referred to during a performance. A single musical piece runs into several sheets and the artists need to keep on turning the sheets during a performance. While playing instruments on a performing stage, it is difficult to turn pages and to keep the sheets intact. Hence, this study offers an image sliding/turning application (app), 'PTO' instead of paper music sheets. The developed app could be used by the music sheet readers who need to use both their hands to perform. There are various types of image sliding apps, but none of them are regularly used due to the less user assistance provided, the need to touch the screen and the need to arrange the photos in the timeline to slide. An Android based app was developed to identify a specific hand gesture through a trained Convolutional Neural Network (CNN) and tune the images accordingly. Mobiles and tabs cannot be used to train the CNN and therefore a powerful machine/cloud with graphics processing units was used to train the model. Python language was used for programming. The execution of the app is more challenging due to the limited capacity and processing power of a mobile/tab specially when using a neural network model. TensorFlow Lite and Android Studio software were used to develop the app to make machine learning easier with a mobile phone. This study offers an off-line music notation page turning mobile application, with a user-friendly interface. The proposed app could be used in several other specific scenarios which require turning of soft pages.

Keywords: Android application, CNN, Music notation, Page turning

**Corresponding author: tharudahanayaka@gmail.com*



THEORETICAL FRAMEWORK ON THE USE OF FRACTURE MECHANICS APPROACH IN FATIGUE LIFE PREDICTION OF RAILWAY BRIDGES

V. Viththagan^{1*}, R.J. Wimalasiri¹, P.A.K. Karunananda²

¹Department of Mechanical Engineering, ²Department of Civil Engineering, The Open University of Sri Lanka

Fatigue failure of steel structures is one of the most timely research topics due to the catastrophic nature of the failure. Engineers and researchers have made significant contributions towards understanding the fatigue phenomenon from different perspectives. When it comes to the steel railway bridges, they experience heavy cyclic loads frequently which cause cracks and leads to complete structural failure. Since it is not always possible to continuously monitor bridges, an accurate life prediction method is needed to predict the failure and reduce major accidents. Several life prediction approaches have been proposed over the years by researchers and engineers for the life estimation of bridges. The stress/strain-based approach combined with Miner's rule is widely used for the life estimation for steel bridges. To predict the life of the bridges, loading histories need to be considered. For many variable amplitude loading conditions, Miner's rule has been found to be unreliable since Miner's rule does not properly consider the loading sequence effect. This paper introduces a theoretical framework based on fracture mechanics for fatigue life prediction of steel railway bridges. The fracture mechanics approach considers crack initiation and crack propagation period of a material when it is under cyclic loading. In this context, crack propagation models with the pre-crack of 0.1mm was used to test the fatigue crack growth with the specific number of cycles and the stress level which was obtained from load histories. Crack length a versus Number of cycles N were plotted and crack growth rate da/dN was determined. Stress intensity factor range ΔK for the C(T) specimen can be determined in accordance with ASTM E647-15. An empirical relationship between da/dN and ΔK can be formed by modifying Paris law under constant amplitude loading conditions. Wheeler's retardation model under variable amplitude loading was used to modify the empirical relationship and the fatigue propagation life was determined.

Keywords: Fatigue failure, Fracture mechanics, Life prediction

*Corresponding author: vvith@ou.ac.lk



COMPUTER NUMERICALLY CONTROLLED PORTABLE WOOD CARVING MACHINE

*H.A.C.S. Dayawansa**, *R.J. Wimalasiri*

Department of Mechanical Engineering, The Open University of Sri Lanka

Wood carving is an art which has evolved from ancient times. Wood carving is usually done by highly skilled craftsmen. However, due to the high demand for carved items, specific machines to perform the carvings have been introduced. The performance of such machines has been enhanced using Computer numerical control (CNC) technology. CNC machines have made it possible to replace the skilled craftsmen who perform carvings to the perfection. Moreover, the available machines do not support carving on a vertical surface. Even to perform horizontal carvings the workpiece has to be mounted on the machine bed. As a solution, a CNC wood carving machine was designed and developed to perform both vertical and horizontal applications. It is a portable artifact that could be fixed to the existing vertical workpiece to perform the carving. Therefore, the workpiece does not have to be dismantled and fixed on the machine. The machine could perform vertical and horizontal in-situ carvings on surfaces such as tabletops, doors, wardrobe doors, windows, headrests of beds, and any flat wood or plastic surface without disassembling the parts. The design and development of the machine tool and optimization has been done to keep the required structural integrity. Every part of the machine was designed and developed for optimized performance. Finite element analysis was conducted using SolidWorks™ to analyze the deflections and stress levels of specific components and the results were used to accurately fabricate the components. This machine operates with the standard industrial software named “Mach 3”. The proposed machine can be used for wood furniture processing, home decoration, wooden door manufacturing, wooden craft processing, relief carving products as well as wood and plastic engraving. Applicable materials are solid wood, artificial board, acrylic, PVC, and MDF. The total cost incurred to develop the prototype without the workmanship cost was Rs.90,000 and the expected selling price of the complete machine with all new features is Rs.120,000.

Keywords: Computer numerical control, Finite element method, Machine design, Wood carving

*Corresponding author: chanukasd@gmail.com



IMPLICATIONS OF A SPATIAL MULTI CRITERIA EVALUATION MODEL TO IMPROVE THE EXISTING LANDSLIDE HAZARD ZONES: WITH SPECIAL REFERENCE TO RATNAPURA DISTRICT, SRI LANKA

E.N.C. Perera^{1*}, A.M.C.T. Gunaratne², S.B.D. Samarasinghe²

¹Department of Regional Science and Planning, Sri Lanka

²HEI-SL Cell, Sanasa Campus, Sri Lanka

Landslide hazard zonation (LHZ) is important to mitigate the landslide risks. Based on geology and geomorphology, National Building Research Organization (NBRO) has conducted LHZ for Sri Lanka. However, the increase of landslides has proven that consideration of dynamic factors in addition to static factors is needed for landslide hazard mapping. This study mainly focused on mapping the landslide hazard considering eight (8) landslide causative factors geology, slope, road network, stream network, land use and the rate of land use change to improve the existing landslide hazard zonation map as a case study on Ratnapura District. The spatial data was obtained from the Survey Department and satellite images. Data layers were converted to Raster data format (100m×100m). Then the landslide causative factors were weighted by applying Spatial Multi Criteria Evaluation (SMCE) method based on 9-point intensity of relative importance. The consistency ratio test was conducted and obtained CR value 0.062 (<0.1) proved consistency in estimated weights. Then, each causative factor in raster layer was multiplied by its derived weight. Finally, weighted raster maps were composited to obtained LHZ map for the district. Improved landslide hazard zonation map shows, 13% (327km²) of high hazard area and 27% of modest hazard (885km²) area. According to the landslide hazard zonation map prepared by NBRO, an area of 257km² was demarcated as landslide area to be expected but in the study it was expanded to 327km² showing 27% of expansion. Although the landslide safe areas show no significant changes, areas where landslides are less likely to occur decreased by 46% and those were converted to modest level risk areas. Also 48% of previously modest level risk areas were transformed to high hazard zones. According to model validation results improved LHZ map shows 84% of accuracy which is higher than the existing LHZ model. In conclusion, the existing LHZ maps should be improved annually considering dynamic landslide causative factors.

Keywords: Geodatabase, Landslide hazard zonation, Landslide prone, Spatial Multi Criteria Evaluation

* *Corresponding author: chinssu@gmail.com*



ANALYSIS OF FLOOD FREQUENCY AT LOWER REACH OF KELANI RIVER IN SRI LANKA

A.M.U.B. Arampola¹, W.G.H.P.K. Munasinghe², P.M.S.S. Kumari^{3*}

¹ Sri Lanka Institute of Information Technology, Sri Lanka, ² National Water Supply Drainage Board, Sri Lanka, ³ Department of Basic Sciences, The Open University of Sri Lanka

Overflowing water onto land that is usually dry is called flooding, and this is one of the major disasters that people all over the world have to face. In the recent past of Sri Lanka, flooding has been a big issue that disturbs the daily routines of citizens. Thus, it is vital to have different flood risk management programs to overcome this issue. This study was carried out to obtain flood predictions to reduce the impact of the flooding at the lower reach of Kelani River, Sri Lanka. The recent flood in 2016 is the most severe hydrological calamity faced by the people near the Kelani River after the main flood event in 1989. Gauge data was collected throughout 1987-2017 in the Hanwella gauge station and analyzed for annual peak discharge. Before the parameter estimation, analyzing flow data is essential to obtain probability distribution. With such intention, descriptive analysis was performed. The prediction of floods and their return period can be determined by identifying the most appropriate probability distribution that follows the annual peak discharge data. Five different distribution methods (Gambel, Frechet, Weibull, Lognormal and Log-Pearson) were used for parameter estimation. A goodness of fit test was used to identify the most appropriate distribution. In addition, a flood frequency curve is used to find the relationship between discharge values and the return periods. It is noted that the Log-Pearson III was the best-fitted distribution to predict the magnitude of the flood and the return period. This analysis revealed that the maximum discharge was 1604.2 cumecs in the year 2016. Log-Pearson distribution showed that it takes 100 years to exceed the flood magnitude of 1600. It also revealed that the second maximum discharge was 1350 cumecs in the year 1989. Further, the analysis showed that it reaches that amount after 25 years. The rainfalls may cause floods, or there may be some other reasons, such as converting most of the marshy areas in the past into residential areas, and sand and gem mining. Therefore, it was concluded that the levels of protection should be increased approximately at least up to 50 year return period to overcome the flood risk.

Keywords: Flooding, Kelani River, Return Period

* Corresponding author: pmkum@ou.ac.lk



ELECTRONIC TRANSACTION PLATFORMS AND THEIR SUPPORT FOR SMALL SCALE TRANSACTIONS: REVIEW, SURVEY AND SUGGESTIONS

S. Krishanthan*

Faculty of Engineering, The University of Ruhuna, Sri Lanka

Digital and electronic transaction system usage is rapidly increasing in the world because of its convenience, increased speed, security and reduced transaction cost. Many people who used conventional transaction approaches are slowly moving into electronic and digital transaction platforms due to Covid-19 and social distancing. People use various modes of payment systems like debit cards, credit cards, electronic wallet, internet-banking and coupons for transactions of different scales. Earlier, people used e-transaction systems for medium to large scale transactions but nowadays it is changing, and people are more focused on performing day to day small scale transactions using e-transaction platforms. This study analyzed previous research on e-transaction systems in both Sri Lankan and global context. However, there is very limited research done on small scale transaction support of these systems and consumer perception on it. This research was carried out as an electronic survey and it used convenient sampling to select a sample of 174 respondents. 74.71% of the study population had previous experience in using e-transaction systems whereas only 7% of them use these systems daily. Around 50% believe that the debit card is the ideal approach for small scale transactions. Consumer perception on the support of e-transaction systems for small scale transactions is measured using 6 dimensions namely flexibility, consumer satisfaction of vendor and intermediate charges, convenience, willingness to adapt, level of security and requirement for alternative approaches. Majority of respondents believe that there should be alternative methods for small scale online transactions in addition to the existing transaction methods. Also, this study suggests an approach using mobile cash to perform small scale transactions in a flexible manner.

Keywords: Digital transactions, Review, Small scale transactions, Survey

*Corresponding author: eg183367@engug.ruh.ac.lk



HATE SPEECH DETECTION ON SINHALA SOCIAL MEDIA TEXT USING LSTM AND FASTTEXT

W.A.S.N. Perera^{1*}, I. Perera¹, S. Ahangama²

*¹Department of Computer Science and Engineering, ²Department of
Information Technology, University of Moratuwa, Sri Lanka*

The prolific increase of social media platforms such as Facebook has led to the rapid growth of hate speech by remarking the fastest assimilation in communication technology and revolutionized the way people connect for exchanging ideas. Online hate speech is more prevalent on social media platforms among the Sri Lankan community which has resulted in exposure to highly undesirable phenomena of being exposed to hate content. It is rampant of automatic early detection of hate speech to minimize the spread over social media. The manual process of hate speech detection by human beings is costly and time-consuming. Therefore, it necessitates the early and urgent identification of Sinhala hate content among those platforms. The automatic identification of hate speech is still challenging with the resource- constrained socio conciseness settings where people communicate with morphologically rich languages such as Sinhala. In this research, we propose a novel state-of-the-art deep learning model to automatic hate speech detection using FastText and Long-Short Term Memory for the classification of text to hate and non-hate. A corpus of 8252 Facebook posts written in the Sinhala language retrieved from public groups and pages chosen to possibly contain hate content has been used for the study. The dataset was prepared for the supervised classification task by annotating them as hate and non-hate using a crowdsourcing platform that is evenly distributed among hate and non-hate speech. The experiment shows that the trained model achieved an accuracy of 80% for hate and non-hate speech detection with Sinhala corpus.

Keywords: Facebook, FastText, Hate Speech, Long-Short Term Memory

*Corresponding author: sureshap@cse.mrt.ac.lk



ENGLISH LANGUAGE TEACHING



A NEEDS ANALYSIS TO EXAMINE THE EFFECTIVENESS OF LANGUAGE COURSE DURING COVID-19 PANDEMIC SITUATION

H.K.P. Dineshika*

The Open University of Sri Lanka

In order to gain English language certificates or diplomas for professional purposes, most of the learners are enrolled to the English language courses conducted by the Technical Colleges in Sri Lanka. The National Certificate in Professional English is one of such courses which has a considerable learner enrollment. In 2020, the class delivery sessions changed from physical classroom context to online classroom. Therefore, this study aimed to identify the learner needs and assess whether those needs were met along with recommendations to improve the quality of the course to deliver online. Thirty-three learners and three teachers participated in the study. The data was collected through questionnaires and semi-structured interviews. The quantitative data were analyzed using SPSS and the qualitative data was analyzed using thematic analysis. It is found out that though the learners wanted to improve the speaking skills they have improved writing skill well at the end of the course. Though speaking activities were used in the physical classroom context, the usage in the online context is limited. However, all the learners are satisfied with the course content to achieve their goals. Both learners and teachers recommend that more speaking activities should be included for the online classes and teachers should be more attentive in preparing the lesson materials and activities.

Keywords: English language, Learner needs, Online class

*Corresponding author: pgie-tesl-20-d029@ousl.lk



STRATEGIC POSITIONING OF MULTIPLE LANGUAGES IN THE VIRTUAL LINGUISTIC LANDSCAPE

R.K. Aiyer*

Post Graduate Institute of English, The Open University of Sri Lanka

Multilingual communities are becoming increasingly common around the globe, equally so in workspaces in most urban areas. Organizations that employ people who speak a variety of languages have begun to understand the power of languages on their business. A less explored yet expanding area is the construction of brand identities of companies that reflect the multilingual societies, both online and offline. This study has set out to understand how a Sri Lankan company that more than 50 branches has both locally and abroad, utilizes the digital linguistic platform of social media to create its identity. The co-constructed impact of multilingualism in posts on the users of the shared space is also analyzed by observing the virtual linguistic landscape. Maly and Blommaert's (2019) methodological development that infuses the element of ethnographic observation and interpretation, aspects of linguistic landscape in public space which is digital in this study called as Digital Ethnographic Linguistic Landscape Analysis (ELLA 2.0) has been adapted as the framework in this paper. Images taken from the company's social media page were categorized based on the weightage given to the purpose; images bearing company products which promote sales, service-oriented messages like free eye camps and public messages like Mother's and Father's Day wishes. Analysis of the data revealed that with the help of strong visual imagery, the company negotiates its identity both as the supreme brand image linked to high quality and its emotional connection with the customers. The brand identity of the company is dominantly represented using English language, foreign geographical locations and white Anglo-Saxon models whereas cultural identity is fore fronted by using traditional symbols, culturally appropriate colors with images like Bo leaf, Galle port, tanks and Vesak lanterns. Multilingualism is well-represented by code mixing in posts where reaching out to customers is the primary goal, but a heavy mix of Sinhala and English is used by commenters for the posts that touch their emotional aspect. It is concluded that the establishment attempts to maintain a fine balance between internationally competent brand image and the emotional connection with the Sri Lankan customer base by using powerful visual imagery.

Keywords: Linguistic Landscape, Multilingual Workplace, Power Relations, Virtual Linguistic Landscape

*Corresponding author: rajeswarika@gmail.com



**EFFECTIVENESS OF USING SUPPLEMENTARY MATERIALS IN ESL
READING; WITH SPECIAL REFERENCE TO SABARAGAMUWA
UNIVERSITY OF SRI LANKA**

G.K.M. Wickramarathna*

Sabaragamuwa University of Sri Lanka

Reading can be depicted as one of the major skills which the second language learners should master in language acquisition. In the process of reading, the reader directly exposes to the text or the reading material where the reader is provided with a competence to clutch profuse of knowledge. Reading is identified as a process of complexity, hence Grabe (1991, p.379) argues that “many researchers attempt to understand and explain the fluent reading process by analyzing the process into a set of component skills”. When adapting reading skills to the second language teaching and learning context, many practitioners employ different types of teaching strategies and methodologies with the purpose of enhancing the reading skills of the learners. Subsequently, use of supportive materials in English as a Second Language reading classroom had attained profound attention in the field of language pedagogy. The present study shed the focus on the effectiveness of using supportive materials in English as a Second Language reading context. The research problem concentrated on the research was, whether the supplementary materials effectively enhance the reading skills of the English as a Second Language undergraduates. The research was conducted in relation to forty undergraduates in the Faculty of Management Studies in Sabaragamuwa University of Sri Lanka. A pre-test and a post-test with a treatment had been adopted in the process of data collection. Findings of the study revealed that the respondents were able to score a satisfactory grade point average for the post-test after the treatment had been applied though the respondents scored less marks in the pre-test and significantly a positive improvement of students can be seen through their performance. The results of the study promoted the fact that second language communicative needs of the students are accommodated with the assistance of the supplementary reading materials if the teacher create suitable interaction opportunities for learners to take up in the classroom.

Keywords: English as a Second Language, Second Language Reading, Supplementary Materials

**Corresponding author: kumariwickramarathna91@gmail.com*



IMPORTATION OF CROSS-CULTURAL ELEMENTS TO NEGOTIATE ALIENATED TARGET CULTURE IN AN ENGLISH LITERATURE CLASSROOM

T. Subramaniam*

Postgraduate Institute of English, The Open University of Sri Lanka

This research aims to find out how teachers can import unfamiliar cross-cultural references to effectively negotiate the alienated target cultures which are discussed in the O/L English Literature textbooks used in the Sri Lankan context. The study is undertaken in an educational setting, which reflects a diversified sociocultural background. This qualitative study is based on semi-structured interviews, classroom observations and textbook analysis. Three participants from upper school were selected for this study. The observations were applied to examine the ground reality of the claims made by the interviewees in relation to the negotiations undertaken by them to handle various alienated target cultures, which are discussed in the English Literature textbook. It also sheds light on the researcher's self-reflection in the form of reflective journals and analytical memos. This ethnographic research design is based on the following research questions: firstly, what are the challenges faced by the teachers in dealing with diversified culture representations in both spoken and written discourse in the English Literature classroom? Secondly, how does the importation of new cultural information mediate the tensions created by the alienated target culture found in the English Literature textbooks? This study is based on the English Literature ordinary level [O/L] syllabus taught in the Sri Lankan schools. It also reveals the numerous target cultural representations, which exist both in spoken and written discourse among English Literature students and teachers. This study examines the realistic classroom culture, culture clashes, and the teachers' strategic management in handling cross-cultural references and examples pragmatically. Researchers point out several mitigating strategies, such as using meta-talk to discuss the varied cultural elements, comparing and contrasting the target culture across other cultural references, and using cross-culture-related artifacts as effective language and culture management tools.

Keywords: English literature classroom, Importation of alienated intercultural elements, Mitigate target culture

**Corresponding author: stharuniah@gmail.com*



A CRITICAL EVALUATION OF USE OF NATIVE ENGLISH SPEAKER AUDIO CLIPS AND NON-NATIVE ENGLISH SPEAKER AUDIO CLIPS IN ESL (ENGLISH AS A SECOND LANGUAGE) CLASSROOM IN THE UNIVERSITY OF KELANIYA

W.K.N. Udara^{1*}, C.M. Arsakulariya², G.G.C. Madushik¹

¹*Department of English Language Teaching, University of Kelaniya, Sri Lanka*

²*Department of English and Linguistics, University of Ruhuna, Sri Lanka*

This study aims to critically analyse the use of native English speaker audio clips and non-native English speaker audio clips in ESL classrooms in the Sri Lankan university context. The study assumes that university students who have been taught by non-native English-speaking teachers at government schools, find comprehension of native speakers' use of English language difficult. The researchers conducted an action research and convenient sampling was used to select the sample group of the research. Thus, 52 first year students were selected from the Department of Fine Arts, University of Kelaniya. The research participants were divided into control group and experimental group and were given a pre-test. The pre-test was followed by a treatment period. The treatment period was two months long covering 16 hours in eight sessions. The control group was exposed to non-native English speaker audio clips. The experimental group, on the other hand, was exposed to native English speaker audio clips. A post-test was conducted thereafter to examine the development of each group. The scores of both pre-tests and the post-tests were quantitatively analysed using SPSS Statistical Analysis Software. The results of this study revealed that the participants in the control group outperformed those in the experimental group in terms of test scores. There was a positive and significant difference in the scores of the control group who was exposed to non-native English speaker audio clips. The analysis of the data proves that the use of non-native English speaker audio clips is more effective than native speaker audio clips. The researchers propose the use of non-native English speaker audio clips in ESL classrooms as this study validates the claim that native speakers' accent is not superior to non-native speakers' accent.

Keywords: Comprehensible Input, ESL, Listening Comprehension, Listening Materials, Native English Speaker

**Corresponding author: nethmiudara95@gmail.com*



**“STUDENTS MUST BE HATING ME”
IDENTITY FORMATION OF A NOVICE UNIVERSITY LECTURER IN
ENGLISH LANGUAGE IN THE FACE OF THE PANDEMIC**

W.T.M. Gunathilake*

Department of English Language Teaching, The Open University of Sri Lanka

This study focuses on a novice English language lecturer in the Sri Lankan state university context which has adopted the distance mode of education during the Covid-19 pandemic. The ‘reality shock’ faced by novice teachers/lecturers appears to have taken a different form with the revolution that has taken place in the field of education in response to the pandemic, with no exception to the field of English language teaching. This study focuses on the negotiated and context-bound nature of identity formation in order to explore how the change in the educational platform, from physical to virtual, has influenced the identity of the novice English language lecturer. This is a qualitative narrative inquiry focused on one novice lecturer in English language attached to the Department of English Language Teaching at a state university in Sri Lanka. The data collection was carried out using ‘interviews as conversations’ where the participant was encouraged to share rich experiences. The interview data were transcribed and analysed thematically employing the two-cycle coding method. The findings of this study revealed that the ‘imagined identity’ of the novice English lecturer who has embarked on an educational career after the outbreak of the pandemic has been considerably compromised. Teaching on an online platform has posed several challenges, urging a significant identity negotiation within the physical constraints of the teaching environment. Her lack of experience as an online student, her extremely ‘distant’ relationship with her student community, the absence or limited presence of multimodal resources such as dress, gestures, and physical bearing for the purpose of self-presentation has influenced the process of identity formation negatively. The study emphasizes the need to build a support system for the novice English lecturers entering online teaching to enable them to see themselves in a more positive light.

Keywords: Novice English lecturer, Online teaching, Teacher identity

**Corresponding author: wtgun@ou.ac.lk*



HEALTH SCIENCES

THE APOPTOGENIC POTENTIAL OF DIFFERENT FRACTIONS OF SRI LANKAN BROWN SEAWEED *Chnoospora minima* AGAINST HUMAN BREAST ADENOCARCINOMA (MCF-7) CELL LINE

M.D.T.L. Gunathilaka¹, K.W. Samarakoon³, P. Ranasinghe², L.D.C. Peiris^{1*}

¹Department of Zoology (Center for Biotechnology), Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka, ²Industrial Technology Institute, Halbarawa Gardens, Sri Lanka, ³Institute for Combinatorial Advanced Research and Education (KDU-CARE), Research and Development Office, General Sir John Kotelawala Defence University, Sri Lanka.

Cancer is a leading cause of death worldwide. Seaweeds are an important source of bioactive metabolites in drug development and nutraceuticals. This study aimed to investigate in-vitro apoptogenic potential of different fractions of *Chnoospora minima* (*C. minima*) against the human breast adenocarcinoma (MCF-7) cell line. De-polysaccharide methanol extract was partitioned with hexane, chloroform and ethyl acetate, and the fractions were subjected for 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) and neutral red uptake assay to determine the cell viability. The apoptotic potential was determined using cellular morphology, DNA fragmentation and Caspase 3/7 assay. The results of both MTT and neutral red assay showed a decrease of the percentage of cell viability in a dose-dependent manner, as signified by cell death. According to the MTT assay, the hexane and chloroform fractions of *C. minima* exhibited a cytotoxic effect with IC₅₀ 90.58±4.34µg/ml and 97.73±2.92µg/ml, respectively, compared to the standard cycloheximide (IC₅₀: 28.76±0.55µg/ml). Further, the potential cytotoxic activity of hexane (119.46±1.32 µg/ml) and chloroform (135.89±1.16 µg/ml) fractions of *C. minima* was confirmed by neutral red assay compared to the standard cycloheximide (27.84±0.33 µg/ml). Besides, apoptotic morphological features such as cell membrane blebbing, formation of the membrane-bound vesicle and nuclear fragmentation, as well as micronuclei formation, cellular shrinkage, cellular aggregation, formation of cell clumps and chromatin condensation were observed both in hexane and chloroform fractions with crystal violet and fluorescence staining method. In contrast, low caspase 3/7 activation was observed in different fractions treated MCF-7 cells without showing a typical DNA ladder pattern of apoptosis. The results indicate the apoptogenic potential of hexane fraction of *C. minima* against MCF-7 cells.

Keywords: Anti-cancer, *Chnoospora minima*, Morphology, MTT, Neutral red, Rhabdomyosarcoma

*Correspondence: dinithi@sci.sjp.ac.lk



COMPARATIVE ANALYSIS OF POSSIBLE RISK FACTORS AFFECTING TRANSMISSION OF DENGUE IN THE DISTRICT OF GAMPAHA, SRI LANKA

E.H.L. Perera¹, S. Viswakula², S.M.C.U.P. Subasinghe³, L. Fernando⁴, M.D Hapugoda^{*1}

¹Molecular Medicine Unit, Faculty of Medicine, University of Kelaniya, Sri Lanka

²Department of Statistics, Faculty of Science, University of Colombo, Sri Lanka

³Centre for Forestry and Environment, Department of Forestry and Environmental Science, University of Sri Jayewardenepura, Sri Lanka

⁴Centre for Clinical Management of Dengue & Dengue Haemorrhagic Fever, Negombo, Sri Lanka

Dengue is an arboviral infection prevalent in the South-East Asia, Western Pacific and various tropical and subtropical regions in the world. It is transmitted through the mosquito bites of infected female adults of *Aedes aegypti* (Linnaeus) and *Ae. albopictus* (Skuse) mosquitoes. The objective of this study was to examine the entomological and socio-economic risk factors affecting the transmission of dengue covering the Negombo Medical Office of Health (MOH), which is considered as the highest dengue risk area in Gampaha administrative district during the last 5 years. The highest and the lowest dengue risk Grama Niladhari (GN) Divisions, Kurana and Udayarthoppuwa respectively in Negombo MOH were selected based on reported dengue cases during 2012- 2017. Entomological surveillance was conducted in 140 households from both 'high' and 'low' risk areas covering a period of 18 months. High densities of *Ae. albopictus* were reported in both high [100% (112/112) adults: 92.4% (171/185) larvae] and low [94.78% (109/115) adults: 95.92% (141/147) larvae] risk areas. In both areas relatively low densities of *Ae. aegypti* were reported. Source of water ($p=0.87$), waste disposal method ($p=0.66$), monthly income ($p=0.55$), Household type ($p=0.13$) and educational status ($p=1.68$) did not show any significant difference while presence of dengue patients previously ($p=0.01$), vegetation coverage ($p=0.03$), cleanliness of premises ($p=0.03$) and presence of potential mosquito breeding sites ($p=0.001$) showed a high statistically significant difference between high and low dengue risk areas. It can be concluded that the presence of high densities of vector species, reporting of dengue cases previously, cleanliness of premises, major mosquito prevention method, presence of potential mosquito breeding sites and vegetation coverage may be the most important risk factors affecting transmission of dengue.

Keywords: Aedes, Dengue, Entomological surveillance, Negombo MOH; Risk factors

**Corresponding author: harshlakmali22@gmail.com*



THE IMPORTANCE OF COMMONLY USED SPICES IN SRI LANKAN CUISINE (AYURVEDA AND MODERN PERSPECTIVE)

W.K.T. Dushmantha^{1*}, S.K.M.K. Herapathdeniya¹, K.A.C.K. Gunathilake²

¹Institute of Indigenous Medicine, University of Colombo, Sri Lanka

²Faculty of Agriculture, University of Jaffna, Sri Lanka

Spices are substances made from specific parts of plants used to give a special flavour to food. From ancient times Sri Lankan traditional cuisine is strongly linked to nutritional, therapeutic and pharmacological considerations of nutrients and cooking methods. In addition, they act as colourings, aromatic agents and preservatives. Spices play a crucial role in the prevention of non-communicable diseases (NCDs) and other ailments of people. Fifteen (15) out of them such as *Brassica nigra*, *Elettaria cardamomum* and *Piper nigrum* were used in this study. This study aims to analyse the medicinal values of these spices following Ayurvedic and modern perspectives, evidence-based information and awareness about the spices used in Sri Lanka with their pharmacological details. The study was conducted by referring to Ayurvedic pharmacopoeia, textbooks on agriculture, online research articles on ResearchGate, PubMed®, Google Scholar, international research journals and databases from the Department of Export Agriculture and by analysing the Ayurvedic pharmacodynamic properties, and their actions as per modern medicine. *Rasa* (taste) predominant *dravya* (substances) are considered *ahara* (foods) and the analysed results of the *rasa* (taste) is important when considering spices. According to the taste of the above spices, 93.3% represent *katu rasa* (pungent taste) while *lavana* (salty taste) is absent. Due to the prominence of *laghu* (lightness) and *theekshna* (sharpness) attributes along with *ushna virya* (hot potency), spices enhance the appetite. By analysing the Ayurvedic pharmacodynamic properties and actions related to them, it is possible to conclude that the majority of above spices have *kapha-vata shamaka* (pacifying) and *pitta vardhaka* (increasing) actions while some have *tridosha shamaka* actions. Therefore, according to Ayurveda, these spices can be used as appetizing, anthelmintic, blood purifying, expectorant, diuretic, aphrodisiac, detoxifying substances which help to cure anorexia, indigestion, flatulence, bronchial asthma, cough, dysuria, etc. According to the modern perspective, these spices have carminative, cardio-tonic, antioxidant, antimicrobial and anti-inflammatory actions. Therefore, they have potential effects on infections and infestations, NCDs, upper respiratory, neurodegenerative and common GIT disorders. The present review confirmed the importance of spices used in Sri Lanka from the Ayurvedic and modern perspectives. Also, these spices help prevent common NCDs and improve the quality of food.

Keywords: Ayurveda, Pharmacology, Spices, Sri Lankan cuisine

*Corresponding author: tharindudush7@gmail.com



ANALYSIS OF TECHNOLOGY TRANSFER PROCESSES OF INDIGENOUS MEDICINE SECTOR IN SRI LANKA

T.P. Weerakoan^{*}, C.T. Liyanage

University Business Linkage Cell, University of Colombo, Sri Lanka

The indigenous medicine of Sri Lanka is an ancient, sustainable healthcare practice that has the capacity to contribute towards achieving socio-economic goals. Recently, attention has been drawn towards indigenous medicine, especially during the crisis arisen in the global healthcare sector due to the COVID-19 pandemic. As a result, much research has been conducted to fabricate innovative methods and products in finding solutions to prevent the disease and to help with symptoms of the disease. Research outcomes need to be effectively utilized to commercialize on a large scale through technology transfer for building social entrepreneurs leveraging on technology. However, due to unawareness and misinformation of intellectual property (IP) rights, in Sri Lanka, a significantly lesser number of academic research have obtained a patent following a successful IP filing. This research has focused on the issues in IP filing, the gap between the IP filing and commercialization, sustainability of the commercialization, and socio-economic impacts on the local community from the commercialization of valuable research outcomes from the indigenous medicine sector. A literature review was carried out based on peer-reviewed journal articles, publications, policy documents, knowledge hubs, and repositories to establish the existing research gap in the technology transfer in the indigenous medicine sector in Sri Lanka. An online questionnaire survey has been conducted with the participation of respondents from the indigenous medicine sector in Sri Lanka, and technology transfer offices. Data collected from survey responses, commercial databases, and further communications with the respondents, were analyzed statistically using SPSS software to find the significant differences between the IP filing and commercialization. Results revealed that only a fewer number of innovative products have the potential to make a distinguishable impact on society, among the commercialized products. Moreover, insufficient knowledge of IP rights, lengthy time frames for preparation of respective documents and for obtaining approval, inadequate market analysis have been identified as primary causes affecting effective commercialization. Policymakers at the national level should be made aware of the perceived deficiency for commercialization in the indigenous sector to uplift the nation's economy to reach a new height.

Keywords: Commercialization, Indigenous medicine, Innovations, IP rights, Sri Lanka

**Corresponding author: thilinaweerakoan@gmail.com*



THE PSYCHOSOCIAL FACTORS RELATED TO POST-PARTUM DEPRESSION AMONG MOTHERS IN THE POST-PARTUM PERIOD AT THE DE SOYZA MATERNITY HOSPITAL FOR WOMEN IN SRI LANKA

P.B.A.D.K. Wimalasooriya, N.A.D.C.K.S. Ranathunga, W.M.D.B. Bandara, N.M. Patterson*, B.S.S. De Silva

Department of Nursing, Faculty of Health Sciences, The Open University of Sri Lanka

Post-partum depression (PPD) is an episode of non-psychotic depression according to standardised diagnostic criteria, with onset within one year of childbirth. Previous literature has evidenced that there is a vast range of factors that can lead mothers to develop PPD. Identifying the different influencing and risk factors will be beneficial to diagnose, treat and prevent PPD. Hence, this study was aimed to determine the psychosocial factors that can affect PPD among mothers. In this quantitative descriptive study, 103 mothers in the postpartum period were recruited conveniently from the De Soya Maternity Hospital for Women in Colombo, Sri Lanka. The Edinburgh Postnatal Depression Scale (EPDS) was used to identify the mothers with depressive symptoms and an interviewer-administered questionnaire was used to identify the factors influencing PPD. The descriptive and inferential data analysis was performed using SPSS software. Ethical approval for conducting the study was obtained from the Ethics Review Committee of the De Soya Maternity Hospital for Women. Results showed that 71% of mothers who show depressive symptoms were between the ages 21 to 40 years. The majority (94%) of participants were married. Out of 103 depressive mothers, only 16% have a family history of mental disease. Further, 67% of the depressive mothers had an unintended pregnancy. Excessive or somewhat fear of delivery was presented by 81% of mothers. Some mothers (39%) did not have any support to look after the baby and hence, 38% depend on parents and 17% depend on hired carers. Further, only 30% of mothers think that they receive satisfactory support from their husbands while 41% think that little support is received and 19% believe they receive no support. The results suggested that unexpected pregnancies, fear of delivery, social support, acceptance of the pregnancy and caring for the child influence the occurrence of PPD. The early detection of contributing factors and modifying such factors will be beneficial in reducing the occurrence of PPD. Therefore, urgent attention must be given to this problem, so that maternal morbidity could be reduced.

Keywords: Influencing factors, Mothers, Post-partum Depression, Psychosocial factors

**Corresponding author: nmpat@ou.ac.lk*



LOCAL UNDERSTANDINGS OF CHRONIC KIDNEY DISEASE OF UNKNOWN ETIOLOGY (CKDu): A QUALITATIVE STUDY IN THE MATALE DISTRICT OF SRI LANKA

D.T. Bulathwatta,^{1*} U. Appuhamilage,² G.P. Gamage³

^{1} Department of Psychology and Counselling, The Open University of Sri Lanka*

²iCLA, Yamanashi Gakuin University, Japan

³ Department of Psychology and Counselling, The Open University of Sri Lanka

Chronic Kidney Disease of unknown etiology (CKDu) can be identified as a devastating health problem among the Sri Lankan agricultural community. In the last several years, the majority of research aimed to find out the etiology of CKDu with a bio- medical framework but the root cause/causes are yet to be identified. A greater number of CKDu patients are farmers and they are the breadwinners of families. As such, CKDu has a shattering impact on the whole family system. However, unfortunately, the psychosocial aspect of CKDu has hardly received research attention. The current study focused on a local conceptualisation of CKDu patients to understand the psychosocial aspects of patient experiences. This study used qualitative methodology (eg: semi-structured interviews, life-line charts, focus group discussions) with two rural communities that report the highest number of patients, along with stakeholders and the medical community in the central province. The findings highlight conflicting disparities in the conceptual understanding of patients and their health/wellbeing needs and existing support systems. The established interventions have understood CKDu as a "disease" and interventions focus on a "cure" for the disease while patients understand the condition based on their psychosocial belief system and the pragmatics of their everyday lives. Similarly, it was recognised that patients are seeking a life and death without pain, with their familial security, which is beyond the "cure". Therefore, it is essential to seek an in-depth understanding of patients' experiences about the disease and reframe the current intervention programme of CKDu.

Keywords: CKDu, Health, Psychosocial wellbeing, Suffering

** Corresponding author: bdbul@ou.ac.lk*



THE IMPACT OF 3 MONTHS OF COMBINED EXERCISES ON HUNGER, SATIETY AND FOOD CONSUMPTION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS (T2DM): A RANDOMIZED CONTROLLED STUDY

D. Vidanage^{1*}, P. Hettiarachchi², S. Wasalathanthri³

¹Department of Nursing and Midwifery, General Sir John Kotelawala Defense University, Sri Lanka, ² Department of Physiology, University of Sri Jayewardenepura, Sri Lanka

³ Department of Physiology, University of Colombo, Sri Lanka

Hunger, satiety and food consumption are closely linked with energy homeostasis. Excess intake of energy is associated with poor glycemic control in T2DM. Investigations exploring the modulation of hunger, satiety and food consumption by regular exercises are limited. Thus, this study aims at determining the impact of combined (aerobic and resistant) exercises on hunger, satiety and food consumption in T2DM. This study was a part of a randomized controlled trial spanning over two years. Seventy-two diabetics aged 35-60 years, with a history of T2DM for more than 5 years were randomly assigned into an exercise group and a control group. A combined exercise protocol (brisk walking 30 min/day, 4-5 days/week and resistance exercises 20min/day, 2-3 days/week) for three months was introduced to the exercise group. Both groups maintained a 3-day diet diary. Perceived intensity of hunger and satiety at -30 min, +30 min, +60 min in relation to a standard breakfast meal were measured by Visual Analogue Scale. Food consumption was assessed by Nutrisurvey2007 (EBISpro) software. The data were analyzed by independent sample t-test and paired sample t-test. Significance was set at 0.05 level. Feeling of hunger significantly decreased in the exercise group at -30 min and the feeling of satiety significantly increased at -30, +30 and +60 minutes after 3 months of exercises compared to controls ($p < 0.05$) as well as when compared to their baseline values ($p < 0.05$). In exercise group, the total calorie ($p = 0.015$) and carbohydrate ($p = 0.013$) intake were significantly decreased compared to the control group and to their baseline values ($p < 0.05$). The intake of fat and protein did not show a significant difference with exercises. These findings suggest reduced hunger and increased satiety leading to decreased food consumption in T2DM patients following three months of regular combined exercises.

Keywords: Appetite, Exercise, Type 2 diabetes

* Corresponding author: dinithi@kdu.ac.lk



KNOWLEDGE, ATTITUDES AND COMPLIANCE TOWARDS DIRECTLY OBSERVED TREATMENT SHORT COURSE AMONG PULMONARY TUBERCULOSIS PATIENTS ATTENDING THE CHEST CLINIC AT THE, DISTRICT GENERAL HOSPITAL IN, KALUTARA

***G.A. Priyadarshani*, T.H.M.A. Dhammika, P.D. Wickramaarachchi,
N.D.C.T.Nakandala, P.W.G.D.P. Samarasekara***

The Open University of Sri Lanka

Tuberculosis (TB) is a communicable disease that is considered to be a major cause of ill health. It is also regarded as one of the top 10 reasons and the leading cause of death from a single infectious agent (Global Tuberculosis Report, 2020). The core idea of the Directly Observed Treatment Short-course (DOTS) is for treatment supervisors to watch patients while they swallow the medicine to re-emphasize the treatment's importance to the patient, his/her family and the care worker. The main purpose of the study is to examine the knowledge, attitudes and compliance towards DOTS among pulmonary tuberculosis patients who visit the chest clinic at the District General Hospital in, Kalutara. A quantitative descriptive cross-sectional design was conducted on a purposive sample of 105 pulmonary tuberculosis patients who are receiving treatment at the chest clinic of the District General Hospital in Kalutara, Sri Lanka. Among 105 respondents, the majority (63%) of patients had adequate knowledge about pulmonary tuberculosis (PTB) and its treatment. The majority (38.1%) of male respondents had more adequate knowledge than females (23.8%). Moreover, 47.6% of patients reported feeling ashamed and isolated when they were diagnosed as having TB while only 23.8% disagreed with such feelings. A higher number of respondents (68.6%) had received their treatment under supervision of either a health-care worker or family member while 31.4% of participants had received treatment alone without any supervision. The majority of respondents had adequate knowledge about DOTS whereas still a quarter of them had poor knowledge, in all age groups. A considerable number of respondents had negative attitudes about PTB and DOTS. Health education and community awareness programmes should be conducted to eliminate the negative attitudes of the patients as well as of the society. This study found that, the compliance of the respondents towards DOTS is high. It also revealed an important aspect, namely that knowledge is not a direct determinant of compliance whereas attitude largely effects compliance with DOTS. Therefore, it is vital to keen ways of improving attitudes to improve compliance. Community-based TB treatments under DOTS is considered to be the only effective way currently to reduce transmission and the development of drug resistant tuberculosis; therefore, by identifying patients who are likely to default, health education could be efficiently directed to maximise patients' compliance.

Keywords: Attitude, Compliance, Directly Observed Short-course, Knowledge, Pulmonary tuberculosis

**Corresponding author: gap03101985@gmail.com*



LEARNING CHALLENGES EXPERIENCED BY STUDENT NURSES DURING CLINICAL PLACEMENTS AT OPERATING THEATRE

***R.M.A. Kumudumalee, S.V. Nishanthi, L.R.B. Lakmali,
T.N.K. Thudugala, K.A. Sriyani****

Department of Nursing, The Open University of Sri Lanka

The Operating Theatre (OT) is one of the most specialised and important clinical learning environments in which student nurses learn OT skills. Failures to identify the challenges faced by student nurses during their clinical placement prevent them from effective learning and growth. The aim of this study was to determine the learning challenges experienced by final year student nurses during their clinical placement in the operating theatre at the School of Nursing, Ratnapura. A descriptive cross-sectional study was conducted among 71 student nurses who had completed their two months of clinical placement. Data was collected using a content-validated, self-administered questionnaire. Socio-demographic information, the learning challenges faced by student nurses in relation to their physical and psychological aspects, communication and self-failure were assessed. Of the total of 67 student nurses (females n=65) participated in the study, the majority of them (83.5%) reported good interaction with the staff nurses. Further, 47% of student nurses accepted that they had language difficulties during the clinical placement. Similarly, the participants responded that they had a lack of confidence (47.8%) and fear (55.2%) about the completion of educational tasks, and felt inconvenient during their OT clinical training. However, a higher proportion of student nurses had regular attendance (78.8%) and showed interest in spending their learning time at OT (90.9%). The majority of student nurses (70%) responded that they did not feel inconvenience due to working in an air-conditioned environment. In contrast, 46% (n=31) of student nurses felt inconvenience due to long-standing hours in the OT. Though most of the student nurses felt that the environment of the operation theatre to be a comfortable and supportive learning environment, appropriate action needs to be taken to overcome challenges such as language difficulties, fear and a lack of confidence.

Keywords: Clinical placement, Learning challenges, Operation theatre, Student nurses

**Corresponding author: kasri@ou.ac.lk*



HUMANITIES AND SOCIAL SCIENCES



IMPACT OF PARENTS' PARENTING STYLE ON EMOTIONAL INTELLIGENCE OF ADOLESCENTS

R. W.M.S.P.K. Rajapaksha*

University of Kelaniya, Sri Lanka

Emotional Intelligence was a young concept arose in the 20th century, which did a revolutionary change in the history of psychology. As well parenting style was a concept which introduced by Diana Baumrind in early 1960s'. Adolescents are young population group, as mentioned by World Health Organization from age 10 to 19 years of age. Emotional Intelligence is an essential for adolescents. Under this study it addresses to the problem of whether Emotional Intelligence score differ according to the parenting style which they are exposed to? Accordingly, it consider about four parenting styles introduced by Diana Baumrind and check whether Emotional Intelligence score of adolescents differ according to the parenting style they are exposed to. General objective under this study is to find out whether there's an impact of parents' parenting style on Emotional Intelligence of adolescents. Specific objectives are to understand about parenting style and differences on impact to Emotional Intelligence of adolescents and to study about gender differences of Emotional Intelligence scores of adolescents. To investigate this research problems and objectives survey method is used with two questionnaires, where handmade questionnaire was used to measure Emotional Intelligence and Schutte Self Report Emotional Intelligence Test (SSEIT) used to measure Emotional Intelligence. This study was conducted with a sample of 100 adolescents (50 females and 50 males). Shapiro-Wilk Test is used to examine normality distribution, Kruskal-Wallis Test is used to examine parenting style differences on Emotional Intelligence score, while Mann-Whitney Test is used to examine gender differences on Emotional Intelligence. According to the findings of the study it has revealed that there's no differences between scores of Emotional Intelligence among different parenting styles and as well there's no gender difference on Emotional Intelligence scores, where it can conclude that there's no impact of parents' parenting style on Emotional Intelligence of adolescents.

Keywords: Adolescents, Emotional Intelligence, Parenting style, Parents

**Corresponding author: sriparamirajaksha@gmail.com*



NATURAL DISASTERS AS AN EXPRESSION OF THE AGGRESSION: ROLE OF THE LOCAL BELIEFS IN POST-ENVIRONMENTAL DISASTER RELATED TRAUMA MANAGEMENT

W.A.S. Thilanka*

Department of Sociology, University of Peradeniya, Sri Lanka

In rural areas of Sri Lanka, local knowledge plays a greater role in post-environmental disaster management than scientific knowledge. Particularly, rural people define natural disasters in terms of their local religious beliefs. This paper is based on a case study of landslide occurred in May 2003 at Diyadawa, Deniyaya in Matara district and its post environmental disaster management practices with reference to local beliefs. This disaster killed around 150 persons and rendered many people homeless and dependent. The main objective of this study is to examine the role of local beliefs in post disaster management process of Deniyaya landslide. The research basically focuses on the problem of the mechanism adopted by the locals in post disaster management. An explorative methodology is used to inquire the qualitative and subjective aspects of post disaster management. Basically, purposive sampling method is used to collect data from 30 respondents. The qualitative data are collected through in-depth interviews with the villagers of the area. Data is mainly analyzed qualitatively based on narrative analysis method. The study reveals that main coping method of people who survived from the disaster and the family members and neighbors of the victims is sticking to the local religious beliefs which has been narrated around 'Getabaru Rajjuru Bandara God' who is the local god of this area. Having environment linked livelihoods, these people have many folklores which protect and maintain the bond between them and nature. It is commonly believed that the landslide was an expression of the aggression of 'Getabaru Rajjuru Bandara God' against people who have broken the rules, customs and practices that are said in these folklores. Further, apart from all professional mediations of social workers, counsellors and volunteers, the villagers have recovered from the post-environmental disaster trauma by agreeing to perform rituals for the sake of their local god as a way of confession and also as a way of giving merits to the souls of the victims. Apparently, it is obvious that cooperating and utilizing the local knowledge and beliefs are more pragmatic than solely seeking solutions through professional knowledge to the contemporary issue of post-environmental disaster management.

Keywords: Confession, Environment Linked Livelihoods, Folklore, Local Beliefs, Post Disaster Trauma

**Corresponding author: sumuduwijesuriya@gmail.com*



STUDENTS' PERCEPTION ON INDUSTRIAL TRAINING: A CASE STUDY AT UNIVERSITY OF VOCATIONAL TECHNOLOGY

B.M.T.D. Jayasekara* , K.G. Alahapperuma

University of Vocational Technology, Sri Lanka

The University of Vocational Technology was established under the parliament Act, No. 31 of 2008, and it is the only body that offers courses at level 7 (degree level) of National Vocational Qualification framework of Sri Lanka. The university offers Bachelor of Technology degree courses in fifteen different disciplines, as weekday courses and weekend courses. Weekend courses have specially been designed for employed students. For weekday students, the fifth semester of the course is a six-month industrial training. The main outcome of this semester is to acquire required practical competencies. However, during assessments of the industrial training, certain students' difficulty in answering the forwarded questions were clearly identified. Therefore, the aim of this study is to analyse the different barriers to acquire competencies during the industrial training period, and to suggest practicable remedies for them. The study was done by collecting data through a structured questionnaire. Two main areas were addressed; training place related issues and personal problems. Thirty-five students participated from 2016/2017 (weekday programmes) intake representing all degree courses. Analysis was done with descriptive statistics. Statistical Package for Social Sciences software was used with 5 point Likert scale (5 - strongly agree to 1- strongly disagree). Responses for 5 and 4 were regarded as agreements while 2 and 1 were regarded as disagreements. According to the findings, main concerns with training place were unnoticed work assignment, lack of appreciation for the work, trivial work assignment, noise pollution and lack of supports from the immediate supervisor, while lack of time management ability, sicknesses during training, difficulty of working in teams and weak speaking skills were the main personal problems. Therefore, recommendations are made to establish a supervisory training unit in the university, implement mechanisms to guide the relevant authorities to fulfil the objectives of industrial training, and also revise the degree curricular enabling students to improve their soft skills which are essential for their future career as well.

Keywords: Expected outcomes, Industrial training, NVQ framework, University students

**Corresponding author: bmtjayasekara@gmail.com*



A RESEARCH BASED ON A WOMAN IN NON-MILLENNIAL ERA AND PERSPECTIVE ON GENDER IN TERMS OF SOCIO-ECONOMIC, CULTURAL AND POLITICAL VIEW

*M. Sarathchandra**

The Open University of Sri Lanka

The paper demonstrates a Woman who was born in 1938 in Anuradhapura District, Sri Lanka and how the evolution of a woman took place with moving to Matale District and after her marriage. The paper investigates how the woman in non-millennial era was influenced by the society in aspects of economic, social and culture and perspective of the woman about the influence occurred. A working woman has more responsibilities and duties in her career and family relationship. Basically Sri Lanka as a South Asian country it is more evident that gender inequality, discrimination of women, missing women, unpaid work in economics are major questions that arise not only in Sri Lanka but in the South Asian context. The paper demonstrates the view of the woman in three perspectives: Horizon, Identity and Decision-making capacity when enter to the labor market and marriage and family life. Paper analyses women empowerment implementations that could overcome the gender inequalities, the critical aspects of economic and social policies of the past and present context and the recommendations to empower women in micro- economics. Analysis was based on qualitative approach method and a direct/face-to-face interview was conducted. A pre-prepared Semi-structured questionnaire was used to gather the information from the interviewee. It is proven statistically that a higher percentage of women in the society is engaged in the economic/labor market and thus, there is less discrimination while women are able to take independent decisions. Woman in the research demonstrates that she is career oriented while maintaining the balance with the work-life. The final conclusion is that it is identical that women in political participation is slightly risen compared to the non-millennial era yet there is a wider gap with respect to gender basis presently. In the South-Asian context it is visible that more than 50% of countries have less female participation and Sri Lanka in terms of cultural and different sociological views women engagement in politics is at lower level. With the liberalization concept in 1977 Sri Lanka brought out different acts and regulations to empower the women in the society and to minimize gender discrimination.

Keywords: Horizon, Identity, Decision making, Working women, Gender

*Corresponding author: sewwandymys45@gamil.com



THE ROLE OF PALMYRA CO - OPERATIVE SOCIETY ON EMPOWERING TODDY TAPPERS: A CASE STUDY BASED ON ACHCHUVELI VILLAGE IN JAFFNA

A. Ramiah^{1*}, D. J. Chandrasegaran²

¹University of Jaffna, Sri Lanka, ²The Open University of Sri Lanka

Palmyra co-operative societies are providing a valuable contribution to toddy tappers' for their social development. It is the focal institution of the toddy tapper's community. Co-operative society means people work together for their social, economic development. A co-operative is a business owned and controlled by the people who use its services and its function based on the demographic platform. Palmyra co-operative society faced many struggles to empower their community such as social, economic spaces. Research explores the role of the Palmyra co-operative society in empowering toddy tappers. This is an institutional based study which is administered on Achchuvveli village which is a famous area for toddy trapping. The study design is a qualitative data collection method conducted using selected 25 persons of Palmyra co-operative societies with the use of a random sampling method in this village. Primary data was collected through case studies, interviews, field observation methods, secondary data was gathered from magazines, books, internet sources. Results are found through thematic analysis from gathered data. Palmyra co-operative society prevents exploitation of dominant people who are the prominent class in historically structured Jaffna. It helps to mobilize people without any form of discrimination and provide concrete and reasonable way of income and formed social security scheme also for toddy tappers such as compensation payments, pension, child education facility, loan facility and saving facilities through the co-operative rural bank. The major reason for this institution to establish was to mitigate caste-based discrimination which is deeply rooted in Jaffna's social structure. It will also help to raise their social status and provide unity, power for this particular community. Palmyra co-operative society conducted educational based welfare programs for their community upgrade and wellbeing. Such as free preschools, distributing educational material and equipment assistance for their members 'children. Palmyra co-operative societies work for rural development through rural multi dimension development. But practically they don't have enough space to conduct their effective services. The government also engages hands with this type of institutions for their enthusiastic performance.

Keywords: Discrimination, Exclusion, Palmyra co-operative society, Toddy Trappers

**Corresponding author: dshshnthychandrasegaran2gmail.com*



ADAPTATION AND VALIDATION OF THE CONNECTEDNESS TO NATURE SCALE FOR THE USE IN SRI LANKA

E.A.S.K. Somarathne^{1,2}, E. Lokupitiya¹, M.W. Gunathunga³*

¹*Research Promotion and Facilitation Center, Faculty of Medicine, University of Colombo, Sri Lanka*

²*Department of Zoology and Environment Sciences, Faculty of Science, University of Colombo, Sri Lanka*

³*Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka*

Exploring the connectedness with nature opens doors to examining the cognitive relationship between an individual and the natural world. Connectedness to Nature Scale (CNS) might be the most studied tool by researchers from a range of disciplines in different parts of the world. The objective of the current study was to adapt and validate the CNS in the *Sinhala* speaking context. Adaptation of the CNS was carried out according to the International Test Commission (ITC) guidelines for translating and adapting tests. Pre-tests, Delphi process and preliminary cross-sectional study to collect data for exploratory factor analysis (EFA) were carried out with the purpose of ensuring the judgmental validity and construct validity of two-way translated CNS into *Sinhala*. Out of all ratings in the last round of the Delphi process, 90.48 % of scores were in the range of 7-9. Pre-testing of the reviewed *Sinhala* version of CNS ensured the clarity of the language used. Items 5, 13 and reversed items 4 (R4) and 14 (R14) were removed based on the results obtained through EFA. Reliability analysis of the *Sinhala* version of CNS (CNS-Sin) revealed that the CNS-Sin without items R4, 5, 13 and R14 showed a good internal reliability ($C\alpha = 0.84$). This is the 1st research study which focused on adapting and validating a tool that assesses an individual's explicit connection with nature in Sri Lankan context. Researchers who investigate psychology in environmental concerns can use this tool in assessing one's experiential connection with nature, which might support in creating an environmentally sustainable society. It can be concluded that CNS-Sin is a valid and reliable tool for measuring connectedness to nature. As this opens the doors to investigate one's environmental beliefs, psychometric data collected through this tool might be helpful to enhance the fruitfulness of environmental management-experimental approaches in the future.

Keywords: CNS, Connectedness to nature, Eco-friendly behavior Environmental attitudes

*Corresponding author: sksomarathne@stu.cmb.ac.lk



LEADERSHIP EFFECTIVENESS OF GOVERNMENT AND PRIVATE ORGANIZATIONAL PERFORMANCE IN SRI LANKA: BASED ON THE GAMPAHA DISTRICT

W.W.L.C. Jananjana*

Department of Social statistics, Faculty of Social Sciences, University of Kelaniya, Sri Lanka

The study aimed at evaluating the impact of effective leadership on organizational performance based on the district of Gampaha in Sri Lanka. The evaluation was done using questionnaire. This study report on the effectiveness of training in the government and private organizations. Using before and after training assessment by employees of several organizations, the analysis shows that private organizations leadership training is more powerful for gaining profit than the government organizational leadership. Sample size one hundred and eighteen were selected from a total population and random sampling was used to select the respondents. The data generated from the questionnaire were presented and analysed using quantitative method like frequency distribution and simple percentage. The test of hypothesis was performed using Chi – square statistical test. The Result arising from the primary data tested at 0.05 coefficient interval and degree of freedom revealed that there is a positive and significant relationship between effective leadership and private organizational performance than the government organizational performance. The study also revealed that despite the above, there are other factors that affect organizational performance. These factors are good office equipment, high salary or funds, poor work environment. This discovers the leadership effectiveness that influences organizational performance. Correlation between the private organizational performance and leadership effectiveness were higher than the correlation between government organizational performance and their leadership effectiveness. Based on the finding, the following recommendation is given correcting the all negative aspects of the effective leadership. Hence, effective leadership has an impact on the private organizational performance more than the government organizational performance.

Keywords: Effective leadership, Government organization, Leadership, Organizational Performance, Private organization

**Corresponding author: chamudijananjana@gmail.com*



INVESTIGATING QUALITY OF LIFE AND TRAIT MINDFULNESS OF SKILLED MEDITATORS: A CASE CONTROL STUDY

**H.M.N.N. Dasanayaka^{1*}, E.A.S.K. Somarathne¹, N.O. Outschoorn¹,
U.Karunarathne², K.K.Vithanage³, K.P.C. Dalpatadu³, M.W.Gunathunga⁴,
H.M.J.C. Herath⁵, W.D.N. Dissanayake^{1,3}**

¹Research Promotion and Facilitation Centre, ³Department of Physiology,

⁴Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

²National Hospital, Sri Lanka

⁵Department of Social Science Education, Faculty of Education, University of Colombo, Sri Lanka

Meditation refers to a set of techniques which facilitates a calm and stable mind, attention, awareness, and tranquillity by continuous practice. Meditation increases the skill-level of a meditator which leads to physiological, genetic, and psychological benefits. Searching for mental health effects of meditation would add new knowledge to the growing body of research on meditation. The aim of this present study was to investigate the association of long-term meditation with the quality of life (QOL) and the mindfulness level. This study is a Matched case control study where the sample consisted of meditators and controls who were above 18 years of age (n=21). Individuals who were pregnant, breastfeeding, smokers or diagnosed of having a psychiatric disorder were excluded. Meditators who have practiced meditation for more than three years (n= 144) were screened with a validated screening tool and 21 skilled meditators, along with 21 age, gender and educational level matched controls were recruited. The mindfulness level and the quality of life (QOL) were measured using Five Facet Mindfulness questionnaire (FFMQ) and QOL questionnaire respectively. Comparison of the mindfulness and QOL between two groups was done by student sample T-test using SPSS software. To evaluate the relationship between QOL, and mindfulness level and population characteristics Pearson correlation was performed. The majority 71.4% (30/42) of the participants were male and mean age of the meditators and controls were 42.78±9.80 and 42.83±9.78 years, respectively. Mean duration of the meditation practice of the meditators was 6.46 ± 2.89 years and they have meditated for a mean frequency of 8.91 ± 4.57 hours per day. Meditators had significantly higher total mindfulness level (meditators: mean±SD=149.5±21.29; non-meditators: mean±SD=127.3±9.7; p=0.007) than the non-meditators. QOL was not significantly different between meditators and controls (meditators: mean±SD=97.58±9.5; non-meditators: mean±SD=93.3±9.6;p=0.307). Total QOL was significantly correlated with the trait mindfulness level (r=0.463; p=0.013) and total QOL was only significantly correlated with the age (r=0.542; p=0.003). The findings of this study suggest that long-term meditation practice has beneficial effects on the level of mindfulness and may influence sub-scale of QOL.

Keywords: Meditation, Mindfulness, Quality of life, Skilled meditator

*Corresponding author: nirodhidasanayaka@gmail.com



A STUDY OF NON-VERBAL COMMUNICATION SYMBOLIC MEANINGS REFLECTED IN BHARATANATYAM GESTURES

*A. Lokumannage**

Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka

Nonverbal communication is the process of sending and receiving messages without using words either spoken or written. Symbols attempt to communicate something from the unconscious, the unknown universe, to the conscious. We assume that a symbol has an unknown meaning when we suggest it has a symbolic meaning. Even when we try our hardest to express the hidden part of the meaning, a symbol's main feature is that some part of it is still left unclear. This study is based on nonverbal communication of Bharatanatyam gestures. Objectives of this research were to study the symbolic meaning of the Bharatanatyam gestures according to Indian dancing tradition and to identify the history and religious meaning of Bharatanatyam. Research problems were what are the nonverbal communication implications of the Bharatanatyam gestures? And how Bharatanatyam gestures connect with Indian traditional beliefs? Methodology of the research was the study of primary sources related to Bharatanatyam. The initial origins of Bharatanatyam are regarded to be Bharata Muni's Natyashashtra and Nandikeshvara's Abhinaya Darpanam. A research structure was formulated to enable an equal analysis of all of the gestures, covering background and symbolic meaning according to tradition of Bharatanatyam. Indian dance does not only present an abundance of nonverbal communicative aspects, through which diverse messages are being transmitted. However, it has also served as a purveyor of Indian culture, as well as an embodiment and audio-visual depiction of the country's cultural history. That makes Indian dance an outstandingly interesting subject for Communication Sociology science, specifically. Body Language, kinesics and nonverbal communication proves that Indian classical dance forms are really great not only to watch but also to understand the great influence of nonverbal communication in our life. Indian Classical Dance, on the one hand, communicates. Meaning of this dance can be derived when the performer gets acknowledged with Indian myths, religious patterns, history. One cannot understand what Indian dancers non-verbally communicate, if there is no knowledge of their special language.

Keywords: Bharatanatyam, Gesture, Non-verbal communication, Symbol

*Corresponding author: amila@spc.cmb.ac.lk



EMOTION RECOGNITION, GENDER AND FACE MASK WEARING DURING THE COVID-19 PANDEMIC

P.Y.O. Perera, T.J. Gunawardena , N. Hettiarachchi, O.A. Rajapakshe*

¹Department of Psychology, Faculty of Art, University of Peradeniya, Sri Lanka

With the spread of the COVID-19 pandemic mask wearing has been recommended as a first line preventive measure. Humans as a species depend largely on facial expressions to read emotions of others and form interpersonal connections. There are cross cultural differences in which facial features becomes paramount in recognizing emotions. When a mask covers the facial cues needed to successfully understand the emotions expressed by others this could lead to a loss in emotional competency and would also affect social relatedness. The aim of the present study was to explore whether the ability to recognize emotions would be affected by wearing a face mask. The study was conducted as an online survey shared through social media platforms. The survey consisted of an emotion recognition questionnaire where twenty-four faces depicting the five primary emotions of happiness, fear, anger, sadness and disgust and a neutral faces was divided into two conditions; with mask and without mask. Participants were required to select the correct emotion from the options given after viewing each face. The same male and female face was used under each alternative masked and non-masked condition. Two hundred participants (Females=162, Males=38) took part in the study. A paired sample T-Test was conducted to compare the number of emotions correctly identified in the masked condition and the non-mask condition. There was a significant difference in the scores for the masked condition ($M=8.24$ $SD=1.39$) and non-masked conditions ($M=10.28$ $SD=1.39$); $t(198)=16.83$, $p=0.00$. There was no gender difference found in the ability to recognize emotions in the masked condition. However in the non-masked condition, females were better able to recognize emotions ($M=10.35$ $SD=1.12$) than males ($M=9.89$ $SD=1.44$); $t(198)=2.09$, $p=0.033$. Females were also significantly more likely to correctly recognize the emotions in the non-masked female face ($M=5.57$ $SD=0.66$) than the male participants ($M=5.27$ $SD=0.91$). There was no significant difference in emotion recognition in the non-masked male face, masked female and male face. This study highlights the impact COVID-19 related preventive mechanism can have on the recognition of emotions through facial cues which might have a long-term impact on emotional competence.

Keywords: COVID-19, Emotion recognition, Face Masks, Gender, Perception

**Corresponding author: tehaniraji@gmail.com*



THE POLITICS OF SHARING AND CARING: SRI LANKAN WOMEN'S GROUPS ON SOCIAL MEDIA

*R.L.A.N. Ranaweera**

Department of Language Studies, The Open University of Sri Lanka

Social media groups devoted to motherhood and domesticity are a relatively new phenomenon in Sri Lanka. I intend to observe a few such Sri Lankan social media groups as repositories of advice and communal knowledge. My objective in this study would be to question how women in Sri Lanka negotiate their identities as women and sometimes as mothers within these social media groups in a backdrop of global neoliberal and post-feminist trends. I would attempt to view these groups with Laurent Berlant's concept of an "intimate public" in mind. A key question I hope to raise in this study is whether the issues and challenges related to women and domesticity are seen as political and socially relevant or whether they are perceived as non-political and personal. What does it mean to "belong" to an "intimate public" which claims to "support" women particularly in the sphere of housekeeping and home making? How does one show one's allegiance to the values of this group/s, what are the affective/emotional cues employed? Is there always assent to these values? To find answers, I hope to engage with the theorizations of Akane Kanai and Amy Dobson in their works on affect, celebrity cultures and online women's communities globally, and hope to align my work with the contemplations of Laurent Berlant, Angela McRobbie and Rosalind Gill, paying attention to how the discourse of optimism and individualization intersects with the post-feminist insistence on a "perfect" woman making a "good life" for herself within these posts. I claim that the tendency to see issues related to women as "personal" demonstrates a process of depoliticization and shift of focus from systemic inequalities and structural flaws.

Keywords: Affect, Digital intimacies, Perfection, Post feminism

*Corresponding author: rlara@ou.ac.lk



PROFESSIONAL AND WORK BASE KNOWLEDGE SHARING HABITS AMONG THE LIBRARY STAFF: A CASE STUDY OF THE OPEN UNIVERSITY OF SRI LANKA (OUSL)

T.S. Nanayakkara* , P.K.M. Kaushamalika

The Open University of Sri Lanka

In early decades land, labour and the capital were considered as the significant source of value and it was transferred in to knowledge with the time. Capturing knowledge for organization existence is a vital part of the current organizations to move towards. This study adopted the survey method aiming to identify the knowledge sharing habits among the staff at OUSL Library, identify the barriers that affect the knowledge sharing habits among the staff at OUSL and to assess their opinion about the consequences of Knowledge sharing. The study was conducted as a descriptive survey using administered questionnaire distributed as a google form. Total population sampling (n=53) was carried out which yielded a response rate of 64%. Descriptive statistics were used to interpret result. It was revealed that majority 56% which falls in to female age 31-40 were Para-Professional staff and (93.1%) they have already followed the professional course in library science. As a habit majority 58.3% prefer to share their professional knowledge in person to person in often. While 96.6% agreed that their knowledge is important to others and 82.8% always prefer to share their work-based knowledge. They (100%) value unity, teamwork and 86.20% willing to listen to other opinion. They (69%) feel comfortable when sharing experiences with others and 27.6% think that meetings are the most suitable way to share the work base knowledge as a habit. The main barrier that affected to knowledge sharing habits is 24.1% staff unsatisfied with the rewards given to them and 58% valuing the trust as important factor when sharing knowledge as a habit.

Keywords: Knowledge management, Knowledge sharing habits, Knowledge, Open University of Sri Lanka

*Corresponding author: tineshasn@gmail.com



**AIR MOBILITY, TEN HEADS AND UNIVERSAL AUTHORITY:
EXPLORATORY STUDY OF KING RAVANA IN THE FOLKTALES OF
SABARAGAMUWA**

*L. Medawattegedara**

Department of Language Studies, The Open University of Sri Lanka

King Ravana has already attained a cult status in modern Sri Lanka owing to a resurgence of texts about the legendary king that suddenly flooded the bookshops as well as articles that saturated the media. Yet, unseen by this phenomenon, a folktale collection focusing on Ravana was released for public consumption by Gunasekera Gunasoma under the titled *Sabaragamuwa Ravana Jana Katha* (Ravana Folktales of the Sabaragamuwa Region). This study undertakes a re-reading of these folktales using the folkloric postulate of ‘folk ideas’ in order to locate what these tales attempt to achieve in its narrative context and what these tales might mean to an ordinary tale teller/listener. By locating the ‘folk ideas’ implicitly embedded in the tales and also reading the ‘silences’ that articulate themselves in texts that are in public circulation, this study makes an exploratory study of the tales as a harbinger to an extensive study of the tales to locate what they might narrate (and not narrate) about the national disposition of the nation.

Keywords: Folk Ideas, Folktales, Narrative Context, National Disposition, Silences

*Corresponding author: lmeda@ou.ac.lk



SINHALA VERSION OF THE FIVE FACET MINDFULNESS QUESTIONNAIRE (FFMQ-39-SIN): CONTENT VALIDATION THROUGH EXPERT JUDGEMENT AND INTERNAL CONSISTENCY

N.O. Outschoorn^{1*}, H.M.J.C. Herath², S.D. Amarasuriya³

¹*Research Promotion and Facilitation Center (RPFC), Faculty of Medicine, University of Colombo, Sri Lanka*

²*Department of Social Science Education, Faculty of Education, University of Colombo, Sri Lanka*

³*Department of Medical Humanities, Faculty of Medicine, University of Colombo, Sri Lanka*

Mindfulness is a concept deeply rooted in the Eastern philosophy of Buddhism and is currently used in psychotherapeutic interventions to enhance psychological health. The Five Facet Mindfulness Questionnaire (FFMQ-39) is a psychometric tool which quantifies mindfulness and consists of five subscales: *observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience*. The current study aimed at adapting and validating the FFMQ-39 to the Sri Lankan context by ensuring its face, consensual and content validity and internal consistency reliability. Backward and forward translation and Delphi processes were conducted to ensure the face content and consensual validity of the FFMQ-39. The resulting set of items were then pre-tested and the Sinhala version of the FFMQ-39 (FFMQ-39-SIN) was developed. Upon providing informed consent, a community sample of 50 individuals (males; n=27) whose age ranged from 27-62 ($M=42.22$, $SD=9.76$) years of age completed the FFMQ-39-SIN and a demographic details form. The internal consistency reliability was explored by calculating the Cronbach's alpha coefficients. IBM Statistical Package for Social Sciences (SPSS) version 23 was used for quantitative data analysis. The translation, Delphi and the pre-testing processes highlighted the need for altering and simplifying certain phrases/words in order to enhance conceptual and linguistic clarity of the items as well as phrasing certain items in a way that conceptual and cultural coherence is ensured. The time spent on completing the FFMQ-39-SIN was recorded to be between 8-19 minutes as indicated by the pre-test process. In terms of internal consistency, Cronbach's alpha levels for the five subscales and the overall scale was reported to be acceptable ($>.70$); *observing* =.81, *describing* =.77, *acting with awareness* =.92, *non-judging of inner experiences* =.83, *non-reactivity to inner experiences* =.82 and overall scale =.91, thus indicating the FFMQ-39-SIN to show good internal consistency reliability. Current study findings indicate the FFMQ-39-SIN to be an instrument with face, content and consensual validity and internal consistency reliability.

Keywords: Cross-cultural validation, Delphi process, FFMQ-39, FFMQ-39-SIN Mindfulness

**Corresponding author: nicholenho@gmail.com*



A SYSTEMATIC REVIEW OF THE FUNDAMENTAL THEORIES ON WORK-LIFE BALANCE WITH SPECIAL REFERENCE TO SRI LANKAN CONTEXT

W.N. Sellaheewa^{1*}, T.D. Samarasinghe²

¹Uva Wellassa University, Sri Lanka

²Sabaragamuwa University of Sri Lanka

The intersection of work and family research is fundamentally challenged by the lack of a commonly accepted basic theoretical framework and key constructs. No single prevailing framework or perspective is universally accepted. The academic body of knowledge regarding work-family relationship relies on a variety of theoretical frameworks, which include segmentation, enrichment, facilitation, spillover, social identity, compensation, congruence, conflict, human capital, instrumental, conservation of resources, border, integration and ladder theories. There has been enough attention on the balancing of work life and personal life. However, lesser attention has been given to consolidate the existing literature on work life balance (WLB). This study therefore addresses this knowledge gap. Accordingly, in this study, attempts have been made to consolidate and review the fundamental theoretical propositions existing in the field of work-family research with particular emphasis on WLB. Therefore, the core objective of this study is to review the existing fundamental literature on work-life balance. Relevant articles published in between 1960 to 2021 were identified using online searches using the keywords such as work-like balance, segmentation, enrichment, facilitation, spillover, compensation, and conflict, etc. The major conceptual frameworks pertaining to work and life domains included in this study are segmentation, enrichment, facilitation, spillover, compensation, conflict, instrumental and ladder theories with adequate descriptions.

Keywords: Concepts in WLB, WLB theories, Work-life balance

**Corresponding author: wasanansellaheewa@gmail.com*



FAST FOOD CONSUMPTION AMONG THE ADVANCED LEVEL SCHOOL STUDENTS IN HATTON IN THE DISTRICT OF NUWARA ELIYA

M. Krishnasoban^{1*}, M. Niroshi², M. Indralavaniya³

¹Department of Geography, University of Colombo, Sri Lanka

²Department of Bio System Technology, Uva Wellassa University of Sri Lanka

³Sri Pada National College of Education, Patana, Sri Lanka

Food is the most precious energy supplement for all human being. but Today's world has been altered to a system of consumption of fast food, which have immensely popular among the school students. In other hand, unhealthy fast food has several adverse effects on health. The main objective of this study is to find the main contributory factor, which made to consume the fast food and to identify the health issues among the school students. To explore this study, a well-structured questionnaire survey was carried out among advanced level students who were affected by fast food consumption in Hatton from Nuwara Eliya district. Purposive sampling method was used to select the hundred (100) affected students to the study and the data collection method was done via Google Form to collect the primary data. All the outcomes were analyzed through MS-Excel. According to the Maslow's Hierarchy of Needs, food is a primary need to human being, and it's required the most immediate satisfaction. Today, the new generations' lifestyles are being strongly connected with fast food. Thus, they couldn't retard the consumption of fast food. This study shows that the fast food contains a high concentration of saturated fat, high content of calories and sodium which lead to obesity (21%), dental decay (18%), pimple or acne (16%), lose their concentration in the studies (14%), digestive problem (9%), headache (6%) and fatigue (4%). Health issues related to fast food consumption have been gathered by students' own experience who participated in the survey. In addition to this, this study gives some recommendations, such as; schools should make awareness about healthy food, should make understand about the negative effect of fast food, asking students to bring healthy foods from home, making a trend to make homemade versions same as fast food, also parents must prepare a well- balanced diet to minimize the health issues on the fast food consumption.

Keywords: Advanced Level Students, Fast food, Hatton, Maslow Maslow's Hierarchy of Needs

**Corresponding author: krishnasoban1@gmail.com*



THE IMPACT OF EMOTIONAL MATURITY ON THE SELF-ESTEEM: A STUDY OF SECOND-YEAR TAMIL MEDIUM STUDENTS OF ARTS FACULTY, UNIVERSITY OF COLOMBO

T. Mithilaimaran^{1*}, N. Pasdevan¹, H. Ghazy², M. Krishnasoban³

¹Department of Sociology, University of Colombo, Sri Lanka

²Department of International Relations, University of Colombo, Sri Lanka

³Department of Geography, University of Colombo, Sri Lanka

Life is becoming complex day by day. In the present circumstances, the undergraduate students are facing difficulties that are giving rise to many issues such as, tension, anxiety, emotional imbalance in everyday life. An emotion is an affective experience that accompanies stirred up mental and psychological states show itself in overt behaviour maturity is the ability to stick with a project or situation until it is finished. Therefore, emotional maturity is a requirement for starting and maintaining a relationship. Self-esteem is a feeling of personal worth influenced by performance, abilities, appearance, and adjustment of significant others. Therefore, the impact of emotional maturity on young people's self-esteem will continue in the future. Based on some recent incidents which we have seen among undergraduate students & know their opinion on the impact of emotional maturity on self-esteem among Colombo University Arts faculty undergraduate students. The research sample was selected from 30 undergraduates representing the second-year Tamil medium students of the University of Colombo. This research was administrated through quantitative data collection methods SPSS and MS-Excel applications were used to analyse the data to identify the main thing about emotional maturity level through their self-esteem and collect opinions about the impact of emotional maturity on self-esteem. According to this study, we have identified some factors that lots of students didn't accept themselves as emotionally mature. Because every human being is created by emotions and feelings. Therefore, each of us unknowingly expresses emotions through some unexpected ways, so the impact of particularly acute among Colombo University art faculty's second-year students as evidence by their responses. It is also noteworthy that many students don't accept themselves as emotionally mature. So the study concludes that education, status, or age don't determine a person's emotional maturity.

Keywords: Emotional maturity, Self-esteem, Undergraduate

**Corresponding author: mithilaimaran@gmail.com*



A SOCIOLOGICAL ANALYSIS ON THE URBAN SCHOOL EDUCATION SECTOR AND THE REPRODUCTION OF SOCIAL INEQUALITY: A CASE STUDY

P.K.G.I.L. Ranasinghe*

The Open University of Sri Lanka

Education is an activity which continues in a society. The aims and methods of education depend on the nature of the society in which it takes place. The Asian subcontinent is home to almost half of the urban population in the world and the majority of them belong to shanty and slum communities living under impoverished conditions. The importance of studying the above research topic is clear. Whether the urban schools reproduce social inequality in Sri Lankan state school education system is the research problem of this study carried out with the main objective of identifying the nature of social inequality reproduced by the state urban school education sector in Sri Lanka. This is a qualitative analysis which employed purposive sampling. Interviews were conducted in order to collect data and the data were analyzed using the thematic analysis. Researchers and educationists use the term 'urban' to introduce black, brown and poor students. Some others use the term 'urban' to refer to large districts, or schools which are located near a central city or schools which have comparatively high rates of exam failures, less parental involvement or high rates of teacher inactiveness. In Sri Lanka, state education is state funded and offered free of charge at all levels. Further, in addition to the government schools, there are non-fee levying private schools and fee-levying autonomous private schools. Urban education has unique characteristics which go in line with the unique characteristics of cities and it has a considerable impact on the education of urban schools. Urban public schools face issues of drug and alcohol abuse, violence, crime in the surrounding communities and family issues while they often result in psychological impacts such as lowered self-esteem and feelings of hopelessness in children and youth. Different aspects of urban education can be identified and analyzed according to different sociological perspectives. Students in urban schools may need different types of support to facilitate their learning as they represent different cultures, ethnicities and socio-economic groups, or else they would experience inequalities within the education system tied to their social classes, sub-cultures and ways of life etc. in urban schools.

Keywords: Education, Inequality, Social Classes, Sub-Cultures, Urban Schools

*Corresponding author: lavangi92.ranasinghe@gmail.com



IDENTIFYING AN EPIDEMIC-RESISTANT THEATRE TO AVOID SHUTTING DOWN THEATRE DURING A PANDEMIC

C.P. Gunamunige*

Department of Fine Arts, Faculty of Arts, University of Peradeniya, Sri Lanka

The decision to shut down all theatres with the outbreak of the “Covid 19” pandemic caused a severe setback in the world theatre. According to the “SDA Bocconi School of Management” in Italy, by 2020, the performing arts production in Europe has reduced by half compared to 2019. The absence of the theatre for the theatre lovers will be more detrimental than the negative financial impact. The aim of this research is to identify an epidemic-resistant theatre model to avoid the closure of theatres in a future epidemic. Scientific findings about the Covid 19, historical investigations of the ancient Greek theatre and contemporary research regarding to covid situation and theatre are based on this research. This study found that theatres attempt to rearrange seats in a way that would preserve social distance. The German theater ‘The Schiffbauerdamm’ is a prime example of that. According to the ongoing investigations about Covid 19, the epidemic is more likely to spread in a closed environment than outdoors. This scientific research confirms that staging a play in a theater can spread the virus, even if the seats are arranged with social distance. Thus, using open space to stage a play would be safer than inside a theatre. Some research has been found that the theatre was kept open even during the plague of Athens around 430 BC. The people of Athens who believed that poetry had healing power, had built a hospital next to the historic Dionysus theatre during the plague. These findings showed that it is possible to be staged a play hygienically even during the plague in the Greek open theatre, which is interacting with the natural environment. These huge Greek theatres are also safe places to keep the social distance. So, this research identified establishing such theatres that have already been set up in Sri Lanka and adopting this model for new theatres to continue the theatres without shutting down in a future epidemic situation.

Keywords: Ancient Greek Theatre, Covid 19, Open theatre architecture, Pandemic, Theatre

*Corresponding author: priyanka.chamila@gmail.com



NEED ANALYSIS FOR DEVELOPING THE ESP COURSE OF THE ENGINEERING TECHNOLOGY UNDERGRADUATES OF UNIVERSITY OF KELANIYA

S. Galagoda*

Department of English Language Teaching, University of Kelaniya

Needs analysis can be considered as a vital asset to identify the learners' needs and to determine the areas that the learners lack. This present study investigates the needs of English language learning and the perceptions of the Engineering Technology (ET) undergraduates for their English for Specific course (ESP): English for the interns. Principally, it focuses on the difficulties faced by the ET undergraduates learning four languages skills through the ESP course and the students' recommendation for the development of the course. The sample of the study comprised of twenty-eight second-year undergraduates who are majoring in Engineering Technology at the faculty of computing and technology of University of Kelaniya. The data of the research were collected using an online survey. A mixed-methods research design was employed. A questionnaire was used to investigate the needs of the students on their ESP course and subsequently, a semi-structured interview was conducted to get the students' overall idea regarding the ESP course. The findings reveal that there is a higher demand to improve productive skills rather than receptive skills among the students.

Keywords: Engineering Technology students' perspective, English for specific purposes (ESP), ESP curriculum revision, Needs Analysis

*Corresponding author: sachinagalagoda19@gmail.com



THE PATTINI WORSHIPPING CULT AND INDIGENOUS APPROACH TO NEGOTIATING NATURAL DISASTERS IN SRI LANKA

*A. Piyarathne**

Department of Social Studies, The Open University of Sri Lanka

In a context like today, where the entire world is struggling to live a social life while taking all the precautions to get out of the contraction of the Covid-19 virus, people around the world seek to get support from indigenous knowledge. The Sri Lankans try to practice a range of methods from using boiled herbs to perform various religious rituals some of which are sponsored at the state level as well. In this context this paper highlights, how the folk religious practices contributed to save lives of the people living in a peripheral remote village during the Asian Tsunami in 2004. The human body is not just a biological entity but also encompasses history, tradition, culture and heritage which help people to understand the risks and how to deal with them. In this context, the current paper explains how folk religious practices of ordinary villagers living in the eastern coast of Sri Lanka have contributed to cope with the Tsunami in 2004. This research paper is based on a theme identified during an ethnographic fieldwork conducted on ethnic and religious dimensions in shaping everyday social lifeworlds in the rural village of Pānama between 2010 and 2012. The paper will detail how the villagers were protected by the goddess Pattini during various disastrous situations in general and Tsunami in particular. In general, people of the eastern coast are a group of traditional believers in goddess Pattini, a goddess of prosperity (including the security or protection and sustainability as well), who cares for them. Their everyday social lifeworlds are shaped by the said belief system enriched by folk religious traditions. The goddess Pattini has appeared in dreams of a few holy people in the village and warned about a precarious situation in the future. This led the entire villagers to gather in the village shrine room, Ampitiya devālaya and perform rituals which were an awareness creation and planning to reduce the risks of the community that ultimately saved their lives.

Keywords: Embodiment of culture, Folk religious practices, Pattini cult, Pre-warning of the disasters

**Corresponding author: apiya@ou.ac.lk*



LAW



IS THERE A DUTY ON STATES TO PREVENT THE SPREAD OF COVID 19 VIRUS? REFLECTIONS ON THE APPLICABILITY OF INTERNATIONAL LAW PRINCIPLES ON STATE RESPONSIBILITY

K.A.A.N. Thilakarathna* , D.G.C.N. Bandara

Institute of Human Resource Advancement, University of Colombo, Sri Lanka

The Covid-19 pandemic has changed the world as we know it. Hundreds of millions of people have been infected and several million have died as a result of the virus which is unprecedented in the history of the humankind. Amidst this chaos, States as sovereign entities has the primary obligation of stopping the spread of the virus both within and outside its territorial limits. While transboundary environmental pollution was recognized as imposing liability upon a State found in breach of its international obligations with regard to the protection of the environment, there is a need to engage in a discussion as to how a State should be held responsible for failing to take adequate measures to stop the spread of the virus under international law. International responsibility of a State can be recognized as something which imposes an obligation upon a State for a breach of international law. However, the law relating to international responsibility of a State is not well defined either under international treaties or through principles of customary international law (CIL). Using a qualitative method by employing the doctrinal approach, this study aims at critically evaluating the current legal status quo regarding the international responsibility of a State to stop the spread of the Covid-19 virus. The results reveal that, the existing framework on State responsibility related to eliminating the spread of the virus, it can be linked with the international law obligations arising out of international human rights treaties related to health and international cooperation in particular. Accordingly, where States fail to take measures as required according to the international standards related to eliminating the spread of the virus, it can be argued that such States will fail to fulfill their obligations under international law and hence responsible for their breaches. Therefore, it is concluded that, under the existing legal norms of international law each State has a responsibility to stop the spread of the Covid-19 virus.

Keywords: Covid-19, International law, State responsibility

**Corresponding author: nuwanthilakarathna23@gmail.com*



BACK TO THE KINGS' ERA: IMPLEMENTING MORE SEVERE PUNISHMENTS OTHER THAN THE PUNISHMENT OF HANGING AS DEATH PENALTY IN SRI LANKA

*E.M.N. Perera**

Sri Lanka Law College

According to Dr. Talagala, Death Penalty has a long history in Sri Lanka, and it dates back to ancient Sinhalese kings' era. The term Death Penalty, in other words Capital Punishment, defines according to Oxford Dictionary as "a method of punishing people who committed more severe crimes and the punishment results in death." The main aim of this research study is to prevent future crimes of Sri Lanka by going through the other jurisdictions in the world that gives severe punishments other than the punishment of hanging as death penalty, which is similar to the punishments of the ancient Sri Lankan system. Therefore, this research study elaborates about the ancient punishments that was given in the ancient time as death penalty and the punishments that are giving in the 21st century by the other countries as death penalty. Also, the objective of this research study is to identify whether it is appropriate to implement more severe punishments as death penalty to the Sri Lankan system. The Methodology that was used for this research study is the qualitative research method. Under the qualitative research method data has been collected through primary and secondary sources. Primary sources consist of national laws in Sri Lanka such as Criminal Procedure Code, Penal code of Sri Lanka etc. and other human rights laws such as International Covenant on Civil and Political Rights, Universal Declaration of Human Rights etc. Further, secondary data has taken from published books, e-journals, e-books, reports and conference proceedings etc. finally, it will discuss about the Buddhist countries that have implement severe punishments as death penalty to reduce their crime rate and through that it will recommend that some Buddhist countries reduce their crime rate by implementing severe punishments as death penalty even though it has many controversies.

Keywords: 21st Century Punishments, Ancient Punishments, Buddhist Countries, Controversies, Death Penalty, Severe Punishments, Sri Lanka

*Corresponding author: naminip93@gmail.com



MANAGEMENT



**INFLUENCE OF THE ORGANIZATIONAL CULTURE ON
MOTIVATION OF NON-MANAGERIAL EMPLOYEES (WITH
SPECIAL REFERENCE TO RANPA FOOTWEAR MANUFACTURING
COMPANY)**

W.L.B. Madushani*

*Department of Business Administration, University of Sri Jayewardenepura,
Sri Lanka*

The success and growth of an organization depends on how effectively and efficiently its employees perform. Similarly, its culture is a means by which employees learn and communicate what is acceptable or unacceptable in an organization in the light of its values and norms. This study was conducted with the core objective of investigating the influence of organizational culture on employee motivation. Furthermore, this study focused on the secondary objective; of identifying the existing characteristics such as leadership, communication and coordination process and equality of the organizational culture. Interviews were used as the method of data collection in this investigation which took a qualitative research approach. Thematic analysis was the technique used for the data analysis. The sample of the study was 8 non-managerial employees working in different factory sections of Ranpa Footwear (Pvt) Ltd. The findings were discussed and developed under three main themes emerging from the collected data in order to answer the research questions. The three themes discussed in the analysis are how leadership influences the employee motivation, how the communication and coordination process leads to the motivation of the employees and how the equal treatment of the employees results in their motivation. The study emphasized the influence of the organizational culture on employee motivation at Ranpa Footwear (Pvt) Ltd. based on the above themes. Similarly, the study showed that the cultural elements discussed under the above themes have a significant influence on the employee motivation. Therefore, the study concluded that the culture of the Ranpa factory, as a whole had a great positive influence on deciding the motivational level of its employees.

Keywords: Employee motivation, Factory workers, Organization cultural elements, Organizational culture

**Corresponding author: madu1995711@gmail.com*



DETERMINANTS OF WORK–LIFE BALANCE AMONG BANKING PROFESSIONALS: AN INQUIRY INTO A PRIVATE BANK IN SRI LANKA

H.G.G. Upeksha , A.A.I. Lakmali*

Faculty of Management Studies, The Open University of Sri Lanka

The main purpose of this study was to explore the determinants of work-family balance among the banking professionals working in the head office of a private bank in Sri Lanka. Though work-life balance has been addressed in many sectors in Sri Lanka, most studies are quantitative in nature while little attention has been paid to the banking professionals in Sri Lankan private banks. This creates the necessity of exploring the determinants of work-life balance manifested by the real experience of private sector banking professionals. Thus, an interpretive phenomenological approach (IPA) was adopted for this study. The sample, selected based on the purposive sampling technique, was 10 executive-level employees, 5 females and 5 males working in the head office of the chosen Sri Lankan private bank. All the participants are married and have children. Semi-structured interviews were carried out for the data collection and the data were manually coded. Thematic analysis was employed to analyse the data and the findings were categorized into three sections: self-management, family, and work. Ability to prioritize tasks, level of commitment to work, preference to delegate work, relationship management skills were the self-management aspects mentioned by the respondents while support from the spouse, spouse's job/profession, extended family support, and communication with the family were identified as the family-related determinants of work-life balance. Furthermore, the support from the immediate boss, support from colleagues, job role and position as well as working schedules were identified as important work-related factors. This study makes a theoretical contribution by identifying a three-factor model of work-life balance in the context of the banking industry in Sri Lanka. Moreover, this provides implications regarding the aspects that need to be considered by the human resource policymakers and practitioners of the bank when preparing future work-related policies and procedures.

Keywords: Banking professionals, Sri Lanka, Work-life balance

**Corresponding author: garufb@gmail.com*



**IMPACT OF PAY SATISFACTION ON EMPLOYEE PERFORMANCE:
A STUDY BASED ON THE DEPARTMENT OF ANIMAL
PRODUCTION AND HEALTH, PERADENIYA**

M.U. Sanjeevani, J.M.A.N.K. Jayaweera*

Faculty of Management Studies, The Open University of Sri Lanka

The study aimed at determining the impact of pay satisfaction on employee performance at the Department of Animal Production and Health. Employee performance which refers to how workers behave in a workplace and how they perform or react to their assigned job duties is the most important concept in human resource management in an organization. Pay is one of the vital factors that directly affects employee performance, productivity and motivation. This study closely looked at the following dimensions: satisfaction with pay level, satisfaction with pay benefits, satisfaction with pay raises, and satisfaction with pay structure/administration. The main objectives of this study were to examine the impact of pay level, pay benefits, pay raises and pay structure/administration on employee satisfaction leading to their performance in the Department of Animal Production and Health. This study employed a simple random sampling technique and out of the 170 middle-level managerial employees, 118 employees were selected as a sample for the study using the Morgan Table. The study achieved a response rate of 94%. The dependent variable and independent variables were tested with a structured questionnaire through survey method, and they were statistically investigated using descriptive analysis, correlation, and multiple regression analysis using the Statistical Package of Social Science (SPSS 21 version). The major finding of the study was that employee satisfaction with pay structure/administration has a significant impact on employee performance. Furthermore, the study revealed that there is no significant impact of satisfaction resulting from pay level, pay benefits and pay raises on employee performance. According to the findings of the study, the most useful dimension of pay satisfaction in the Department of Animal Production and Health is pay structure/administration.

Keywords: Employee performance, Pay satisfaction, Satisfaction with pay benefits, Satisfaction with pay level, Satisfaction with pay raises, Satisfaction with pay structure/administration.

**Corresponding author: upekshasanjeevani06@gmail.com*



THE IMPACT OF THE CHANGE IN THE WORK ENVIRONMENT ON EMPLOYEE ENGAGEMENT: TEACHERS WORKING FROM HOME DURING THE PANDEMIC IN SRI LANKA

*L.P.D. De Silva**

Department of Management, The Open University of Sri Lanka

COVID-19 caused an unprecedented pandemonium in human lives around the world in 2020. It was necessary to impose lockdowns to mitigate the outbreak which affected many industries, including the education sector. Employees were encouraged to work from home to ease their lives, as businesses and national economies received a severe blow with this closure. The new environment was a different experience for many employers. It produced unique challenges in engaging employees and ensuring their satisfaction and motivation when working under lockdown conditions. With the new restrictions, the employees faced creative challenges while struggling to maintain their performance in stressful situations. It was particularly challenging for teachers to adapt to the new work environment in the educational system. Their work environment and relationship with the students significantly influence their engagement. Therefore, the present study investigated how the change in the work environment has affected the employee engagement by addressing job satisfaction and motivation. As the qualitative approach was selected, twenty-five secondary teachers from ten non-government schools in Western Province were interviewed to gather in-depth information. In the study, teachers were considered the employees and the school board the employer; students characterize customers while the classroom environment is the normal environment and online teaching is the new normal environment. Data were analyzed using thematic analysis, and in the current study, Herzberg's two-factor theory was applied. Relationships with others and working conditions were identified as central themes of this research. The study indicated a strong correlation between the normal environment and the engagement of teachers. In contrast, when teaching from home, a negative correlation affecting their engagement level due to the lack of satisfaction and motivation was observed. The research was concluded with qualitative findings that tend to drive the employees when hygiene factors are met to an agreeable extent. But when the work environment changes adversely, such as in a lockdown situation, the hygiene factors also vary accordingly, causing increased frustration which takes away the motivation for many.

Keywords: Employee engagement, Job satisfaction, Motivation, New normal environment, Normal environment, Working environment

**Corresponding author: s14003367@ousl.lk*



FEELINGS OF FINANCIAL GUILT: EXPLORING THE FACTORS THAT INFLUENCE FINANCIAL GUILT DURING THE COVID-19 PANDEMIC

A.M.D.S. Jayawardhana^{1}, R.H.A.T. Perera¹, N. Abeysekara²*

¹Department of Human Resource Management, ²Department of Marketing Management, The Open University of Sri Lanka

COVID-19 is a global health crisis, but it has also severely affected the global economic and financial spheres. Lingering economic pain and perceived risk of a shortage in goods and services experienced by the consumers have changed their buying patterns drastically. As a result, people have been led to a state where they are currently purchasing items based on three needs: to protect, to entertain and to connect. Thereby, feelings of financial guilt associated with the consumers' purchasing decisions appear to grow during this period of uneven economic recovery. This study analysed the impact of this phenomenon on the financial guilt experienced by the consumers in the Sri Lankan market context amidst the COVID-19 pandemic. The purpose of this research was to identify the relationship between four independent variables of guilt; purchase, non-purchase, on-self and others guilt on the dependent variable which is the consumers' financial guilt. A quantitative methodology with convenient sampling techniques was used for this study and the responses were gathered via a google form survey questionnaire distributed among a sample of 102 consumers residing in the three districts of the Western Province of Sri Lanka. The questionnaire was created considering the new normal buying behaviour of consumers during the pandemic. Hence, methods of buying, methods of payment, time lag between the purchases and prioritizing goods and services between the consumer needs were few areas that were given the prominence. Accordingly, the results showed that there is a significant positive relationship between the consumer financial guilt and their purchase behaviour. Moreover, the analysis indicated a positive relationship between the other variables considered; non purchase guilt, on-self guilt and others guilt on the ultimate financial guilt experienced by the consumers.

Keywords: Financial Guilt, Non-purchase Guilt, On-self Guilt, Others Guilt, Purchase Guilt

**Corresponding author: amjay@ou.ac.lk*



KNOWLEDGE, PRACTICES AND ISSUES OF SOLID WASTE MANAGEMENT: A QUALITATIVE STUDY IN KULIYAPITIYA PRADESHIYA SABHA AREA

*A. Pallegedara**

Department of Industrial Management, Wayamba university of Sri Lanka

United Nations (UN) introduced Sustainable Development Goals (SDGs) to support the development challenges faced by its member countries. Achieving SDGs by 2030 is a global challenge for every nation. As a lower middle-income country, Sri Lanka has to engage in various activities to achieve the targets of SDGs. The target 5 of SDG Goal 12: “substantially reduce waste generation through prevention, reduction, recycling and reuse (3R)”, aims to reduce waste and manage waste efficiently in all countries. With the continuous growth of solid waste owing to accelerated urbanization and increased population, effective waste management is one of the most important development challenges facing Sri Lanka. This study explores knowledge, practices and issues of solid waste management among selected waste generators and waste collectors in Kuliypitiya Pradeshiya Sabha area. A qualitative study was conducted using in- depth interviews with selected retail merchants and local government waste collection workers. The observational field notes and recorded interview transcripts were analyzed using content analysis. The findings indicated that all retail merchants have the knowledge of waste management activities. Most retail merchants practice proper waste disposal methods. For instance, they segregate waste into biodegradable waste and polythene/plastic waste using separate waste bins and bags. However, there are some existing issues in waste collection by local government, especially due to the lack of resources such as equipment, vehicles and workers. In order to overcome the identified issues in waste management, local government should enforce rules and regulations and introduce informational awareness campaigns. In addition to the efforts of the local government, the central government should also provide financial support to purchase necessary equipment and logistics facilities, and to employ more workers for effective waste management practices.

Keywords: Qualitative analysis, Solid waste management, Waste collectors, Waste disposal

**Corresponding author: asankap@wyb.ac.lk*



IMPACT OF EMPLOYEE RETENTION STRATEGIES ON EMPLOYEE TURNOVER: A CASE STUDY OF AN INTERNATIONAL SCHOOL IN SRI LANKA

G.V.P. Ramachandran* , R.H.A.T. Perera

Department of Marketing Management, The Open University of Sri Lanka

Encouraging employees to remain in the organization for a long period of time can be termed as employee retention. It is a process in which the employees are encouraged to remain with the organization for a maximum period of time or until the completion of the project. The general objective of the study is to assess the impact of employee retention strategies on employee turnover. The study was guided by the specific objective to identify the relationship between retention strategies and employee turnover, furthermore the researcher attempted to explore the possible ways of reducing employee turnover. The independent variable is employee retention strategies and the dependent variable is employee turnover. employee retention strategies have four key dimensions such as compensation; rewards and recognition; participation in decision making; and training and development. The sample for the study is 86 employees working at an international school. Convenience sampling method was used to collect the data in this study. Primary data was collected using a structured questionnaire. The study found out that the international school was experiencing high cases of employee turnover and research findings prove that there is a significant negative relationship between employee retention strategies and employee turnover. Most respondents indicated that lack of retention strategies affected the turnover intention. The study concludes with identified causes for employee turnover that impacted negatively on employee retention; namely, lack of compensation, lack of rewards and recognition made, having no space for participation in decision making and lack of training and development.

Keywords: Compensation, Employee Turnover, Participation in Decision Making, Rewards and Recognition, Training and Development

**Corresponding author: shenusaranya95@gmail.com*



FACTORS INFLUENCING CUSTOMER SATISFACTION OF CEYLINCO GENERAL INSURANCE MOTOR POLICY: SPECIAL REFERENCE TO WESTERN PROVINCE IN SRI LANKA

R.A.M. Madumanjalee* , R.H.A.T. Perera

Faculty of Management Studies, the Open University of Sri Lanka

Insurance is a social device to reduce or eliminate risk of life and property. Under an insurance plans, people share risks, that they may not be able to face on their own. The main objective of this research is to identify the factors that influence customer satisfaction in Ceylinco General Insurance Motor Policy. The population of this study was the motor insurance policy holders in the Western Province. Quantitative methodologies utilizing convenient sampling techniques have been used for this study and responses were gathered via a Google form survey questionnaire distributed among a sample of 100 motor policy holders residing in the three districts of the Western Province of Sri Lanka. Structured questionnaire was used to collect the primary data and the data analyzed by using SPSS software package to examine the customer satisfaction of the motor insurance. According to this result, responsiveness is highly influence to the customer satisfaction and assurance and reliability factors highly influence to the customer satisfaction compare with other factors. Further Pearson correlation test found that customer satisfaction is being very strongly correlated with reliability and responsiveness and strongly correlated with tangibility. However moderately correlated with empathy and assurance.

Keywords: Assurance, Customer Satisfaction, Empathy Motor insurance, Reliability, Responsiveness, Tangibility

**Corresponding author: mmadumanjalee@yahoo.com*



EMOTIONAL INTELLIGENCE AS A MODERATOR ON THE STRESS-PERFORMANCE RELATIONSHIP

W.D.N.S.M. Tennakoon^{1*}, W.K.D. Ariyaratne²

¹*Department of Business Management, Wayamba University of Sri Lanka,*

²*Ceylon Electricity Board, Sri Lanka*

Occupational Stress (OS) is a universal phenomenon that almost all employees of any capacity undergo. Analysis of the negative effects of OS showed deterioration in Employee Performance (EP), which is a critical concern of both practitioners and researchers. Emotional Intelligence (EI), a powerful inner property of individuals, has been tested for significance at harmonizing the negative mental and physical processes at work. Thus, the motive of the present study is to examine the effect of EI on the relationship between EP and OS. Following the deductive research approach, a quantitative inquiry of the research problem was performed. The field survey of Technical Officers of Ceylon Electricity Board of Sri Lanka generated 141 valid responses. Pre-tested standardized instruments captured the responses on a five-point Likert scale. Univariate, bivariate, and multivariate techniques were used for the analysis of data while hypotheses testing was based on the result of the multiple regression analysis. The results indicated that EI has a greater potential to affect the association between OS and EP. The positive effect of EI shortens the negative effect of OS on the EP. Out of the two key drives of OS, only the time pressure was found to have a negative effect on EP, suggesting that the job of the technical officers is not balanced across the demands of the role. The study implications are critical for two reasons. First, they rectify the long-established association between OS and EP in the context of the Utility sector which was not addressed by the previous researchers. Second, they offer direct evidence of the power of EI as a moderator to the existing relationship between OS and EP. Incorporation of other possible intervening variables and deployment of other methodological options such as qualitative or mixed approaches to the research design are proposed as the future research directions. The study stresses the upliftment of EI of employees as an alternative arm of managing OS while all the other conventional approaches to address the OS are also given a top concern by the governors of human capital.

Keywords: Emotional Intelligence, Employee Performance, Occupational Stress, Time Pressure, Utility Sector, Work Overload,

**Corresponding author: tennakoon@wyb.ac.lk*



NEXUS OF RELATIONSHIPS AMONG EMOTIONAL INTELLIGENCE EXPERTISE, PERCEIVED ORGANIZATIONAL SUPPORTIVENESS AND INNOVATIVE WORK BEHAVIOR: A RESEARCH IDEA

W.A.D.W.R Wijesooriya^{*}, M.P.N. Janadari

Department of Human Resource Management, University of Kelaniya, Sri Lanka

Globalization, individualized customer demands, shortened product life cycles & technological breakthroughs of the competitive global business environment command organizations to spiral their innovations. Organizational innovations are often triggered by the Innovative Work Behavior (IWB) of its members, which usually originates in innovative culture. Innovative culture, in general, is powered by technological advancements that result in improved business processes. Organizational-wide innovative culture leads the optimum return on investment, boosts productivity & profitability, improves market response ratios, increase market share, and, importantly, unlocks the Emotional Intelligence Expertise (EIE) where seeds of innovative ideas are nourished. Additionally, knowledge sharing, human capital, management practices, innovation climate, absorbing capacity, and organizational learning are often regarded as the other main impetus of IWB of employees. Golman's (1998) theory of Emotional Intelligence (EI) suggests that the individual's EI can open up the door for the generation of innovative ideas targeting problem-solving. EI is the ability to perceive emotions, to access and generate emotions to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth. With the deep elaboration of the concept of EI, the expertise of the above concept which is developed internally and how it contributes to urging the IWB has not received much attention. Furthermore, vindications of Diffusion of Innovation theory (DOI) posit the pressing need to have a supportive organizational culture so that innovative ideas may flourish. Adding to that, technological orientation as proposed by the Creative Destruction Theory (CDT), would strengthen the innovative mindset both at individual and organizational levels. In addressing the theoretical lapses about the nexus of relationships among the said drives of IWB, a research objective is proposed to analyze how the EIE of employees can contribute to inculcate the IWB of employees with the facilitation of Perceived Organizational Supportiveness and Technological Orientation of the organizations.

Keywords: Emotional Intelligence Expertise, Emotional Intelligence, Innovative Work Behavior, Perceived Organizational Supportiveness, Technological Orientation

**Corresponding author: rohanaw@malibanbiscuit.com*



IMPACT OF ‘WORK FROM HOME’ ON EMPLOYEE PRODUCTIVITY: WITH REFERENCE TO THE SRI LANKAN WORK COMMUNITY

J. Hapugoda, A. Fernando, C. Mahakumbura*

The Open University of Sri Lanka

Work From Home (WFH) is a novel concept introduced in Sri Lanka due to the COVID-19 pandemic, although it has gained prominence in many countries over the world with the number of WFH employees increasing annually. WFH has been facilitated by the advancement of ICT whereby employees are able to work across time, space, and organizational boundaries which reflects the flexibility of WFH. As a result of the numerous benefits experienced, WFH has now become a dream of many people, which drives their Motivation to WFH. Further to that, WFH can lead to higher Employee Productivity (EP). In order to validate these associations in the Sri Lankan context, the main objective of this study has been set, to develop a model which assesses the impact of ‘Flexibility of WFH’ and ‘Motivation to WFH’ on EP. Secondary objectives include, 1) assessing the perceived practicability of WFH, 2) assessing the perceived level of agreement on flexibility, motivation, and EP related factors of WFH, and 3) identifying the perceived benefits of WFH to the employees and organizations. The study was conducted by employing a quantitative approach for which the data were collected from an online survey through a structured questionnaire which was designed based on literature. The sample consisted of 144 respondents which were drawn on convenience and the data were analysed using IBM SPSS 23.0. According to the analysis, it was identified that though the employees perceive that WFH suits their job, the companies do not practice WFH up to their fullest potential. Moreover, the respondents perceived a higher level of agreement on flexibility related factors of WFH, motivation related factors of WFH, and EP in the WFH environment. The developed model suggested that both the ‘Flexibility of WFH’ and ‘Motivation to WFH’ have a positive impact on EP, thus validating the viability of WFH concept in the Sri Lankan context. The findings further facilitate the decision-making process of organizations by emphasizing on the perceived benefits of WFH. Therefore, organizations can consider adopting WFH as employees perceive that WFH suits their job to a greater extent.

Keywords: Employee Productivity, Flexibility, Motivation, Work From Home

*Corresponding author: jchap@ou.ac.lk



THE DIGITAL TRANSFORMATION IN LEARNING AMIDST COVID-19 PANDEMIC IN SRI LANKA

**R.P. Gunasekara^{*1}, D.W. Nisansala¹, S.G.H.M.A.D. Herath¹, W.A.R.
Senevirathne², W.M. Nilwala²**

¹*Faculty of Education, Horizon Campus, Malabe (WP), Sri Lanka*

²*Department of Accounting and Finance, The Open University of Sri Lanka*

The purpose of this study is to examine the modernized online learning trends amidst COVID-19 Pandemic in Sri Lanka. The study explores how students have adapted to the newest and advanced technology utilized in the education sector amid the COVID-19 Pandemic. Currently, the digital transformation of all levels in education has paved the way for new learning and teaching processes. A quantitative research approach based on a cross-sectional research design was used in this study. Data was gathered through the medium of electronic survey using a questionnaire and it was composed of Likert scale, multiple-choice, and open-ended questions. It was administered through Google Forms among public and private sector 447 learners attached to universities and higher educational institutes in Sri Lanka. Data gathered under the following instances (a) demographics (b) accessibility to technology infrastructure (c) habitual practices in learning (d) living conditions and (e) pros and cons of using online learning etc. Descriptive analyses were conducted by using SPSS 25.0. The outcomes of the study were a great number of individuals had utilized Zoom Meetings (94.8%) out of 447 respondents as the most popular video conferencing tool. Most of the individuals have allocated more hours to online learning after the pandemic. Most individuals have utilized Google and YouTube to search for online resources and portals in E-Learning. Many of the individuals have encountered technological and domestic barriers while they engaged in online learning. Presently, the smartphone plays an essential role as a multifunctional device as many of the learners used it as the login device. This research will be able to assist the stakeholders, policymakers, and The Government to make futuristic decisions about online education. The digitalization of education has led to drastic changes in online education in Sri Lanka.

Keywords: COVID-19 Pandemic, Digital Transformation, Learning Barriers, Online Learning Trends

**Corresponding author: randima91@gmail.com*



THE INFLUENCE OF E-WORD OF MOUTH MARKETING ON THE STUDENTS' INTENTION TOWARDS SELECTION OF MANAGEMENT DEGREE PROGRAMS: SPECIAL REFERENCE TO UNDERGRADUATES OF THE OPEN UNIVERSITY OF SRI LANKA

U.G.C. Lakchan, T.H. Rathnayake*

Department of Marketing Management, The Open University of Sri Lanka

Electronic Word of Mouth Marketing (eWOM) can be identified as a one of the key marketing elements which is growing rapidly with the development of online Platforms in the World. Now a day's eWOM marketing has become a highly effective method in marketing and which has surpassed all advertising efforts. Degree selection is a high consumer involvement purchase as most of the students follow their bachelor's degree once in their lifetime. Further, eWOM ensure a greater influence for their degree selection. This research provides in depth knowledge in this area by examining the influence of electronic word of mouth marketing for management degree selection. This study examined the influence of three independent variables (eWOM quality, eWOM quantity and eWOM credibility) on dependent variable (Student's Intention towards Degree Selection). This study is based on positivistic research philosophy, deductive approach and explanatory research design. A structured questionnaire has been used to gather primary data for the study. The population comprised of undergraduates who have been registered for Bachelor of Management Studies (BMS) Degree Program in the period of 2016-2020 and the potential students who wish to follow BMS Degree Program. The sample size of the study was 384 respondents, and 312 responses were collected and 283 were analyzed after removing outliers. Since the total population is unknown the convenience sampling technique was used to select the respondents. Hypotheses were tested by using correlation analysis and regression analysis. Results showed that eWOM quality, eWOM quantity and eWOM credibility have significant and positive influence on students' intention towards management degree selection. Moreover, results indicated that eWOM credibility has the highest influence on students' intention towards degree selection. Future researchers can go beyond from The Open University of Sri Lanka and are encouraged to focus on another degree selection such as (Economics, Engineering, and Medicine) as the perception may be different. Additionally, they can expand the same research for different areas such as banking, insurance, textile etc.

Keywords: Degree selection, E-word of mouth, Students' intention

*Corresponding author: chamindalakshan1994@gmail.com



THE IMPACT OF ACCOUNTANTS' ROLE ON SUSTAINABILITY OF BUSINESS; EMPIRICAL STUDY ON SMEs IN SRI LANKA

M.D.D. Ishara**, *Y.M.P.M. Yaparithne*, *W.A.R. Senavirathne

Department of Accounting and Finance, Faculty of Management Studies, The Open University of Sri Lanka

The purpose of this study is to assess the role of professional accountants in ensuring sustainability of business in Small and Medium Scale (SMEs) in Sri Lanka. A professional accountant can be recognized as the guardian of a business. His sole responsibility is to make sure sustainability of the business. This research is based on quantitative research approach adapted where data were collected using a structured questionnaire using simple random sampling technique. The sample consists of accountants attached to SMEs in Sri Lanka. The definition of SMEs in Sri Lanka covers entities revenue between 16 to 750 million rupees per year and employees between 51 and 200. The regression test was performed in order to examine the relationships between exogenous and endogenous constructs. Five hypotheses out of six were accepted and one was rejected through the analysis. Book-keeping, staying up to date, financial acumen, preparing financial statements and maintaining rapport have significant relationships on sustainability of business ($P < 0.000$). The correction of errors variable has not shown substantial significant impact on the sustainability of business. The finding highlights the need for a greater recognition of the crucial role that accountants can play when the ownership and management is performed by two parties. Business owners should pay more attention to the analysis of professional accountants specially related to financial acumen, preparing financial statement and maintaining rapport with related stakeholders. This paper discusses the important functions of an accountant and will contribute to the SMEs literature in Sri Lanka.

Keywords: Accountants, Financial Acumen, SMEs, Sri Lanka, Sustainability of business

**Corresponding author: mddilumishara@gmail.com*



INFLUENCE OF INFORMAL ACCOUNTING RECORDS ON FINANCIAL PERFORMANCE EVALUATION OF MICRO ENTERPRISES IN KANDY DISTRICT IN SRI LANKA

Y.M.P.M. Yaparathne^{}, M.D.D. Ishara*

Department of Accounting and Finance, The Open University of Sri Lanka

This study examines the impact of informal accounting records on financial performance evaluation with; reference to micro enterprises in Kandy district in Sri Lanka. The study is encouraged from the previous empirical findings which proved that poor management of accounting records and practices have become the main problem which leads to poor financial performance evaluation in micro enterprises. Micro enterprise, as defined by the ministry of industries and commerce as an entity with a turnover less than 15 million rupees per year and employees less than 10. However, the contribution of over one million SMEs to Sri Lankan economy is very important. Therefore, any inherent barriers of this nature should be carefully examined to find remedies. The study was conducted with a sample of registered SMEs in Kandy district Sri Lanka. A structured questionnaire was used to gather data from the respondents and simple random sampling method was used to collect data. Collected primary data was analyzed using descriptive and inferential statistics with the SPSS 21.0. Correlation and liner regression analysis were used to examine the relationship and effect of independent and dependent variable respectively. The predictive variables are represented by mental accounting, accounting records, financial record management and financial literacy. Financial performance evaluation is the endogenous variable. Findings of the study reveals that accounting records, financial record management and financial literacy were significant with financial performance evaluation. However mental accounting does not indicate a significant relationship with financial performance evaluation. Hence researcher suggests that other than keeping all the information in mindset, it is better to record the information in digital repository or as printed copies. It will help the retrieval of data or records when it is required. The researcher expects these findings will add to the best practices which can be adopted by micro enterprises in Sri Lanka.

Keywords: Accounting Records, Financial literacy, Financial Performance, Informal Accounting, Micro enterprises

**Corresponding author: pabodamshi@gmail.com*



IMPACT OF RECORD KEEPING PRACTICES ON BUSINESS PERFORMANCE EVALUATION OF SMALL AND MEDIUM ENTERPRISES (SMES) IN THE MATALE DISTRICT IN SRI LANKA

M.M. Mubasshira , P.H. Dharshani, V.N. Nilusha, W.A.R. Senevirathne*

Department of Accounting and Finance, The Open University of Sri Lanka

SMEs play a vital role in an economy in both developed and developing countries in promoting socio economic benefits to the country with minimum level of investment. Even though, SMEs contribution to the Sri Lankan economy is high, SMEs often encounter accounting and financial management challenges due to poor record keeping. Therefore, the purpose of this research is to evaluate the impact of record keeping practices on business performance evaluation of Small and medium Enterprises. An empirical study in the Matale district- Sri Lanka. Record keeping practices consist of accounting record procedures, proper accounting records and preparation of financial statements whereas business performance evaluation is measured by organizational goal achievement and organizational efficiency and effectiveness. The quantitative research approach is used to achieve these research objectives. Accordingly, the research was conducted by means of a self-administered questionnaire which was distributed through an online platform of SMEs in the Matale District. The primary data was obtained from SMEs owners in the Matale district using a structured questionnaire from one hundred and forty six respondents. The respondents were requested to indicate the extent of their agreement with a series of questions on a five-point Likert scale. The collected data was analyzed by using SPSS 22.0. The hypothesis of accounting record procedures has no direct relationship with business performance according to the analysis. However, accounting records and preparation of financial statements significantly influence business performance evaluation ($p > 0.000$). Through this study, the following recommendations are suggested. Organizing training programmes to improve accounting knowledge of SME owners, and the use of both tailor-made and readymade accounting software to support accounting procedures, as well as preparation and presentation of financial statements to be done electronically.

Key words: Performance Evaluation, Record Keeping Practices, SME, Sri Lanka

**Corresponding author: ann.muba@gmail.com*



FACTORS AFFECTING ENTREPRENEURIAL INTENTION AMONG FEMALE UNDERGRADUATES IN SABARAGAMUWA UNIVERSITY OF SRI LANKA

D.M.D. Chathurika*

Sabaragamuwa University of Sri Lanka

Entrepreneurship is considered as a psychological process that entails creativity and conceptualization. Due to the current health crisis and its high unemployment rate, the labor market increasingly requires multidisciplinary undergraduates with entrepreneurial intentions. The entrepreneurial intention has received a significant amount of attention from researchers as a development tool for many countries. Even though a university curriculum focuses on entrepreneurship, it is recognized that creating successful female graduate entrepreneurs is still controversial in the Sri Lankan context. As well as there is a lack of evidence for the entrepreneurial intention of female undergraduate students in Sri Lanka. Therefore, the purpose of this research is to examine the antecedence for entrepreneurial intentions of Female undergraduates in Sabaragamuwa University of Sri Lanka. Theory of Planned Behaviour has been generally shown as a significant predictor of both intention and the behaviour. The constructive predictors of intention; attitude, subjective norm, and perceived behavioural control were used to predict the entrepreneurial intention among female university undergraduates. A questionnaire survey under deductive approach was used to collect quantitative data for predicting the factors from the 183 female undergraduates of the Faculty of Management Studies, Sabaragamuwa University of Sri Lanka. Data were taken by the convenience sampling method through a structured questionnaire. The findings indicate that attitude (0.469 β value), subjective norms (0.256 β value), and perceived behavioural control (0.328 β value) positively affect the entrepreneurial intention at 0.000 significant level. Overall, the study results show that the model has a good model fit with the adjusted R^2 value of 62.5% and can be used to explain the theory. That will enable the authorities, government, and other relevant parties to be aware of the entrepreneurial intention and how the intentions towards entrepreneurship can be stimulated.

Keywords: Attitudes, Entrepreneurial Intention, Perceived Behaviour Control, Social Norms

*Corresponding author: d.m.d.chathurika@gmail.com



THE EFFECT OF ELECTRONIC SERVICE QUALITY ON CUSTOMER SATISFACTION IN TELECOMMUNICATION INDUSTRY IN SRI LANKA DURING CORONAVIRUS OUTBREAK PERIOD

*C.A. Fernando**, *A.A.I. Lakmali*

Department of Marketing Management, The Open University of Sri Lanka

This study investigates the effect of the quality of e-service on customer satisfaction in the telecommunication industry in Sri Lanka during the corona virus outbreak period. Accordingly, the literature identified five e-service quality dimensions: website design, fulfillment, security, personalization, and experience from the customer's perspective. This study was quantitative, and accordingly adopted a causal research design. An online survey questionnaire was used to collect the data. A sample 200 of questionnaires was collected from consumers in the telecommunication in Colombo district using the convenient sampling technique. A normality test was employed to ensure the normality of data distribution. The measurement properties were proven reliable. The analysis revealed that e-service quality is a predictor of customer satisfaction in the telecommunication industry in Sri Lanka. Further, the study empirically validated the five dimensions of e-service quality: web design, fulfillment, personalization, security, and experience from the customer perspective, which have an influence on customer satisfaction in the context of Sri Lanka. More importantly, results revealed that the most contributing factors to the customer satisfaction of the telecommunication industry in Sri Lanka during the Covid 19 pandemic are fulfillment, security, and experience from the customer's perspective. Implications of the study to the telecommunication companies need to be improved by three factors: experience from the customer's perspective, security, and fulfillment to enhance customer satisfaction in the telecommunication industry in Sri Lanka. Meanwhile, website design and personalization should not be ignored and maintained for better customer satisfaction.

Keywords: Coronavirus outbreak, Customer satisfaction, Electronic service quality, Sri Lanka, Telecommunication industry

**Corresponding author: achala.fernandoc@yahoo.com*



**IMPACT OF FINANCIAL CAPITAL AVAILABILITY AND
RESOURCES FLEXIBILITY ON FIRM PERFORMANCE EMPIRICAL
STUDY OF SME-s IN THE NUWARA-ELIYA DISTRICT IN SRI
LANKA**

*V.P.N. Nayomi**, *W.A.R. Senavirathne*, *M.M. Dee*, *P.H. Dharshani*

Faculty of Management Studies, The Open University of Sri Lanka

SMEs play an important role in the country as it is the major driving force towards economic development. SMEs contribute to the innovation, job creation and distributing of resource. SMEs development is therefore of utmost importance and must be encouraged at all times. The objective of the study is to examine the impact of financial capital availability and resources flexibility on firm performance; Empirical study of SMEs in the Nuwara-Eliya District in Sri Lanka. The researcher used quantitative research approach based on cross-sectional survey design and data collected using an online Questionnaire. The questionnaires were distributed among the 350 Small Enterprise Development Division (SEDD) members, of whom 216 of the respondents (61.71%) presented their responses. The linear regression model was run in order to test the hypothesis. The research was conducted in five (05) Divisional Secretaries and 50 Grama Niladari (GN) divisions to collect the data. The data was analysed using statistical software SPSS 21.0. The findings revealed SMEs capital availability had no significant relationship. However, resource flexibility had a significant relationship on firm performance. The outcome of this study had practical validation as it empirically proved if SMEs' resources are flexible and have alternative uses, then it may contribute to SMEs performances. However, even though sufficient capital is available sometimes, it may not significantly influence firm performances as it could not be managed wisely. These results could be used by SMEs in Sri Lanka and will add value to the present literature of SMEs in Sri Lanka.

Keywords: Capital availability, Firm performance, Resource flexibility, SMEs in Sri Lanka

**Corresponding author: nayomihilusha12345@gmail.com*



AN ANALYSIS OF FACTORS INFLUENCING EMPLOYEE COMMITMENT, IN THE PUBLIC SECTOR ORGANIZATIONS IN THE KANDY DISTRICT: (WITH SPECIAL REFERENCE TO THE DIVISIONAL SECRETARIAT, YATINUWARA)

R.M.D.D. Rathnayake*

Faculty of Management Studies, The Open University of Sri Lanka

During the past several years, a common complaint that is made by the general public, media and other interested parties is that the public sector service organizations are unable to perform well and the public sector employees are not committed towards their assigned works and duties. So, this study has made an attempt to identify what are the factors affecting employee commitment of public sector employees. This is a positivistic research study within the perspectives of employee commitment concepts for which quantitative approach was used to collect views of respondents. The research was designed to study different perspectives of employee commitment and accordingly an attempt was made to identify the factors of employee commitment of the public sector employees in government organizations in the Central Province, with special reference to the Divisional Secretariat, Yatinuwara. Convenience sampling method is used to select the elementary units of the sampling frame. The questionnaire of 5 point Likert scale was administrated among the employees and it was structured upon influential and causal factors on employee commitment. Research findings revealed that, the individual factors and organizational factors have significant relationship with employee commitment among the employees in the Divisional Secretariat, Yatinuwara. Accordingly, the researcher identifies Motivation, Attitudes and Values, Perception, Organizational Structure, Management Information System, Group Dynamics, Procedures, Norms and Standards and Internal Group Behaviour as the most influential factors which leads to employee commitment in the organization. Based on the findings of the research, recommendations are given for the management of the government organizations to take required actions in order to maintain high commitment level among the employees.

Keywords: Employee Commitment, Individual Factors, Managerial Factors, Organizational Factors

*Corresponding author: dulanir1992@gmail.com



MICROFINANCE SERVICES ON LIVING STANDARD OF SRI LANKAN COMMUNITY; WITH SPECIAL REFERENCE TO KURUNEGALA, ANURADHAPURA AND BADULLA DISTRICT

U.D.I.C. Udawaththa^{1}, R.K.M.H.T. Rajakarunanayake²*

¹*Uva Wellassa University of Sri Lanka*

²*Wayamba University of Sri Lanka*

Microfinance can be identified as a provider of financial services such as Microcredit, Micro savings, and Micro insurance to low-income people who lack access to traditional financial services. In today's context, some of the financial service beneficiaries revealed that the structure of micro finance as a development strategy failed to achieve the establishment target such as the alleviation of poverty while negatively effecting socio-economic circumstances of the nation. The fluctuations in the micro finance industry dramatically affect the living standard of poor people and highlighted the need of researching the microfinance service on the living standard of the Sri Lankan community. Therefore, the research is designed with the objective of examining whether micro finance services such as micro credit, micro savings, micro insurance, and advisory services are associated with the living standard of low-income people in Kurunegala, Badulla, and Anuradhapura District. The study uses primary data to estimate the effect of microfinance on living standards, and data was mainly gathered by distributing a structured questionnaire among the microfinance beneficiaries of Samurrdhi Banks. The collected data has been analyzed by using IBM SPSS Statistics 20 software and Frequency analysis, Correlation analysis, and Regression analysis. The study considers Micro credit, Micro savings, Micro insurance, and Advisory services as the independent variables and Living standard as the dependent variable. According to the results, Micro credit, Micro savings, Micro insurance, and Advisory services have a statistically significant positive impact on the Living standard of low-income people in these areas. Thereby, Financial Institutes can empower low-level income individuals through more advisory and consultancy services of microfinance services and increase the saving habits among low-income people by providing reasonable interest.

Keywords: Advisory services, Living standard, Micro credit, Micro insurance, Micro savings

**Corresponding author: isuchandeepea@gmail.com*



FACTORS INFLUENCING THE SUCCESS OF PROCUREMENT IN UNIVERSITY PROJECTS A CASE STUDY IN UVA WELLASSA UNIVERSITY

W.N. Sellaheva^{*1}, T.D. Samarasinghe²

¹*Uva Wellassa University of Sri Lanka*

²*Sabaragamuwa University of Sri Lanka*

Procurement is a very imperative part of the contemporary world. It is about delivering the right product or service to the right person on time, at the right price and in the right place. The procurement implication affects the overall cost of implementing the decision of any organization. However, preliminary observations revealed that many government and semi-government organizations in Sri Lanka are experiencing poor performance in their procurement process. This wastes a lot of time and resources including public money. Only a few institutions are effectively implementing the procurement process. Pilot observations revealed that Uva Wellassa University (UWU) always receives good ratings and positive feedback during Third Party Verification (TPV) and other progress reviews to make high progress in the procurement process. In this context, this study was conducted to identify factors affecting the well-functioning procurement process in UWU. Accordingly, the main objective of this study is to identify the factors contributing to the well-functioning of the UWU Procurement Process and to make recommendations for improving the Procurement Policies in any public sector in Sri Lanka. This study is mainly based on the primary data which has been collected through the observation method. The behaviors and practices of the procurement officers, administrative officers related to the procurement in the university, project coordinators, activity coordinators, project assistants and other officers related to the projects which is going on within the UWU have been deeply observed to gather data to conduct the current study and the observed data have been analyzed descriptively. The findings were the availability of resources, sufficient knowledge regarding the government procurement process, availability of adequate staff, appropriate communication and coordination among the internal and external parties, continuous monitoring, appreciation and rewarding culture, flexibility in procurement procedures and the strong monitoring mechanism for well-functioning the procurement process in UWU.

Keywords: Bureaucracy, Efficiency, Performance, Public procurement

**Corresponding author: wasanansellaheva@gmail.com*



THE EFFECTS OF CORPORATE GOVERNANCE PRACTICES ON CAPITAL STRUCTURE: CRITICAL REVIEW OF LITERATURE

*A. Baroon**

Sri Lanka Institute of Advanced Technological Education

One of the primary goals of capital structure management is to reduce the cost of capital in order to optimize shareholder wealth. Studies on a firm's capital structure can be traced back to Modigliani and Miller's (1958) seminal work, in which they argued that a firm's capital structure was irrelevant in assessing the firm's value and future performance. Since Modigliani and Miller's declaration in 1958, numerous hypotheses have been formed to justify firm financing decisions. On the other hand, corporate governance, is the framework and principle that includes the processes and arrangement that enhance the creation of shareholder value through the management of an organization's affairs to ensure the protection of all stakeholders' individual and collective interests. The purpose of the study is to critically look at the existing research to identify what has been found on corporate governance practices and capital structure and to bring out research gaps of knowledge on the relevant topic. The results of the most studies show that corporate governance practices such as board size, board composition, CEO tenure, CEO compensation, CEO duality, board meetings, managerial ownership and ownership concentration influence the mixture of long-term debt and equity of the company and when developing models for corporate governance, the type of the country needs to be considered. However, most studies in relation to the effect of corporate governance practices on capital structure have focused on a similar pattern, regardless of whether firms are low or high levered. In other words, there has been little research into the persistence of low and high levered capital structure. Several studies have been undertaken to investigate the relationship between corporate governance and capital structure using secondary data obtained from financial reports. Until now, no research on corporate governance and capital structure has been conducted considering both primary and secondary data at a time and analyzed comparatively.

Keywords: Board composition, Board meetings, Board size, Capital structure, CEO compensation, CEO duality, CEO tenure, Corporate governance practices, Managerial ownership, Ownership concentration

**Corresponding author: baroonatham@yahoo.com*



SUSTAINABILITY PERFORMANCE THROUGH GREEN SUPPLY CHAIN MANAGEMENT (GSCM) PRACTICES: A STUDY FROM LARGE SCALE APPAREL COMPANIES IN SRI LANKA

K.A.G. Maduwanthi, A.K.D.N. Dilshani, S.M.N. Praveeni*

Department of Business Management, Wayamba University of Sri Lanka

Since the last couple of decades, growing impacts of global warming, climate change, waste and air pollution issues have drawn increasing worldwide attention to think more ecofriendly and find optimum possible solutions towards “Green”. Green Supply Chain Management (GSCM) has been considered as a novel managerial action that enables organizations to create sustainability in their manufacturing activities by minimizing environmental impact and enhancing ecological efficiency. GSCM covers all phases of supply chain management by adhering to environmental protection requirements. Until recently, sustainability was not a driving factor in the apparel industry. But, as the world moves on and when people feel more and more responsible for sustainability, initiatives have been taken to mitigate their negative environmental impacts. Thus, this study was conducted to examine the impact of GSCM practices on the sustainable performance of the organization by giving special reference to the Sri Lankan apparel industry. As per the extensive literature, GSCM practices are measured based on green procurement, green manufacturing, green design and green distribution. Sustainable performance is measured based on environmental, social and economic performance. The study was based on a random sample of 75 garment manufacturing companies in Sri Lanka. Data were collected using a structured questionnaire. Descriptive statistics, regression and correlation analysis were used to analyze data. The study confirmed that GSCM practices have a significant impact on sustainability performance. Further, it was revealed that green procurement, green design and green manufacturing are the most affecting factors on sustainability performance than green distribution. Enterprises should deeply understand the potential positive effects of GSCM adoption on sustainability performance and proactively apply it in practices. To enhance strong and rapid sustainable performance, all GSCM’s elements should be integrated. Integrated elements will support in collaboration and create the success of the GSCM. In addition, the optimization of manufacturing processes and adoption of cleaner production not only decrease the negative environmental impacts but also reduce costs and increase profits. Through green manufacturing, the companies can also enhance health care, employment opportunities to the community and education of the surrounding people.

Keywords: Apparel Industry, Green Supply Chain Management Practices, Sustainability Performance

**Corresponding author: praveeni@wyb.ac.lk*



THE IMPACT OF KEY SUCCESS FACTORS OF ERP IMPLEMENTATION ON EMPLOYEE ADAPTABILITY: A CASE OF A REPUTED CONSTRUCTION FIRM IN SRI LANKA

*E.M.D.S. Ekanayake^{*1}, W.A.M. Niranga²*

¹Cardiff Metropolitan University, United Kingdom,

²Department of Industrial Management, Faculty of Science, University of Kelaniya, Sri Lanka

Research on relationship between employee adaptability and Enterprise Resource Planning (ERP) implementation supports the notion that the proper identification of key success factors may be the predictor of effective work performance of employees in contemporary organizations. A range of studies stress that the holistic effort of ERP is relate to successful ERP implementation within an organization and identify corporate management, project management and user training as the key elements of its success. In general, the success of the ERP implementation depends on the work performance of employees in a digitalized context. However, relatively few studies have tested, how and why key success factors of ERP implementation effect on worker adaptability. Accordingly, the main aims of the present study are to identify the key success factors affecting on successful ERP implementation, investigate the impact of the key success factors on employee adaptability and identify the leading factors of ERP implementation affecting on employee adaptability in construction industry in Sri Lanka. To advance the understanding of these, multiple regression analysis and Pearson's Correlation Analysis were performed to test hypotheses with a sample size 170 ERP users in different departments of the ABC construction firm in Sri Lanka. At first, the study established system flexibility, excellent project management, clear objective, employee training and top management as key success factors of ERP implementation. Further, the study found that there is positive direct association between clear objective and top management support on Employee adaptability in the ABC firm context. Moreover, these two key success factors have been identified as the leading factors to the construction field in implementing an ERP system in a construction firm in Sri Lankan context. Managerial contributions of the present study make domestic construction firms successful through better focus on leading key success factors of ERP implementation which facilitates employee adaptability through positive work performance in a firm boundary.

Keywords: Construction Industry in Sri Lanka, Employee Adaptability, Key Success Factors of ERP Implementation

**Corresponding author: danidu_e@yahoo.com*



**IMPACT OF TRAINING AND DEVELOPMENT ON PERFORMANCE
OF EXECUTIVE-LEVEL EMPLOYEES IN LICENSED SPECIAL
BANKS: EMPLOYEES' PERSPECTIVE (WITH SPECIAL REFERENCE
TO ABC BANK PLC HEAD OFFICE)**

A.D.D.H. Atapattu , D.K. Sewwandi*

Faculty of Management Studies, The Open University of Sri Lanka

Human Resource is a key asset and a major source of competitive advantage for many organizations. Diverse measures are taken by organizations to ensure high performance of their employees as they decide the growth and survival of the firm. Training and development is one such popular method of grooming the employees and increasing performance. ABC Bank PLC, a licensed specialized bank in Sri Lanka experiences a downfall of annual profit during recent years where managers attribute the low performance of employees for this situation. In a context where the bank invests less in training and when the output of a service sector firm is mainly decided by the performance of respective human resource, this study aims at identifying the impact of training and development on employee performance of ABC Bank PLC, especially from the employees' point of view. Reviewing of extent literature revealed three main independent variables which represent the main construct of Training and development; identification of training needs, selection of trainees and training content and delivery approach. The study followed positivistic research philosophy, deductive and quantitative research approach and was conducted as a cross-sectional study. Based on the theoretical framework, hypotheses were developed to depict the possible relationships between the independent variables and the dependent variable; employee performance. A questionnaire-based survey was conducted among 110 executive level employees in the bank who were selected using stratified random sampling. The correlation analysis depicted a strong positive relationship between the three independent variables and employee performance. Regression results too revealed a significant influence of training and development on employee performance, yet variations were evident when the contribution of individual independent variables in predicting employee performance is considered. The findings of this study contribute to fill the gap in extant literature in terms of the employees' perception on the influence of training and development on their work performance. Using these findings, the bank under concern and all other institutions in the similar category will be encouraged to think twice on the aspects of training and development initiatives before implementing them.

Keywords: Employee Performance, Licensed specialized bank, Training and Development

*Corresponding author: hansaniedulanga@gmail.com



DETERMINANTS OF SUCCESSFUL KNOWLEDGE MANAGEMENT IN SOFTWARE DEVELOPMENT INDUSTRY IN SRI LANKA

*S. Priyangika^{*1}, R. Perera²*

¹ICBT, Sri Lanka, ²The Open University of Sri Lanka

Software development has been one of the processes which require a high intensity of knowledge utilization of individuals. Therefore, it is crucial for software firms to pay attention to preserving and managing knowledge in the right way to avoid rework and increase productivity. This is where the need of an effective knowledge management system arises. Software companies in worldwide face issues such as continuous rework, increased development time and decreased productivity due to the lack of proper knowledge management practices. To implement an effective knowledge management system, it is important to recognize the factors leading towards it. Based on the literature review, a conceptual framework was developed, and hypotheses were formulated. Conceptual framework was consisted of Effective knowledge management system as dependent variable and Leadership, Organizational Culture, Technology and Knowledge Management Measurements as independent variables. The research was carried out as a questionnaire-based survey. A pilot test was conducted to verify the validity and reliability of the study. Test results showed a Cronbach Alpha value of 0.836 and KMO value of 0.814 which were above the minimum acceptable level of reliability analysis. The main survey was distributed among 217 participants but only 163 were qualified for further analysis. Post-test also indicated high reliability and validity of the study with a Cronbach alpha value of 0.806 and a KMO value of 0.740. Collected data was analyzed using Statistical Package of Social Sciences (SPSS) software. Correlation analysis indicated strong positive correlations among dependent and independent variables (Leadership-0.594, Culture-0.735, Technology-0.488, KM Measurements-0.527) while regression analysis showed that only Leadership(B=0.049, p=0.005), Organizational Culture(B=0.769, p=0.000) and Technology(B=0.080, p=0.046) have a significantly positive impact of effective knowledge management. Therefore, it could be concluded that Leadership, Organizational Culture and Technological infrastructure of the company play major roles in implementing a successful knowledge management system. It is recommended that strategic decisions need to be taken based on those significant factors. This study only explains 88.7% of variation in effective knowledge management. The rest of the influencing factors should be uncovered by future researches with a higher sample size.

Keywords: Culture, Knowledge Management Measurements, Knowledge Management, Leadership, Software Development, Technology

**Corresponding author: suchinipr92@gmail.com*



THE DETERMINANTS OF CONSUMER PURCHASE INTENTION TOWARDS ORGANIC RICE IN SRI LANKA: WITH SPECIAL REFERENCE TO PANADURA CITY

G.K.T.D. Senevirathne* , A.A.I. Lakmali

*Department of Marketing Management, Faculty of Management Studies, The
Open University of Sri Lanka*

Sri Lanka has a long history of organic cultivation and rice is the staple food of the country. However, the commercial cultivation of organic rice is new to Sri Lanka. Though the health benefits emphasized the importance of organic rice consumption, there are many other factors such as price influencing on the purchase decision of organic rice among the Sri Lankans. Thus, this study aims to investigate the determinants of consumer purchase intention towards organic rice among the consumers by special reference to consumers in Panadura city. The study sample was 115 participants using a quantitative approach based on a survey research design. The results of multiple regression revealed that the determinants identified through literature, health consciousness, price, sensory attributes, and consumer awareness, explain a lower variation of the customer purchase intention of the organic rice. Moreover, health consciousness significantly influences customer purchase intention of organic rice among the consumers in the Panadura area. Further, the price has a negative insignificant influence on purchase intention while sensory attributes and consumer awareness have a positive but insignificant influence with purchase intention. This implies that many factors are embedded in the low level of purchase intention. The negative, insignificant impact of price and low level of trust on organic labeling can be such factors. However, agriculture and health related policymakers require increasing consumer awareness with support from marketers of organic rice. Further they have to increase publicity on the benefits. The considerable production, market driven pricing policies, evidence and standards to prove the products are organic were some of the implications of the study. This reveals that it should be increased the degree of organic rice using new mechanical systems. Since this study is limited to the Panadura area and only investigated four variables identified through literature, this study can be extended by covering the whole of Sri Lanka and further to identify the factors other than employed in this study.

Keywords: Organic rice, Panadura city, Purchase intention

**Corresponding author: gkthilids@gmail.com*



DETERMINANTS OF CUSTOMER SATISFACTION IN TOURISM INDUSTRY IN SRI LANKA

*S.N. Karunathilake^{*1}, M.J.R. Perera²*

¹International College for Business & Technology, ²The Open University of Sri Lanka

The tourism industry is the most important sector of the economy of Sri Lanka. The improvement of industry depends on the expansion of the hotel sector. However, currently the whole world faces the pandemic situation of Covid-19 disease. Therefore, the growth of tourism industry has dropped than the previous years. Customer satisfaction is the most important feature in the tourism industry and the hotels need to consider it to ensure the improvement of the hotel sector. The main objective of this study is to explore the determinants of Customer Satisfaction in tourism industry. The significance of this research can be evaluated through management, development, and informative purposes. Based on the in-depth literature there are many factors found by the previous researchers that determine customer satisfaction in tourism industry. Hence Brand Image (BI), Quality of Hospitality (QH), Sales Promotion (SP) and Health Safety (HS) were identified as the independent variables of this study. The population was mainly based on the customers who arrived at the hotels belonged to Ceylon Hotels Corporation and sample size (376) was determined through a population of 21,036 which was based on the average value of the last six months in year 2020. A self-administered questionnaire was used to collect data on a Five-point Likert scale, using google forms. The analysis was done through demographic profiles and statistical analysis. The sample represented 58% males with a maximum age range of 31-40 years. The pilot test results revealed that reliability test (Cronbach's Alpha = 0.902) and validity test (KMO =0.814) results were up to the standard. The correlation between independent and dependent variables was found as significant positive. Further, Regression Analysis revealed that BI (0.112, P = 0.012), QH (0.106, P = 0.025), HS (0.495, P = 0.00) were significantly supported and SP (0.079, P = 0.125) was not supported. Since the results indicated that the most important aspect of this study is HS, this research recommends including - health safety procedures in the hotel contingency plan and increasing quality of hospitality using hotel human resources practices. Future research can be recommended, with a longitudinal study to get a snapshot of existing situation and to find the remaining factors ($R^2 = 59\%$) using a large sample.

Keywords: Brand Image, Customer Satisfaction., Health Safety, Quality of Hospitality, Sales Promotion

**Corresponding author: snirasha18@yahoo.com*



SURVIVING THE CHILL WIND: HOW WOMEN ENTREPRENEURS IN STEM FIELDS IN SRI LANKA COMBAT THEIR CHALLENGES?

R. Razik*, A.S. Adikaram

Department of Human Resource Management, Faculty of Management and Finance, University of Colombo, Sri Lanka

Entrepreneurs are the growth drivers of a nation, and women entrepreneurship is particularly important to a country like Sri Lanka where women outnumber men in the population. This paper aims to explore how women entrepreneurs in STEM fields in Sri Lanka cope with the challenges and barriers they face, operating in a doubly masculine field where they are double bind. Following a qualitative approach under the broader interpretative paradigm, semi structured interviews were conducted with 15 STEM women entrepreneurs with a minimum of one year's experience. Due to their scarcity, the respondents were chosen by contacting them directly through their social media pages, approaching through professional organizations and snowballing. Prior research suggests that women entrepreneurs in general are facing myriad challenges and barriers which belong to two major categories, a) challenges caused by stereotyped gender ideologies and b) challenges caused by structural or institutional factors. Findings revealed that STEM women entrepreneurs in Sri Lanka follow 3 main strategies in coping with barriers – enduring strategies, contesting strategies, and abstaining strategies. Respondents appeared to be more focused in combating challenges caused by stereotypical gender ideologies and social norms, within which they were mostly attempting to adjust and reinforce the gender structures around them whereby they endure the challenges. Although not very common, some respondents attempted to contest the challenges by altering their personalities and thought processes. Although, the respondents recognized the prevalence and the perils of structural barriers which are common to both men and women STEM entrepreneurs, ironically the respondents appear to abstain from challenging or enduring them leaving the question whether they expect the males to take the initiation in solving these challenges.

Keywords: Challenges, Coping Strategies, STEM, Women Entrepreneurs

**Corresponding author: ruwaiha@hrm.cmb.ac.lk*



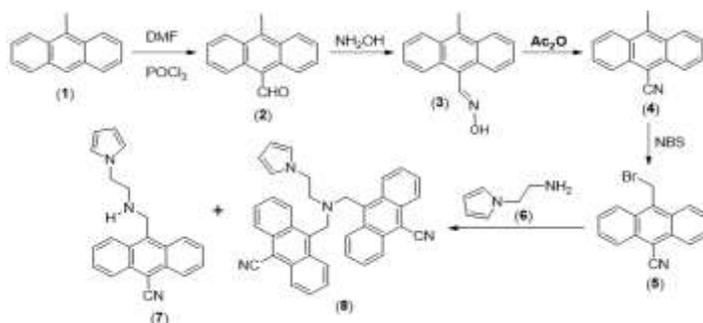
PHYSICAL SCIENCES

SYNTHESIS OF PYRROLE DERIVATIVES WITH PENDANT ANTHRACENE GROUPS

*S.D. Perera**

Department of Chemistry, The Open University of Sri Lanka

Electro-polymerization of pyrrole and substituted pyrroles containing redox centres has received considerable attention because of the useful properties of the resulting polymers. Anthracene is a photoactive molecule, but its reduction potential is quite negative. To make it more positive, a cyanide group was introduced on to the anthracene moiety. With a view to finding a pyrrole derivative/s with electroactive group/s, it was decided to prepare pyrrole derivatives 1-[2-(9-cyanoanthracen-10-yl-methylamino)ethyl] pyrrole (**7**) and 1-[2,2'-di(9-cyanoanthracen-10-yl-methyl)]aminoethyl pyrrole (**8**), containing 9-cyanoanthracene group/s. Synthetic routes to compounds (**7**) and (**8**) are summarised below.



Vilsmeier formylation of 9-methylanthracene (**1**) with POCl_3/DMF yielded 10-methylanthracene-9-carboxaldehyde (**2**), as yellow crystals in 75% yield. The proton resonances of the methyl and aldehyde protons appeared as singlets at 3.16 and 11.31 ppm, respectively. Compound (**2**) was converted into its oxime (**3**) by treating it with hydroxylamine. The singlets at 7.82 and 9.19 ppm were assigned to $=\text{NOH}$ and $\text{CH}=\text{O}$ protons, respectively. With the addition of D_2O , the peak at 7.82 ppm exchanged with deuterium, confirming the presence of $=\text{NOH}$ group. Dehydration of (**3**) with acetic anhydride (Ac_2O) afforded 9-cyano-10-methylanthracene (**4**) as yellow needles in 91% yield. The ^1H NMR spectrum showed a singlet at 3.11 for the methyl group and the absorption peak in the IR spectrum at 2208 cm^{-1} was assigned to $\text{n}(\text{C}\equiv\text{N})$. 9-Bromomethyl-10-cyanoanthracene (**5**) was obtained by the reaction between (**4**) and N-bromosuccinimide (NBS) in dry carbon tetrachloride. The reaction between (**5**) and 1-(2-aminoethyl)pyrrole (**6**) in dry benzene gave a mixture containing the secondary amine (**7**) and tertiary amine (**8**). These two pyrrole derivatives were separated by column chromatography on silica using dichloromethane as the solvent. The compound (**8**) eluted first and was isolated as a yellow solid. The second fraction containing compound (**7**) was collected and the secondary amine (**7**) was isolated as yellow needles in moderate yield. In conclusion, two N-substituted pyrrole derivatives (**7**) and (**8**) containing pendant anthracene groups were successfully prepared.

Keywords: Amines, Anthracene, Pyrrole

*Corresponding author: *ksper@ou.ac.lk*



EFFECT OF FILM THICKNESS OF REDUCED GRAPHENE OXIDE COUNTER ELECTRODES ON PHOTOVOLTAIC PROPERTIES OF DYE SENSITIZED SOLAR CELLS

J.M.K.W. Kumari^{1,2*}, M.A.K.L. Dissanayake^{1,2}, G.K.R. Senadeera^{1,3}

¹National Institute of Fundamental Studies, Kandy, Sri Lanka

²Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

³Department of Physics, The Open University of Sri Lanka

The role of the counter electrode (CE) in dye sensitized solar cells (DSSCs) where wet cell is concerned, is to transfer electrons from the external circuit back to redox electrolyte and to catalyze the reduction of tri-iodide (I_3^-) to iodide (I^-). Generally, Pt has been used as the preferred CE material in DSSCs due to its excellent electro-catalytic activity and corrosion resistance to iodide ions (I^-) present in the redox electrolyte. However, Pt is a precious metal and it increases the cost of DSSCs. Recently, Pt free materials mainly based on carbon materials with lower cost and good stability have been investigated as catalysts for DSSCs. Out of these, reduced graphene oxide (RGO) has been mostly used as the CE material for DSSCs, due to its easy synthesis process, outstanding electrical, optical and mechanical properties needed for potential applications. In this study, RGO based CEs were prepared by spray method and deposited on FTO conducting glass substrate. To investigate the effect of CE film thickness on DSSC performance, a series of RGO based CEs were prepared by varying the amount of RGO and these CEs were sintered at 250 °C for 45 minutes. Photovoltaic performances of liquid electrolyte based DSSCs were tested by using RGO CEs with different thicknesses. Results revealed that with increasing the CE film thickness, the photovoltaic performances also increased up to a certain thickness, but further increment of the CE film thickness showed a decrease in the DSSC performance. The best DSSC performance was exhibited by 15 mg of RGO/per 6 cm² area of the CE which corresponds to a RGO film thickness of 27.7 μm. The highest efficiency of 4.70 % was observed for this optimized RGO CE based DSSC. This low-cost RGO CE exhibits good stability and acceptable efficiency compared to the efficiency of 7.82 % exhibited by DSSC with Pt CE operating under similar conditions. The thicknesses of the prepared RGO CEs were measured by scanning electron microscopy. Results suggest that the RGO based CE can be one of the alternatives to replace the expensive Pt-based CEs in DSSCs.

Keywords: Counter electrode, Dye sensitized solar cells, Film thickness, Photovoltaic properties, Reduced graphene oxide

*Corresponding author: kalpani.ku@nifs.ac.lk



FORECASTING TOURIST ARRIVALS IN SRI LANKA

*H.A.N. Thilakarathna**

Department of Mathematical Sciences, Faculty of Applied Sciences, Wayamba University of Sri Lanka

Tourism is one of the most fast-growing industries in Sri Lanka. Sri Lanka has been a popular tourist destination since ancient times due to its natural beauty, and this industry is one of the main foreign income generators of the country. Since tourism is one of the main foreign income sources of the country, the development of the tourism industry will increase the foreign income of the country. If forecasted information about tourist arrivals are available prior to arrivals, it will be much easier to facilitate them. Therefore, this study was conducted to develop an accurate forecasting model for tourist arrivals from the country that generates the most number of tourists to Sri Lanka. The data was obtained from annual reports of the Sri Lanka Tourism Development Authority and annual arrivals from 2010 to 2017 were analysed by country of residence, which were North America, Latin America and the Caribbean, Western Europe, Eastern Europe, Africa, Middle East, Asia and Australasia. According to the Pareto chart, it is clear that the highest number of arrivals were from Asian countries. Further, it was found that India demonstrated the highest number of arrivals out of 11 Asian countries, which were China, India, Indonesia, Japan, South Korea, Malaysia, Maldives, Pakistan, Philippines, Singapore and Thailand. Thus, for this study, monthly arrivals from India from 2010 to 2017 was selected to forecast arrivals. According to the minimum MAPE and MAD values, SARIMA(0,1,1)(1,0,0)₁₂ was selected as the best model to forecast monthly tourist arrivals from India. In this study, the forecasting was done for the years 2018 and 2019. The actual arrivals in the years 2018 and 2019 were compared with the forecasted values and the Residual Mean Square Error of the forecasted period is 11964.7756. Therefore, this study will help to identify the strategies outlined in the “Tourism Strategic Plan 2017-2020” that will affect the actual arrival and to look for reasons not to influence them with a better approach.

Keywords: Forecasting, Pareto chart, Strategies, Tourism, Tourist arrivals

*Corresponding author: nayomithilakarathne@gmail.com



THE SUBSTITUENT EFFECT ON THE VARIATION OF PHOTOPHYSICAL PROPERTIES OF 1,10-PHENANTHROLINE IN THE ANALYSIS OF Fe(II)

*M.V.T. Mawela¹, W.K.D.P.S. Kodithuwakku¹, M.D.P. De Costa¹,
R. Senthilnithy^{2*}*

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Department of Chemistry, The Open University of Sri Lanka*

1,10-Phenanthroline is a weakly fluorescent, strong chelating agent. It undergoes non-fluorescent complexation with Fe(II) in a 1:3 metal to ligand ratio. Fe(II) could be quantified with high sensitivity by fine-tuning the photophysical properties of pristine 1,10-phenanthroline. The substitution of 1,10-phenanthroline with different functional groups at different atomic positions of its aromatic ring alters the degree of electronic delocalization in the phenanthroline skeleton. Thus, the photophysical properties of phenanthroline derivatives remarkably deviate from their parent compound. Fluorescence quenching of 5-nitro-1,10-phenanthroline, 5,6-epoxy-5,6-dihydro-[1,10]phenanthroline and 1,10-phenanthroline by Fe (II) was used to investigate and improve these photophysical properties in the detection of Fe(II). Absorption and emission peak maxima for 1,10-phenanthroline were observed at 268 nm and 367 nm, respectively. For 5-nitro-1,10-phenanthroline, both absorption and emission peak maxima show a blueshift with respect to pristine 1,10-phenanthroline at 265 nm and 366 nm, respectively. The absorption and emission peak maxima for 5,6-epoxy-5,6-dihydro-[1,10]phenanthroline were observed with a redshift with respect to pristine 1,10-phenanthroline respectively at 303 nm and 373 nm. The Electron-withdrawing ability of the nitro group and electron-donating nature of epoxy oxygen have altered the electronic distribution of the phenanthroline ring system giving rise to these spectral shifts. Stern-Volmer quenching constants of 1,10-phenanthroline and 5-nitro-phenanthroline decrease upon increasing temperature, indicating static quenching. The opposite effect is observed for 5,6-epoxy-5,6-dihydro-[1,10]phenanthroline with increasing temperature resulting predominantly from the dynamic quenching. 5-Nitro-1,10-phenanthroline and 5,6-epoxy-5,6-dihydro-[1,10]phenanthroline show stable complexation with Fe(II) in the pH range of 3.50 to 3.70 at 25 °C with a detection limit of 0.88×10^{-7} M and 1.32×10^{-7} M, respectively at 3.3σ . These derivatives show improved detection limits from pristine 1,10-phenanthroline, which is 4.35×10^{-7} M, under the same conditions. Thus, 5-nitro-phenanthroline and 5,6-epoxy-5,6-dihydro-[1,10]phenanthroline show improved photophysical properties than pristine 1,10-phenanthroline in the analysis of Fe(II).

Keywords: Pristine 1,10-phenanthroline, 5-Nitro-1,10-phenanthroline, 5,6-Epoxy-5,6-dihydro-[1,10]phenanthroline, Photophysical properties

*Corresponding author: rsent@ou.ac.lk



**HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY-DAD
ANALYSIS OF APO-CAROTENOIDS PRESENT IN THE SAFFRON
(*Crocus sativus* L.) FLOWER STIGMA**

**R.M.T.N. Perera¹, J.A.S.U. Gunawardena¹, U.G. Chandrika², D.D.D.H.
Alwis^{1*}**

¹*Faculty of Natural Sciences, The Open University of Sri Lanka*

²*Department of Biochemistry, Faculty of Medical Sciences, University of Sri
Jayewardenapura, Sri Lanka*

Saffron (*Crocus sativus* L.) flower stigmas are a high value spice with therapeutic significances, which is mainly used in Asian cuisine as a food additive and traditional medication. A few secondary metabolites like apocarotenoids, picrocrocin and safranal play a major role in characterising the physical nature of the spice. Chromophores present in these phytochemicals absorb radiation in the UV-Visible region of the spectrum, and these properties can be used to characterise the molecule and interpret its light-harvesting capability and photo-protective actions. Secondary metabolites present in saffron stigmas (purchased from the Sri Lankan market) were extracted with absolute ethanol and the resultant pigments were subsequently acid hydrolysed and separately analysed using reversed phase high performance liquid chromatography equipped with photo-diode array detector (HPLC-DAD). The carotenoids present in the initial extract was confirmed by their retention time, maximum absorption wavelength (λ_{max}) and spectral fine structure. Results have shown that there were five types of crocins (detected at 440 nm). Peaks eluted at 14.421 min and 15.495 min are the two major types of crocin that are more polar in nature when compared with other types of crocins. Further, a minute peak appeared with the retention time of 16.547 min, which also indicated a characteristic spectral fine structure of crocin. The acid hydrolysed sample has shown a prominent peak corresponding to crocetin with 100% purity, and it was identified as crocetin by a spectral fine structure with λ_{max} of 418 nm. This confirmed that all types of crocins present in the sample were converted to crocetin during acid hydrolysis. This study has identified the secondary metabolites present in commercial saffron samples available in Sri Lanka. It also provides an identification of the important plant apo-carotenoids present in the Saffron flower stigma that could be used as an efficient dye as a natural sensitiser for dye-sensitised solar cells.

Keywords: Apo-carotenoids, HPLC chromatogram, Saffron stigma

*Corresponding author: ddalw@ou.ac.lk



STELLAR POPULATIONS AND THE STRUCTURAL PROPERTIES OF SIX ULTRA-FAINT DWARF GALAXIES

B.K.S. Perera^{1*}, J.V. Wijesekera², P.L.V.J. Siger³, K.S. Rathnayake¹, H.R.S. Udani¹, W.C.S. Senarath¹, H.M.K.G.A. Herath¹, K.A.C. Nilmini¹, A.M.C.I. Abeyratne¹, P.V.N.D. Wimalaweera¹, B.V.A. Chathuranga⁴

¹*Institute of Astronomy, Sri Lanka*

²*University of Padova, Italy*

³*University of Ruhuna, Sri Lanka*

⁴*The Open University of Sri Lanka*

Ultra-faint dwarf galaxies are small, low-luminosity galaxies with little dust and an older stellar population. They are companions of the Milky Way and other large galaxies such as the Andromeda Galaxy in the Local Group. This work was based on the structural properties of six ultra-faint dwarf galaxies: Bootes I, Canes Venatici II, Coma Berenices, Hercules, Leo IV and Ursa Major I. Our findings are based on a combination of high-precision photometry obtained from the Advanced Camera for Surveys of Hubble Space Telescope and the isochrones generated by the Dartmouth Stellar Database. Calculations of metallicities $[Fe/H]$ and abundance of α elements $[\alpha/Fe]$ in our analysis suggest that ultra-faint dwarf galaxies are similar in age to the Milky Way halo. The globular cluster NGC 2808, in the Milky Way halo, was taken as a reference for a comparison of key properties with the six galaxies. Globular clusters are also considered to be old as the halo of the Milky Way. The abundance patterns of the most metal-poor stars in the small dwarf galaxies and the galactic halo give us useful information about the early universe. Thus, these old survivors provide information on the evolution of elements, the nature of the first stars and the first processes of star and galaxy formation, as well as the process of assembling the stellar halo of dwarf galaxies long ago. While the six ultra-faint dwarf galaxies are older than 10 Gyr, globular clusters appear much younger than UFDs with higher metallicity compared to them.

Keywords: Globular Cluster, Local Group, Metallicity, Milky Way Halo, Ultra-faint Dwarf Galaxies

*Corresponding author: pererashamindika@gmail.com



RELATIONSHIP OF THE SUNSPOT NUMBER WITH CROP YIELD FOR SELECTED CROPS IN DIFFERENT COUNTRIES: A MATHEMATICAL APPROACH

**V.A.C. Hansani^{*}, A.P.H. Somarathna¹, D.A.P.D.P. Ranasinghe¹,
A.T. Bulathsinghala¹, K.A.C. Nilmini¹, J.V. Wijesekera², R.K.C.S.
Rajakulathunga¹, H.R.S. Udani¹, B.K.S. Perera¹, W.C.S. Senarath¹**

¹*Institute of Astronomy, Colombo, Sri Lanka*

²*University of Padova, Italy*

Sunspot behaviour follows a predictable pattern. Temperature, precipitation, increasing lengths of seasons, radiation levels, air pressure, high altitude and wind speed can all be affected by sunspot cycles elsewhere. The crop yield model against the sunspot number (SSN) was used in the preliminary study to investigate the relationship between crop yields and SSN for tea, rice and sugarcane in Sri Lanka. The observed yield was carefully analysed with SSN, time, and cultivated area as input variables. Minitab Software was used to perform multiple linear regression analysis to obtain coefficients for the parameters under consideration. The results evident from this model reflected a considerable decrease in yields for tea and sugarcane in Sri Lanka during the periods of maximum solar activity while a significant increase in yields for the crops was observed during the periods of minimum solar activity. However, the opposite aspect of this result was found for rice. The validity of this crop yield model against the SSN created for Sri Lanka was investigated in applying this in a way that represents the whole world. Climate effects were ignored in the selection of countries categorised as equator (Indonesia, Kenya and Brazil), near-equator (India) and high latitudes (Madagascar, South Africa, Argentina, USA and China). Crops (banana, soybean and tea) that grow in the selected countries were considered to apply for this model. The R^2 (the square of the Pearson's product-moment correlation coefficient) value fluctuates between 0.67 – 0.96 and measures the strength of the relationship between the model and dependent variable on a convenient 0 – 100% scale. The p-values for the coefficients indicate whether the relationships are statistically significant. The p-values obtained for Sri Lanka and the other countries studied were greater than the 0.05 level of significance for every crop considered in this study. This indicates that the model performed considerably well for the crops and the countries selected in this study, and it is obvious that there is a significant effect of SSN on crop yield, which is similar to the other parameters on which crops are affected. Comparably, a model using a polynomial regression analysis can be a better representation for different crops in other countries.

Keywords: Crop yields, Model validation, Multiple linear regression, Sunspot number

**Corresponding author: pavithrahiru@gmail.com*



Panel Discussion

**POST PANDEMIC HIGHER EDUCATIONAL EXPERIENCE AND
GENDER (IN)EQUALITY**

Panelists

Professor Kalinga Tudor Silva
Emeritus Professor
University of Peradeniya
Sri Lanka

Professor Victoria Showunmi
Associate Professor
University College London Institute of Education
University of London, UK

Professor Anastasia Zabaniotou
Professor of Chemical Engineering
Department of Chemical Engineering
Faculty of Engineering, Aristotle University of Thessaloniki (AUTH)
Greece

Dr Tara De Mel
Co-founder, Education Forum Sri Lanka and Mindful Educators Sri Lanka
Member of the Worldwide Commission to Educate All Kids Post Pandemic

The impact Covid-19 has had on education in schools and universities is a topic that has captured the attention of academics, policymakers and others universally. However, the impact of the pandemic on gender issues in higher education, and particularly the glaring inequalities faced by academics and others in the sector, is not a topic that has grabbed global attention in a significant manner. Although academics frequently work from home, the shift to online learning entirely, during these past one and half years has had multiple consequences, including the inability to pursue research in a productive manner. Women have to bear the brunt of domestic and caring responsibilities, have to face issues like pregnancy and lactation, and women are also more likely to lose their jobs and therefore feel less secure in their employment. This Panel Discussion aims to discuss these issues and to highlight the impact Covid-19 has had on gender equality in higher education, in order to sensitize policy makers, university and higher education authorities, to appropriately support staff and students, when facing post pandemic challenges.