



THE OPEN UNIVERSITY OF SRI LANKA



OPEN UNIVERSITY RESEARCH SESSIONS 2020

OURS 2020

12th & 13th November 2020



**THE OPEN UNIVERSITY
OF SRI LANKA**

Book of Abstracts
Open University Research Sessions 2020
OURS 2020

12th & 13th November 2020

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MESSAGE FROM THE VICE-CHANCELLOR

It gives me great pleasure to send this felicitation message to the Open University Research Sessions (OURS) 2020, which is an important annual event of the Open University of Sri Lanka (OUSL) that is eagerly looked forward by the university community and other researchers to disseminate their research findings.

Mary-Louise Kearney, former Director of the Secretariat of the UNESCO Forum on Higher Education, Research and Knowledge, once said ‘Knowledge generated by research is the basis of sustainable development, which requires that knowledge be placed at the service of development, be converted into applications, and be shared to ensure widespread benefits’. It is apparent that generating knowledge through research and sharing it is an essential part of the life of an academic in any university. Generating knowledge through research in a country like ours is crucial to develop differentiated and effective academic systems, and to make it possible for the country to join the global knowledge society and compete in sophisticated knowledge economies. Research provides diverse benefits that are distributed across many functional impact areas, positively influencing knowledge expansion and innovation, economic development, enhanced capabilities of human capital, and societal well-being and quality of life.

From its inception, the OUSL has viewed Open and Distance Learning (ODL) related research as important as subject based research and insisted that it is an integral part of the academic life of our University. I believe that this is far more important in the post Covid-19 scenario, where distance education and online education are increasingly being acknowledged as one of the main modes of learning. Therefore, as the pioneering ODL institute in the country, it is important that we get involved in institutional research to provide the country with the required input on improving the effectiveness of this mode of teaching.

In recent years, we have seen OURS establish itself as a high caliber research forum that attracts not only researchers from the OUSL community but also other state universities and higher education institutions. I take this opportunity to thank all the researchers who have sent research papers to be presented at OURS-2020. It is my fervent hope that OURS-2020 would create a forum for presenting and discussing valuable research findings leading to enriching experiences to all the participants.

Let me also take this opportunity to express my appreciation to the Organizing Committee of OURS-2020 and other staff members who have contributed their time and effort to make this event a success.

Thank you very much and all the very best.

Prof. S. A. Ariadurai
Vice-Chancellor

PREFACE

The Open University Research Sessions 2020 - OURS 2020 - is held from 12th – 13th November 2020. It commences with the inauguration on Thursday 12th of November and continues until 13th November 2020. Originally, OURS 2020 was planned as a face to face conference that was scheduled to be held at the OUSL premises in Nawala. However, due to the current health situation in the country and the health guidelines provided by the government of Sri Lanka, we have moved the conference to an online platform. The inauguration session, invited speeches and all presentations will be presented online. By migrating the conference to an online platform during a global pandemic, we ensure that our commitment of Open Distance Learning is upheld.

This year we received 165 abstracts and extended abstracts for reviewing and 114 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 2020 is Dr. Priyanie Amerasinghe who is Emeritus Scientist, at the International Water Management Institute (IWMI), Sri Lanka. The invited speakers include Dr. Panduka Karunanayake of the Department of Clinical Medicine, Faculty of Medicine, University of Colombo, and Dr. Prathapasinghe Dharamawansa of the Department of Electronic and Telecommunication Engineering, University of Moratuwa. 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 2020 conference in this year is the panel discussion on English Language Teaching (ELT). The focus of this panel will be on doing research 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 2020. Therefore, on behalf of the Senate Sub-committee for OURS 2020, I thank all the authors who submitted abstracts to the conference, all reviewers who helped in reviewing abstracts and language editors for editing them. My thanks also go out to the Professors of OUSL for agreeing to serve as Session Chairs at this event. 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. Taniya Munindradasa are greatly appreciated.

We also wish to record our thanks to the Vice-Chancellor, Professor S.A. Ariadurai 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 Dr. Jayantha Wattevidana, Acting Director CETMe 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. Mahesh Bandara at CETMe and Mr. J.P.P.Tharanga at the Department of Computer Science, OUSL for maintaining and updating the OURS 2020 web site.

I need to extend a very special appreciation for the excellent team effort of “OURS 2020 Online Working Group” for their efficiency and willingness to make OURS 2020 online conference a reality. The untiring effort of Dr. Uthpala S. Premarathne, Dr. T. Saminda P. Fernando, Dr. Nayana Nilakarawasam, Dr. Malinda Punchimudiyanse, Mr. J.M.U.T. Jayamanna/Director-IT, Mr. J.P.P. Tharanga and Mr. Kanishka I. Tennakoon is highly recognized.

The support received by Mr. B.M.P. Somaratna, Director Operations and Mr. B. A.D.J. Balachanadra, the Acting Printer with the printing of the abstract book is also appreciated.

This year too, we are able to issue a conference bag to authors who have registered for conference sessions. This would not have been possible without the generous support of Siam City Cement (Lanka) Limited. Our special thanks go to Mr. Chanadana Nanayakkara, Marketing Manager of Siam City Cement (Lanka) Limited, Dr. Thushara Priyadarshana and Dr. Suminda Ranasinghe at the Department of Civil Engineering, OUSL in this regard.

Finally, let me wish all the presenters and participants. I hope OURS 2020 will be intellectually stimulating and academically productive and you will be able to get the best out of this online conference.

Prof. S.R Weerakoon

Professor of Botany and Director/Research

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Address of the Chief Guest

Nature-based solutions for resilient ecosystems: How did the Covid-19 pandemic impact global thinking?

Ecosystems are subject to disturbances due to natural phenomena as well as anthropogenic activities. For instance, floods, droughts, pollution, disease outbreaks and developmental activities disrupt ecosystem functions as much as long term stresses such as nutrient enrichment and changes in sediment supply. Globally, millions of hectares of primary forests have been lost due to development and associated processes of urbanization. An estimated 75% of land surface has been alerted, over 85% of wetlands have been converted, and 66% of oceans are experiencing multiple cumulative threats. These figures will continue to increase, unless greener solutions are embraced. With huge visible impacts, there is a growing consensus that Nature-based Solutions (NBS), which utilizes more robust approaches and opportunities to build ecosystem resilience, are a necessity. These solutions cost less and are more eco-friendly, and hence have the potential to integrate both grey and green infrastructure for more sustained outcomes. While countries are beginning to document the evidence base, its institutionalization and economic feasibility as part of larger master plans still lag behind.

A renewed interest in NBS has surfaced, since the global Covid-19 pandemic swept across the world in an unprecedented manner. With devastating impacts on the health of populations and economies of countries, world leaders are reconsidering the relative merits of NBS for greater accountability, economic feasibility and sustainability of development agendas, which call for greater emphasis on living in harmony with nature, while sharing its benefits. The balance between safeguarding natural resources, human well-being and biodiversity has become imperative if we are to make a positive economic recovery.

Not only is Covid-19 a public health crisis, it is also an ecological nightmare. It has impacted ecosystems and landscapes at differential rates and scales, exacerbated by events of natural disasters. Therefore, more and more people are convinced now that NBS is the way forward to plan for the future, as these solutions are known to offer better protection, sustainable management and restoration of disturbed ecosystems through natural processes. Examples of restored ecosystems show enhanced ecosystem services that benefit people and biodiversity alike. Many countries are looking at novel approaches supported by

digital innovations to design their master plans, where an ecosystem perspective has been embraced so that the full potential of NBS can be realized.

The global economic outlook during the Covid-19 pandemic has been dismal. Due to the travel restrictions aimed at managing the spread of the disease, food production systems and multi-faceted global industries have experienced a high economic downturn. Thus, the Covid-19 pandemic represents one of the largest economic shocks the world has experienced in decades. The economic recovery programs are now looking at how to plan amidst a pandemic situation. They are taking a keen interest in the examples of NBS from around the world, which are already being considered as solutions for urban, rural and coastal flooding, and for managing water scarcity, soil erosion and sedimentation, landslides and inland flooding, storm surges and sea level rise, sea surges, etc. Some of the key areas to be considered against the aftermath of the pandemic are landscape changes that disturb ecosystems and their natural cycles of zoonotic infections, demand for exotic live food for human consumption, and human migration. A recent report highlights the benefits of NBS in five areas – climate change, resource use, nature and biodiversity, health and well-being, and socioeconomic impacts – and invites the business community to be part of the greener recovery process, where NBS are given top priority.

Dr Priyanie Amerasinghe

Emeritus Scientist, Human and Environmental Health
International Water Management Institute (IWMI), Colombo

Keynote Address 1

Academia and Medical Education in the Post-Covid World

The COVID-19 pandemic of 2020 has become the single most important event of contemporary life, due to the changes and disruptions it has brought through both direct and indirect ways and the resultant responses and adaptations we make. COVID 19 invariably has an impact on education, including higher education in general and medical education in particular. The eventual ‘new normal’ will include the ‘residues’ or what is left over from our previous practices into the post-covid world; the adjustments that we ourselves make or are compelled to make to bring some degree of normalcy or meet the societal demand to deliver our programmes; the effects of the challenges that we will face as we adopt new technologies and practices to do the above; and the wider societal changes of the pandemic, both local and global, that impose ‘background effects’ on education.

As academics, however, we could and should analyse and anticipate these changes and attempt to adjust ourselves towards more favorable outcomes, rather than merely identifying and reacting to them. It is therefore important to start from a broader perspective rather than go straight into strategies, or from ‘a vision’ rather than ‘mission statements’, ‘objectives’ or ‘measurable outcomes. Medical education, as well as other forms of professional education, will face certain special challenges, including the necessity to continue with in-person teaching and assessment rather than merely adopt online strategies, so that aspects such as procedural knowledge and contextual knowledge, which are crucial to the graduate’s future professional role, are not lost sight of.

In this keynote address, I will make an attempt to enthuse such an approach, and also venture to offer some suggestions.

Dr. Panduka Karunanayake

Department of Clinical Medicine

Faculty of Medicine

University of Colombo

Keynote Address 2

The Past and Present of the Linear Model

Some statistical models are simple. Some are useful. Some have certain optimal properties. Few are even two of these. The linear model is all three. The concept of linear model goes back to Gauss, if not earlier. The linear model can be used for different purposes: to summarize data, to predict the future, and to predict the result of interventions (i.e., causal inference). Although useful in many scientific disciplines, the classical linear model and related least squares estimator depend on the assumption, among others, that the number of observations (i.e., n) and number of predictors (i.e., p) satisfy the inequality $n > p$. However, decades of advances in data transmission and collection have dramatically increased p with respect to n (i.e., $p > n$) which is also known as the high-dimensionality. Certain modifications have been introduced to the classical linear model to cater for high-dimensional data.

This talk reviews the basic concepts of the classical linear model and illustrates a number of recent developments due to high-dimensional data. Moreover, the role of modern linear model as a supervised learning technique is also highlighted.

Dr. Prathapasinghe Dharamawansa

Department of Electronic and Telecommunication Engineering
University of Moratuwa

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6



OPEN AND DISTANCE LEARNING (ODL)



THE EFFECTIVENESS OF ONLINE GROUP DISCUSSIONS FOR CHEMISTRY PRACTICALS

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The Department of Chemistry, of the Open University of Sri Lanka (OUSL) has used different distance teaching and learning methods such as e-learning to motivate the students about chemistry practical sessions. Experimental videos and pre-lab quizzes are uploaded to promote e-learning, but most of the students attend the laboratory sessions without much preparation. As a result, the students take a considerably longer time for the pre-activity which involves uncovering the experimental procedures which is a group work. The time taken for this pre-activity depends on the preparedness of students. If the students are motivated to prepare themselves before coming to the practical, the time allocated for pre-activities can be minimized, and there would be more time for hands-on experiences. Therefore, it is important to study the effectiveness of online group discussions via mobile apps to motivate students to engage in pre-laboratory activities. This study to evaluate the effectiveness of group discussions was carried out by giving four types of learning materials (objective, theory, lecture video and demonstration video) related to the practical. Level 3 students in the Kandy Regional Centre voluntarily participated in this activity via the WhatsApp mobile app. The student performance was evaluated using quizzes. The results revealed that there was no significant relationship between the given learning materials and the quiz marks, but the student feedback revealed that 55% of students preferred demonstration videos than the other methods. Further, 97% of students preferred this kind of group activity and 60% of students preferred this as a pre-laboratory activity. Therefore, the results indicated that online pre-group discussions with demonstration videos has the potential to motivate the students to engage more in practical courses.

Keywords: Mobile learning, Open and distance learning (ODL), Online group discussions, Chemistry practical

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VIRTUAL TEACHING DYNAMICS IN URBAN SRI LANKA: CURRENT ATTITUDES OF SECONDARY SCHOOL TEACHERS TOWARDS VIRTUAL TEACHING

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Incorporation of technology in education has proved to be an effective teaching method. Even though the concept of virtual teaching is widely accepted utilized in most of the countries in the world, Sri Lankan secondary education has followed the more traditional classroom face to face teaching methods until the Covid 19 pandemic. After the sudden closure of schools due to the pandemic, teaching methods adopted in schools went through a rapid transformation from traditional classroom teaching to virtual teaching. Since teachers played a significant role in this transformation, it is imperative to look at teachers' attitudes towards virtual teaching. The purpose of the study is to investigate the attitudes of teachers towards the effectiveness of virtual teaching and the motivating factors that led to this change. To explore this, a survey was carried out with teachers from the Western province. They completed an online questionnaire and took part in an interview. The participants consisted of 88 secondary school teachers in urban schools in the Western Province. The findings reveals that although the teachers do not find virtual teaching to be a hundred percent effective as a teaching method, they accepted it as a moderately effective teaching methodology. They also felt they had to deal with fewer disciplinary issues. The participants also revealed that the training and support they received from the school management and colleagues were motivating factors. The findings reveal that secondary teachers have embraced virtual teaching and many were using a blended teaching approach to maximize its effectiveness.

Keywords: Attitudes, Blended approach, Pandemic, Training, Virtual teaching

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FEASIBILITY OF IMPLEMENTING A MOBILE LEARNING ENVIRONMENT TO FACILITATE SCHOOL TEACHERS DURING COVID-19 PANDEMIC

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The sudden burst out of COVID-19 global pandemic has disrupted conventional school education systems around the world (UNESCO, 2020; Zaharah, Kirilova, & Anissa, 2020; Toquero, 2020; Arora & Srinivasan, 2020; Fields & Hartnett, 2020) and urged educators to explore alternative teaching learning methodologies such as mobile teaching-learning platforms. This study focusses on the availability of infrastructure and the digital literacy of Sri Lankan teachers to implement a mobile-based environment to support teaching and learning. The study was carried out with the participation of 63 female teachers with the use of the Google form, other digital communication tools and the Framework for the Rational Analysis of Mobile Education (FRAME) by Koole (2009). The results showed that the digital devices and tools that were used by the teachers in the sample could be used as the infrastructure to initiate a mobile learning environment (henceforth MLE). However, the limited mobile literacy and digital tools are needed for mobile learning has been the major challenge in initiating an MLE. One of the obstacles which made the awareness process difficult was the teachers' lack of familiarity of the mobile learning platform, which they were not competent to use. Among the teachers, there was high motivation and willingness to adapt mobile learning and most of them considered it even after the pandemic. It is important to note that some teachers had adapted the MLE as they had no choice, most of the others considered it as an opportunity to continue teaching amidst prevailing pandemic situation. With proper measures to surmount the challenges posed by the lack of digital literacy and drawbacks encountered due to slow networks, the MLE has given an opportunity for the teachers as well as authorities an alternative method of continuing teaching. Moreover, as already shown by Selvaras (2020) and implemented at the Post Graduate Institute of English (PGIE), productive MLE for universities will be fruitful future research.

Keywords: COVID-19, Feasibility, MLE, Online teaching, School teachers

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SUMMATIVE EVALUATION OF A MOBILE LEARNING APPLICATION USING A TABLET COMPUTER: EXPERIENCES OF HEALTH SCIENCE UNDERGRADUATE LEARNERS

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A mobile learning application (MLearn) for tablet computers was designed and developed by the Centre for Educational Technology and Media (CETMe) for the Faculty of Health Sciences of the Open University of Sri Lanka (OUSL) using designed-based research. For the mobile application, one session each from a course in the BSc Hons in Nursing, Bachelor of Pharmacy (BPharm) Hons and Bachelor of Medical Laboratory Sciences (BMLS) Hons was transformed to digitized content from existing print course material. The content was enriched with additional media affordances to facilitate self-learning studies offline, considering the limited access to the internet based on the baseline survey findings. The purpose of this study is to report on the findings of the summative evaluation of the mobile learning application using tablet computers with real learners. The research questions focused on how undergraduates use the mobile application for learning via a tablet computer, their reading behaviours, and their perceptions on using mobile applications for future learning. Purposeful sampling method was used to select the undergraduates of the three Honours degree programmes; 17 from BSc Nursing, 7 each from BPharm and BMLS participated in this study. The data collection methods were observations with learners while using the mobile application via a tablet computer and interviews (individual or 2-4 focus-group interviews) thereafter to get their views on the learning experience of this novel approach. The observation showed that almost all the learners used the application in linear fashion using programme control buttons. Only a few attempted learner control buttons displayed on the top of the screen and also missed certain features which were designed parallel to the text. The interview data revealed that they enjoyed and were very satisfied with their learning experience. It was possible also to identify four factors with respect to mobile learning; motivation, access, inherent and learning factors. The experiences expressed in this study would be useful to assess the future changes that may be required in the organisational culture of teaching-learning, if mobile learning integration is mainstreamed at the OUSL.

Keywords: Mobile learning application, Health Science, Open and distance learning, Open University of Sri Lanka

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A STUDY OF CHALLENGES RELATED TO ONLINE TEACHING-LEARNING IN SCHOOLS

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The sudden outburst of the COVID-19 pandemic compelled the world to take drastic measures to keep the human population safe leading to the inevitable locking down of states. As a result, education systems worldwide came to a temporary standstill. However, by following the directives of the relevant authorities, all schools in Sri Lanka were compelled to conduct online teaching sessions despite a certain segment of the student population being marginalised due to economic and social reasons. Online teaching, which is a currently an ongoing process, is undoubtedly undergoing a trial and error period since there are no concrete experiences to rely on. Meanwhile, its stakeholders which include the teachers, students and parents too need to be aware of the immediate issues pertaining to this novel experience in order to reap better results as distance learning now seems to be applicable to the school education system as well. Accordingly, this study looked at the challenges faced by teachers, students and parents during live online teaching sessions as well as the possible methods that could minimise them. To do so, a complete qualitative study was conducted by interviewing a group of thirty-six participants consisting teachers representing the local (government), local (private) and international school sectors, school going students and parents. In addition, a few online learning sessions too were observed. The results revealed a considerable number of challenges faced collectively by the sectors mentioned above such as non-adherence to strict discipline, inability to gauge the students' level of comprehension and monotony. However, this study has the scope to be extended by viewing issues related to specific subjects when taught in a virtual classroom so when the need arises, the relevant teachers are better positioned in conducting more successful online lessons.

Keywords: Challenges, Online Teaching-Learning, School education system, Covid 19 pandemic

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PRE-ACTIVITY PREPARATION IN AN ODL UNDERGRADUATE CHEMISTRY LABORATORY: THE STIMULATORY ROLE OF PRE-ACTIVITY ASSIGNMENTS

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In Open and Distance Learning (ODL), the carefully designed course material serves as the principal source for imparting knowledge for ODL learners. Hence, an essential and expected pre-requisite of the ODL system is for the learners to study the course material as guidance before participating in course related activities. Unfortunately, it is notable that many learners do not allow adequate pre-activity preparation; a likely indication of the lower levels of performance. However, if guidance is given by carefully designed pre-activity assignments to motivate learners to study the course material, they are likely be more inclined to engage in pre-activity preparation. The objective of the proposed study was, therefore, to assess the correlation between pre-activity assignments, and post-activity performance evaluations as a measure of ensuing learner performance to assess the stimulatory role of pre-activity assignments in driving learner performance. The study was conducted based on a practical session conducted for a Level 3 undergraduate chemistry course (CYU3302) at the Open University of Sri Lanka (OUSL). Here, the learners were required to attend a 3-day compulsory practical session which focused on the basic practical skills in qualitative inorganic and organic chemistry. The methodology of the study was designed to test the hypothesis that the academic performance in an OUSL undergraduate chemistry laboratory is positively influenced by the degree of pre-activity preparation where pre-activity assignments were used as guidance, to improve learner preparation. Data for the study was collected based on the performance of 190 learners in two pre-tests and four post-tests. The pre-tests were strategically designed to provide specific guidance/hints for the learners to uncover the important information provided in the course material. Based on the findings, there is correlation between the pre-activity and post-activity performance of learners, specifically considering the performance of the subset of high performing learners in the post-tests. However, given that the pre-tests were administered as Open Book Tests (OBTs), there are clear signs of the presence of surface learning. Feedback on the learner perception on the specific guidance provided by the pre-tests for pre-activity preparation, anticipated to be collected as the future direction of this work, will hopefully provide imperative qualitative insight in this regard.

Keywords: Chemistry laboratory, Open Distant Learning, Post-test, Pre-activity preparation, Pre-test

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EXPLORING THE CHALLENGES AND BENEFITS OF USING MOODLE CHAT SESSIONS AS A LEARNER SUPPORT MECHANISM DURING THE COVID-19 LOCKDOWN IN SRI LANKA

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Learning Management Systems (LMS) have been dominating online education for decades but the value of online learning was recently highlighted as it became the 'new normal' in education systems around the world (UNESCO, 2019) with COVID-19 (Corona Virus Disease) pandemic. Since the first cases of the virus in Sri Lanka were identified around January 2020, the impact on human life has been devastating and over 500,000 deaths were globally recorded by June 2020 (WHO, 2020). While the health impact crippled the health service sector, education sector also suffered. Education institutes around the world adhered to strict social distancing rules to prevent the spread of this respiratory disease. However, there were positive outcomes within the education sector as video-based online schooling and universities attempted to provide continuous education using free open-source software such as Moodle LMS. Among the course content delivery, communication, discussion forums and online assessments, another infrequently used function within Moodle was the chat option. It allows synchronous and asynchronous learning and interaction between students and teachers. This was investigated through a pilot intervention with the aim of providing revision support for an existing supplementary course developed for year one *Introduction to Psychology* course. The objectives of this research study were to: 1) explore the utility of Moodle chat function for revision purposes; and to 2) facilitate continuous engagement with course material using the existing online platform. In achieving these objectives, challenges such as time restrictions on the chat function, typing speed necessary for effective participation, and online chat etiquette were observed. The Intervention was: the chat was included in their course homepage and students were given specific instructions about which topics would be discussed as purposefulness was identified through previous research as a key for an effective chat. At the end of a six-week period where Sri Lanka was under strict lockdown and curfew rules, this chat was conducted weekly at a specific time slot via Moodle. The methodology was: Twelve question surveys were distributed to evaluate the chat usage displayed in the Moodle at the end of the six weeks. The Participants were 36 students who responded (40% response rate) with 88% females. In the sample, 52% were between 19-27 years of age while maximum age was reported as 53 years. The results showed that majority of those who joined the chat found it moderate to extremely useful for their revision with (78%) confirming the objective of the study. Another positive outcome was that 56% of the students were already using another chat application to discuss course material before this intervention and they could be motivated to use Moodle chat with similar mobile type application. Also, the 44% who never used chat functions are also important as they could be motivated to use this tool within safe and secure environment of the university-based LMS. In conclusion, it is recommended that students should be encouraged to use Moodle tools such as chat which allows synchronous and asynchronous learning interactions.

Keywords: Chat, COVID-19, Learner support, Learning management systems, Moodle, Sri Lanka

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RESEARCH PUBLICATION EXPERIENCE OF ACADEMICS: AN EXPLORATORY STUDY WITH A SAMPLE AT OUSL

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Research is vital for development of any discipline. Academics in universities are expected to engage in research in their discipline or other areas of interest and publish them in reputed journals. In most of the universities and other Higher Education Institutes in the world, the quantity of research publications has become the main criterion for promotion, grants, and other incentives for academics. According to the Theory of Reasoned Action (TRA) by Ajzen and Fishbein (1980), individuals' intention to perform a behaviour is guided by their own attitudes about that behaviour, and perceived social pressures to satisfy the demands from different parties. Some researchers have argued that high publication pressure may cause harmful effects on the area of research and on individual researchers (Haven, Bouter, Smulders, & Tjldink, 2019) and this may affect the quality of research leading to 'scientific misconduct, fraud, and plagiarism' (Haven, de Goede, Tjldink, & Oort, 2019). Since anecdotal evidence from fellow academics shows that they too experience such pressure, the need to conduct research on the publication experience of academics of the Open University of Sri Lanka (OUSL) was felt to be necessary. The sample consisted of 175 OUSL academics who were on a common mail list. The study adopted a survey research design. The Publication Pressure Questionnaire (PPQr) by Haven, Bouter, Smulders, and Tjldink (2019) was slightly adapted and used as the data collection instrument after obtaining written permission. The objectives of the study were to investigate the level of publication pressure experienced by OUSL academics and to identify the barriers for research publishing. This exploratory study revealed that the OUSL academics in the sample experience varying degrees of pressure in the three subscales, Publication Stress, Publication Attitude, and Publication Resources. The findings reveal the importance of reducing the sources of pressure on academics and creating a positive research culture in the university.

Keywords: Academic stress, PPQr, Publication pressure, Research publication

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AGRICULTURE





DEVELOPMENT OF CRYOPRESERVATION PROTOCOL FOR BANANA VARIETY 'PULATHISI' (*Musa spp.*) BY VITRIFICATION TECHNIQUE

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Banana (*Musa L. spp.*: Family *Musaceae*) is one of the common plants grown in tropics and subtropics as a food crop, an essential commodity for marketing locally and internationally. Most of the banana varieties are parthenocarpic and it is an identifiable challenge for germplasm conservation. Further, a few varieties of banana are categorized under endangered and threatened due to human activities. Therefore, preservation of such germplasm is essential for future plant breeding and crop improvement programs. The experiment was aiming to develop a cryopreservation protocol for banana variety 'Pulathisi' which is recommended by Department of Agriculture, Sri Lanka (DOA) for cooking purposes. Furthermore, this study was aiming to investigate the physical and chemical cryopreservation conditions and to develop a better regeneration medium with a high recovery rate for 'Pulathisi' banana variety. Therefore, an experiment was conducted to identify desiccation time, thawing temperature, thawing time and regeneration medium for meristem cryopreservation. The suckers (*Musa* AAXBB 'Pulathisi') were collected from the Plant Genetic Resource Center (PGRC) field gene bank at Gannoruwa, Sri Lanka. These explants were subsequently used for establishing tissue culture and meristem cryopreservation. Plant Vitrification Solution (PVS) desiccation time: 30 min and 40 min, thawing temperature: 40°C and 42°C, thawing time: 1 min and 2 min and regeneration medium: Murashige and Skoog (MS) medium supplemented with 17.7 µM 6-Benzylaminopurine (BAP) and MS medium incorporated with 10.2 µM of BAP + 10.2 µM of Indole Acetic Acid (IAA) was tested with 80 meristems of banana variety 'Pulathisi' and the data were analyzed with analysis of variance (ANOVA). The 40 meristems treated with PVS solution for 30 min desiccation time shrank and later died at the end of the culture period. Except for PVS solution application for 40 min desiccation time ($p = 0.049$) and the regeneration medium $p = 0.0308$, other variables were not significant. Survival percentage of 85 (meristems remained green color after 4 weeks of culture period) was obtained in the regeneration medium 01 which consisted of MS supplemented with 17.7 µM BAP. Under the PVS desiccation time 40 min, 40 meristems were cultured 55% of meristems survived, while 25% meristems were dead and 20% were contaminated. Significant differences were observed in this 40 min desiccation time for survival percentage. In this study higher contamination percentage was reported, which can be due to endogenous bacteria. In this study 55% of meristems were survived with PVS desiccation time of 40 min and regeneration medium supplemented, MS with 17.7 µM BAP.

Keywords: Cryopreservation, Explants, Parthenocarpic, Plant vitrification solution, Thawing

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USE OF ARECANUT HUSK AS A PARTIAL SUBSTITUENT IN COCO PEAT BRIQUETTES

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Arecanut belongs to the family Arecaceae which is a common plant found in tropical countries. Though coconut husk-based products have a high commercial value and demand, arecanut husk is not used to produce any commercial product. Coco peat briquettes are one example for coconut husk-based products which has a huge demand in the export market as soilless plant media. Coco peat briquettes are prone to fungal diseases and to prevent fungus attacks these briquettes are treated with harsh chemicals before exporting. Arecanut, on the other hand, has inherent antifungal properties due to its chemical composition which is proven by many recent researches. However, these antifungal properties of the arecanut husk is not commercially used for any product and disposed as valueless waste material. With consideration to all the above factors the aim of this research was to develop a coco peat briquette by using arecanut chips as a partial substituent. The first objective was to make an arecanut husk-based briquette with low electrical conductivity level and similar expansion volume compared to briquettes made with coconut husk. For that, samples were made with five different ratios of coco peat to arecanut chips, which were 90:10, 80:20, 70:30, 60:40 and 50:50 respectively. Control samples were made with the same ratio by replacing arecanut husk chips with coconut husk chips. The electrical conductivity level and expanded volume were measured and the ratios with electrical conductivity below 800 mS/cm and similar expansion volumes, which has no significant difference ($p>0.05$) compared to the coco peat made with coconut chips were selected for the estimation of antifungal properties. All the tested samples resulted low electrical conductivity levels compared to the respective ratio of coco peat with coconut chips. However, 80:20 and 70:30 ratios did not have similar expansion volumes when compared with coco peat made by using coconut chips. Therefore, these two ratios were not considered to estimate the antifungal properties. Hence antifungal properties were evaluated for 90:10, 60:40 and 50:50 ratios of coco peat to arecanut husk chips by using *Thielaviopsis paradoxa* pure cultures. The antifungal property was measured by the inhibition zone diameter. According to the results 50:50 ratio of coco peat to arecanut husk chips produced maximum zone of inhibition of 14.6 mm compared to 0 mm inhibition zone resulted with cocopeat to coconut husk chips. This emphasizes that arecanut husk chips contains antifungal properties. Ultimately it can be concluded that coco peat briquettes can be produced by using arecanut chips as a partial substituent which also contains antifungal properties against *Thielaviopsis paradoxa*.

Keywords: Arecanut, Antifungal properties, Coco peat, *Thielaviopsis paradox*

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SCREENING OF SELECTED PLANT EXTRACTS USED AS A BIO FUNGICIDE TO CONTROL THE ANTHRACNOSE DISEASE OF MANGO

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Anthracnose caused by *Colletotrichum gloeosporioides* is one of the most common postharvest disease affecting mangos. Consumer dislike to consume fruits with chemical fungicide residues urges scientists to develop bio-fungicides using botanicals. Hence, the aim of the present study was to investigate the antifungal effects of plant extracts, *Aloe vera* (Komarika) peels, *Syzygium cumini* (Madan) seeds and *Senna alata* (Ath Thora) leaves against the anthracnose causing fungus *Collectotrichum gloeosporioides* isolated from the Sri Lankan mango variety Karthakolomban. Ethanolic extracts of the above plant parts were tested with and without Tween 20 under five different concentrations; 0.2%, 0.5%, 1%, 1.5% and 2%, *in vitro* to determine the mycelia colony inhibition (CI) and spore germination inhibition (SGI) of the fungus. Combination of *Aloe vera* and Tween 20 at 2% concentration gave the highest colony inhibition (65%) and spore germination inhibition (71%) compared to *Aloe vera* without Tween 20. *Syzygium cumini* with Tween 20 at 2% gave 38% inhibition of colony and 58% inhibition of spore germination as well as *Senna alata* with Tween 20 at 2% showed 45% colony inhibition and 60% spore germination inhibition. Negative control showed no inhibition of colony as well as zero spore germination inhibition. The study revealed a promising prospect for the utilization of selected plant extracts in anthracnose pathogen control.

Keywords: Mango anthracnose, Plant extracts, Tween 20

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SUITABILITY OF MICROENCAPSULATION OF CRUDE CAROTENOID EXTRACTS FROM FRUIT PEELS FOR REPLACING ARTIFICIAL FOOD COLORANTS IN JELLY

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Industrial fruit waste of processing industries has become a major challenge globally due to the generation of large quantities of by-products such as peels, which contain substantial amounts of carotenoids. Thus, microencapsulation of crude carotenoids (CCs) extracted from mango, papaya and banana peels and replacing artificial colourants with the microencapsulates for imparting colour in jelly products were the focus of this study. The CCs were extracted from the peels under optimum conditions of ethanol concentration, temperature and time based on Box-Behnken design of response surface methodology. The extracted CCs were stabilized by mixing with polysorbate 80 and maltodextrin (15% w/v) followed by spray drying. The resultant papaya microencapsulates were of small granular shape than those of mango and banana as revealed by scanning electron microscopy. Jelly products were prepared by incorporating microencapsulates of CCs into the sugar-gelatin mixture at 2%, mixing well and refrigerating according to the method described in SLS 586:1982. Jelly products were also prepared using jelly mixtures marketed by a reputed food manufacturing company according to the method described in the market sample. Colour of the jelly products was determined in triplicate by measuring L*, a*, b* values and compared with those containing tartrazine and azorubine (control 1) and tartrazine and sunset yellow (control 2). The results revealed that the a* values of jelly containing microencapsulates of mango, papaya and banana CCs were comparable with both the controls and the b* values of those containing microencapsulates of papaya and banana CCs were comparable with control 2 (p<0.05). This reveals the suitability of microencapsulates of CCs extracted from mango, papaya and banana peels for replacing artificial colourants in jelly products for imparting yellowish colour.

Keywords: Box-behnken design, Carotenoids, Fruit peel, Industrial fruit wastes, Microencapsulates

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EFFECT OF A WATER SAVING SUPER ABSORBENT POLYMER ON IRRIGATION INTERVALS OF TEMPERATURE AND WATER STRESSED CHILLI (*Capsicum annuum* L.) PLANTS

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Chilli (*Capsicum annuum* L.) is a major spice crop that is found all over the world. Temperature and water stress conditions are two key factors that affect the growth and yield of the chilli in Sri Lanka. To overcome the water stress effect, super absorbent polymers have been used extensively. The main objective of this study is estimating the effect of Zeba (Super Absorbent Polymer) on the irrigation interval to alleviate the temperature and water stresses. This experiment was designed with three irrigation intervals (3 days, 5 days and 8 days) and two levels of Zeba (No Zeba and 2g of Zeba). This experiment was conducted at the Open University of Sri Lanka. MI-2 variety was used and temperature regulated polytunnel was used to impose the temperature stress maximum of 36°C and the plant house was used to represent the ambient temperature (32-33 °C). One set of treatments were conducted inside the polytunnel while the other treatments were conducted inside the plant house. All treatments were arranged according to the Completely Randomized Design (CRD) with three replicates and the experiment was repeated thrice to replicate in temperature effect. Growth parameters were measured in two-week intervals and yield parameters were measured after harvest. Statistical analysis revealed that a significant three-way interaction effect of three major factors (temperature stress, irrigation and Zeba) on growth and yield parameters. The treatments without Zeba have shown a significantly lower performance than the treatments with Zeba. Zeba has the potential to alleviate drought stress and reduce irrigation frequency in chilli cultivation in drier regions.

Keywords: Chilli, Super absorbent polymer, Temperature stress, Water stress

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INFLUENCE OF ORGANIC BASED SUPER ABSORBENT POLYMER (ZEBA) ON GROWTH OF CABBAGE AND SOIL WATER CONTENT UNDER TEMPERATURE AND WATER STRESS CONDITION

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Today environmental factors are unpredictable, and their unpredictable nature negatively influences crop cultivation. Among them, temperature and irrigation are very important for crop cultivation. Application of Super Absorbent Polymers (SAPs) is one modern technique that can be used to mitigate temperature and water stress on crop cultivation. This research project is designed to study the effects and interactions of ZEBA (organic super absorbent polymer), temperature and water stress on growth and yield of cabbage. Three factors were used as temperature (Temperature stress/T1, Ambient temperature/T2), Irrigation interval (three days/I1, five days/I2 and eight days/I3) and ZEBA (without application (Z1) and with application (Z2)). Treatments were arranged in Complete Randomized Design (CRD) with three replicates and the experiment was repeated thrice to replicate in temperature effect. Analysis of variance (ANOVA) was run by SAS program package for SAS university version using three-factor model. Three factor analysis of variance revealed that all sources of variations were significant and according to the F-test, all interactions were significant at the 0.05 probability level on soil moisture and growth and yield parameters of cabbage. Treatment with ZEBA, with 3 days' irrigation interval at ambient temperature condition has shown the highest soil moisture content (T2Z2I). Treatment without ZEBA, with 8 days' irrigation interval under temperature stress condition (T1I3Z1) has resulted in the lowest soil moisture content. Reduced plant height and width of plant canopy at temperature stress and water stress conditions might result from leaf senescence and wilting due to lack of moisture. Relative water content was reduced in water-stressed leaves. Treatments with ZEBA under ambient temperature with all irrigation intervals showed positive responses of crop growth and yield and treatments with ZEBA, under temperature stress condition at the 3 days' and 5 days' irrigation interval were given higher growth and yield performances.

Keywords: Cabbage, Soil moisture, Temperature stress, Water stress, Yield

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INVESTIGATING THE POTENTIAL OF PREPARING A LIQUID FERTILIZER FROM WASTEWATER OF COIR PITH PROCESSING INDUSTRY

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In many industries, the only wastewater treatment measure taken before discharging wastewater into natural water bodies, is dilution. The reason for this is the fact that other treatment processes are expensive. However, this causes many environmental problems. Coir pith naturally contains many salts and in processing, calcium nitrate and fresh water are used. Wastewater of coir pith industries is diluted with fresh water in 1:3 ratio before discharge. The objective of this study was to investigate the potential of wastewater to be used as a liquid fertilizer for growing and blooming stages. Wastewater samples collected on different days and times were analyzed. The average [K], [Ca], [Na], [S], [Mg], [P] and [N as NO_3^-] in wastewater were 1938 (± 22), 315 (± 15), 680 (± 26), 55 (± 8), 94 (± 11), 30 (± 5) and 536 (± 31) ppm respectively. Based on the amount of K, dilution factors to prepare the two fertilizers were calculated. They were 8.42 and 6.40 for growing (WG) and blooming (WB) stages respectively. The balance required amounts of other macro element sources were calculated based on plant standard requirement for WG and composition of the control commercial fertilizer for WB. The compositions of prepared mixtures were [K]=343, [Ca]=300, [S]=52, [Mg]=41, [P]=33 and [N as NO_3^-] =269 ppm for WG and [K]=450, [Ca]=257, [S]=58, [Mg]=57, [P]=93 and [N as NO_3^-] =210 ppm for WB. The pH and EC of WG and WB were 5.90 and 5.59 and 1.9 and 2.3 dS/m respectively. A simplified hydroponics (SH) study and a study in soil were carried out with *Capsicum annum* (variety CA 8). Four treatments; waste fertilizers in soil (SW), waste fertilizers in SH (HW), control fertilizers in soil (SC), control fertilizers in SH (HC) were tested with three replicates having two plants in each. The results revealed that the temperature in the mesh house (25°C - 32°C) was within the recommended range for *Capsicum* but relative humidity was higher than the recommended range (75 - 86%). The maximum stem width and total no. of fruits of HW were significantly greater than others may be due to high N amount available in SH system. Fresh weight *per* fruit and the maximum root length of HC were significantly higher (dry weight *per* fruit significantly lower) than others may be due to the high P amount available in SH system. The yield of HW and HC was significantly higher than others. There was no significant difference in the plant height and stem width with time, average cuticle thickness, pH of extractions, TSS and % of TA of fresh fruits between the treatments. The study concluded that wastewater of the coir processing industry can be used to prepare low cost successful fertilizers for capsicum making an additional income while eliminating the cost of wastewater treatment. A complete analysis of wastewater is required to find out other constituents which might affect the plant growth. The effect of tested fertilizer on other plants and systems should also be investigated for a wider applicability.

Keywords: *Capsicum annum*, Coir pith, Liquid fertilizer, Simplified hydroponics, Wastewater



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BIOLOGICAL SCIENCES

INVESTIGATION OF SECRETORY PHOSPHOLIPASE A2 INHIBITORY ACTIVITY OF BUTANOL FRACTION OF AQUEOUS EXTRACT OF *Tragia hispida* (WEL KAHAMBILIYA) AS A POTENTIAL THERAPEUTIC AGENT FOR DENGUE FEVER

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Dengue Hemorrhagic Fever (DHF) occurs due to vascular leakage, which leads to shock and subsequently death. Platelet Activating Factor (PAF), which is one of the most important mediators of vascular leakage and secretory phospholipase A2s (sPLA2s), is an inflammatory enzyme that mediates its production. It was shown that sPLA2 activity is significantly higher in DHF patients. *Tragia hispida* is a perennial herb with scattered stinging hairs. *T. hispida* is used traditionally for bleeding and fever and was screened for its possible sPLA2 inhibitory activity. Therefore, the present study is aimed at identifying the possible sPLA2 inhibitors from *T. hispida* as inhibition of sPLA2 which could be used as a potential treatment for dengue. The sPLA2 activity was measured using a commercially available assay kit and was measured in 80% ethanol extract (THE), aqueous extract (THA) and the butanol fraction of the aqueous extract of *T. hispida* (THB). Among them, THB showed potent sPLA2 inhibitory activity against bee venom sPLA2 (sPLA2 group III) compared to the positive control, CAY 10590 (commercially available sPLA2 inhibitor). Therefore, THB was further investigated with dengue patient serum sPLA2 (n=31) and it showed a significant inhibitory effect (p<0.0001) compared to positive control, CAY 10590. Cytotoxicity of aqueous extract of *T. hispida* (THA) was evaluated using Sulforhodamine B assay employing MRC 5 cells and paclitaxel as positive control. It was found that THA is non-toxic to the normal human fibroblast cells (IC₅₀ =4400, 445, 199 µg/mL for 24, 48 and 72 hrs respectively). THB can be considered as a potential treatment for dengue due to higher sPLA2 activity with less cytotoxic activity. Therefore, it should be further investigated to identify the compounds responsible for the inhibitory activity.

Keywords: Dengue, Secretory phospholipase A2, *Tragia hispida*

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DIVERSITY OF ARTHROPOD FAUNA ASSOCIATED WITH FIVE DIFFERENT SPECIES OF TREE IN THE OPEN UNIVERSITY PREMISES, NAWALA, SRI LANKA

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Arthropods associated with species of tree play an important functional role on growth and survival of trees and regulation of nutrient cycling processes in the ecosystems. Therefore, understanding the interactions of arthropods and the species of tree is crucially important. There have been no previous studies carried out to investigate the arthropod faunal association with the species of tree in the Open University (OUSL) main campus in Colombo and this study was conducted at OUSL's mentioned premises to fill this research gap. Five dominant species of trees, namely *Mesua nagassarium* (Na), *Mangifera indica* (Mango), *Filicium decipie* (Pihimbiya), *Terminalia catappa* (Kottamba) and *Acacia auriculiformis* (Acacia) were selected for the study. Arthropods were collected from the canopy and bark using several methods such as tree beating, sweep netting, bark spraying, sticky trapping, and hand picking. The sampling was done twice a month from each tree species during the period February to July 2014. All arthropods collected were identified using standard taxonomic keys and their abundance and diversity indices were calculated. All arthropods belonged to class Insecta and class Arachnida representing 45 insect families and 21 Arachnid (spiders) families. Out of the 45 insect families the 13 insect families; Lampyridae, Carabidae, Coccinellidae, Chironomidae, Mycetophilidae, Muscidae, Culicidae, Pyralidae, Formicidae, Evaniidae, Hemirobidae, Chrysopidae and Balattidae were found in all five tree species. In this study, five insect families, Pedilidae, Simuliidae, Sciaridae, Therevidae, and Lyonetiidae, were recorded only in the Na tree, and 2 families, Siphonuridae and Coreidae, were recorded only in the Acacia tree showing host specificity. All spiders found belonged to 21 spider families and 5 families, Salticidae, Oonopidae, Lynyphiidae, Clubionidae and Thomsidae were represented in all five tree types. Highest number of spider families were recorded in the Na tree (19) and lowest number of spider families in the Pihimbiya tree (13). Results showed that the highest arthropod abundance was recorded in Na tree with a high species diversity ($H = 2.89$) representing 29 insect families and 19 spider families and species diversity was comparatively less in other four trees with the Acacia tree ($H = 2.01$) showing the lowest diversity in representing 21 insect families and 15 spider families. This study revealed that Na trees provide favorable microhabitats for diverse and numerous arthropod faunal associations with 48 arthropod families and Acacia trees contribute for the lowest faunal association representing 36 arthropod families. These baseline data will be useful when considering replanting activities of the OUSL premises since the university should focus more on trees which provide high arthropod association considering biodiversity aspects for a green concept in the OUSL premises. Further studies should be carried out to investigate feeding guilds of these identified arthropod faunal groups in the OUSL premises.



Keywords: Arthropod associations, OUSL premises, Species diversity

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KEEPING FISH AS PETS: PERCEPTIONS FROM FISH OWNERS IN NALLUR, JAFFNA, SRI LANKA

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Fishkeeping is a popular hobby worldwide. Owning a fish pet and caring for its welfare is known as pet fish ownership. National and district-level information on pet fish ownership is limited. The present study aimed to collect basic information on owners' perceptions of keeping pet fish and various preferences, potential constraints and challenges in aquarium keeping and possible recommendations for the identified constraints. A qualitative study was performed from September to December 2016, by using structured questionnaires from randomly selected home aquarium owners (n = 70). The findings reveal that those of the younger age category 6 - 15 (27%) and 16 - 25 (27%) were involved in ornamental fish guardianship. This study leads to the understanding that the surveyed respondents prefer freshwater medium (100%), glass tanks (86%), artificial feed (72%) and low-cost fancy fish such as Goldfish (17%), Guppy (15%), Dwarf Gourami (15%) and Angel (14%) in the household aquarium. Fish owners who responded to the survey reported that diseases, lack of proper knowledge in maintenance of aquarium fish, especially monitoring the changes of water quality, proper feeding, cleaning and cost for purchasing accessory equipment are the major challenges faced in pet fish ownership. The recommended solutions are the provision of proper awareness for fish owners through brochures, leaflets, videos and newspapers, development of paid jobs related to fish tank maintenance and promotion of animal welfare. Pet fish shops can educate buyers regarding management and maintenance of aquarium in the home.

Keywords: Aquarium, Ornamental fish, structured questionnaires

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APPLICATION OF VISITOR PERCEPTIONS FOR THE ADVANCEMENT OF DEHIWALA ZOOLOGICAL GARDENS, SRI LANKA

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National Zoological Gardens of Sri Lanka is the only place where the highest number of captive animal species are exhibited in cages and enclosures. No previous studies were done on perceptions of zoo visitors in Sri Lanka and this present study was carried out in the Zoological Gardens at Dehiwala from July to December in 2015 to fill this knowledge gap. A random sample of 1500 zoo visitors were selected for the data collection. Questionnaires including 10 closed and 20 open ended questions were employed to collect data and questionnaires were distributed among selected sample of visitors in weekdays, weekends and public holidays. Data was analyzed by Mini tab 14 software. Questionnaires were focused on animal cages, enclosures, facilities provided for visitors, purpose of zoo visit, preference of animal exhibits, animals which they like to see at the zoo in future and suggestions for improvement of zoo environment. Results showed that 52.5% zoo visitors are females and majority of visitors were in age category 15-30 yrs. (45.5%). Priority order for the purpose to visit the zoo was, for education (35%), seeing animals (33%), and for leisure (21%). Most of the visitors preferred visiting elephants and chimpanzees while least preference was on reptiles. High visitor expectation was clearly identified (78%) to see new animal species like pandas, gorillas and polar bears in the future and also on more facilities at the entrance with mechanical gates (89%), ticketing machines (88%) and credit card payments (23%). Most visitors were dissatisfied about the space and facilities of animal cages and enclosures (56%) and also on infrastructure facilities (58%). A resolution on the part of a high number of visitors to not to revisit the zoo (39%) was identified. These base line data may provide some guidance for the National Zoological Gardens to improve in the future. Further studies should be carried out to identify visitor perception on zoo concepts and animal conservation.

Keywords: Dehiwala National Zoo, Visitor perceptions, Questionnaires, Visitor expectations

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ANTI-HYPERCHOLESTEROLEMIC ACTIVITY IN PLANT SPECIES OF THE FAMILY EUPHORBIACEAE ON CHOLESTEROL-INDUCED WISTAR ALBINO RATS

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The increased serum cholesterol level, known as hypercholesterolemia, is a condition leading to the development of atherosclerosis and coronary heart diseases. Plant metabolites are being tested for anti-hypercholesterolemic properties. Plants species of family Euphorbiaceae consists of various medicinal properties. However, few species in the family are subjected to anti-hypercholesterolemic screenings. The present study aimed to investigate the anti-hypercholesterolemic activity of nine species of family Euphorbeaceae; *Phyllanthus maderaspatensis* L., *P. reticulatus* Poir. ('Welkayla'), *P. polyphyllus* Willd. ('Kuratiya') *P. amarus* Schum. ('Pitawakka'), *Glochidion zeylanicum* (Gaertn.) A. Juss. ('Hunukirilla'), *G. montanum* Thw., *Bridelia retusa* (L.) A. Juss. ('Katakela'), *B. mooni* Thw. ('Patkela') and *Embllica officinalis* ('Beheth nelli') in cholesterol-induced Wistar albino rats. Collected plant parts and barks/fruits/leaves were dried and powdered mechanically, and samples were subjected to soxhlet extraction with methanol at 64°C for 6-8 hrs. Extracts were evaporated at 40°C and samples were dried in vacuum oven until gain constant weight. Healthy adult male Wistar albino rats weighing between 180-200 g were kept under standardized animal house conditions with water and standard diet ad libitum. Experimental animals were acclimatized for 7 days before commencement of the study. Rats were divided into eleven groups (n = 6/group). Hypercholesterolemia was induced in rats by feeding a cholesterol rich diet after acclimatization period. Equal amounts of the diet (~2 ml) were given to all the rats except the negative control group, once a day orally throughout the experiment. Hypercholesterolemia could be induced by feeding cholesterol-rich diet for two weeks. The crude methanolic extracts were then administered orally to Wistar albino rats, at the dosage of 2000 mg/kg body weight per day for 14 days to assess the acute toxicity and anti-hypercholesterolemic activity. Acute toxicity signs were not observed with the extract of 2000 mg/kg. The most effective plant extracts that reduced total cholesterol and triglycerides are the *P. maderaspatensis*, *E. officinalis* and *G. zeylanicum*. Additionally, extracts of *P. reticulatus*, *P. amarus* and *B. retusa* were able to reduce total cholesterol. The crude methanolic extracts of *P. maderaspatensis*, *P. reticulatus*, *P. amarus*, *E. officinalis* and *G. zeylanicum* significantly lowered LDL-Cholesterol level in rats. Except crude methanolic extract of *P. polyphyllus*, *P. amarus* and *B. retusa* all other plant extracts increased HDL-Cholesterol levels. When considering all parameters and all Euphorbiaceaeous extracts tested, *P. maderaspatensis* and *E. officinalis* plants have a higher capability in enhancement of lipid profile in diet induced Wistar albino rats.

Keywords: Euphorbiaceae plants, Hypercholesterolemia, Wistar albino rats

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MORPHOLOGICAL DIVERSITY AMONG SELECTED SRI LANKAN TRADITIONAL RICE (*Oryza sativa* L.) VARIETIES

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Oryza sativa varieties grown in Sri Lanka from ancient times to the middle of the last century are known as traditional rice varieties and a collection of over 3000 traditional rice accessions are conserved at the Gene Bank, Plant Genetics Resource Center (PGRC), Peradeniya. Farmers prefer traditional rice varieties for their adaptability to biotic and abiotic stresses and they are an important component of the biodiversity of Sri Lanka. A detailed understanding of the genetic structure and diversity of traditional rice varieties is essential for the effective utilization of rice genetic resources and identification of potential parents possessing valuable genetic traits for future crop improvement in rice breeding programmes. The objective of the present study was to explore the genetic diversity and the relationships among thirty-six (36) traditional rice varieties. Rice varieties were grown in a plant house according to Randomized Complete Block design with 4 replicates and 5 plants per each replicate. Prior to the analysis, scale variables were converted into nominal data to maintain the uniqueness among the data type. Statistical analyses were performed using *ad hoc* statistical procedures. Descriptive statistics and basic inferential statistical analyses were performed to access the variation of the agro-morphological characters among rice varieties. Data were subjected to cluster analysis (CA) to examine the grouping tendencies and supplemented with Multidimensional scaling (MDS) to explore the procedural differences in the outcome. CA and MDS produced five groups of rice varieties and the groups were further analyzed using Classification and Regression Analysis (CART) to extract the diagnostic agro-morphological features. The variations of agro-morphological characters across rice varieties are negligible and presence/absence of awn and characteristics of awn showed restricted distribution. The variation of agro-morphological characters across the rice varieties except stem color was significant ($p < 0.05$). CA and MDS clustered most rice varieties into one and certain rice varieties into four different groups. Characterizations of these groups were achieved by CART analysis. Based on CART result, groups of rice varieties were characterized by lemma-palea color, presence or absence of awn, height, and flag leaf angle. Traditional varieties represent distant clusters on agro-morphological features. The more the distance, higher the possibility of application in breeding programs. Further studies on genetic diversity at molecular level is essential for the confirmation of findings of the present study. The genetic differentiation of these varieties avoids duplication of traditional rice accessions/varieties in the Gene Bank at PGRC.

Keywords: Agro-morphological characters, Genetic diversity, Traditional rice



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EDUCATION



ACTIVITY BASED TEACHING METHODS IMPLEMENTED BY TEACHERS IN PRIMARY MATHEMATICS

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The new educational reforms emphasise that primary education must be activity oriented and that it must adopt an enjoyable learning approach. However, research shows that most of the mathematics teachers spend the first 20 minutes of a lesson writing on the blackboard and questioning in the students. Similarly, research has also pointed out that students are mostly involved in seated academic work rather than engaging in play based activities. This research was conducted against this backdrop. The purpose of this study was to examine the implementation of activity-based teaching methods in Primary Mathematics (key stage 2). The specific objectives of this study were to examine primary teachers' perceptions of activity-based teaching and identifying the issues faced by mathematics teachers engaged in activity-based teaching. This study was carried out under the two-phase survey method. In the first phase, data, which were the perceptions of primary teachers on activity-based teaching, were collected with the use of questionnaires. Questionnaires were administered to 143 primary teachers of the Galle Educational Zone. It was revealed that 67.1% of the sample was aware of activity-based teaching methods and 50% of the sample said that they used this method consistently. However, 72% of the teachers stated that there are many difficulties in adopting activity-based teaching methods in primary classes and 60.8% agreed that activity-based teaching methods are necessary for enjoyable learning. However, only 16.7% of the teachers in the sample reported that activity based teaching methods uplift the interests of the students. In the second phase of this study, 30 teachers were selected out of the sample for lesson observation under Gerges sampling method. Focus group interviews and participant observation were used as methods of data collection and transcripts were prepared using field notes and audio records. Five core categories were identified under thematic analysis. In depth analysis of each core-category revealed that most of the teachers made an effort to develop the lesson with the incorporation of activities. Lack of resources and poor time management were identified as the major problems that teachers faced. This study concludes by identifying the need to organize professional development programs for teachers that can help them to deliver lessons that increase student interest. It also highlights the need for teachers to be provided resources necessary for the implementation of activity based mathematics teaching.

Keywords: Activity -based teaching, student interest, Primary mathematics, challenges, teacher perceptions

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ENGLISH LITERATURE TEACHERS' PERCEPTIONS OF MITIGATING CULTURE TENSIONS IN LITERARY TEXTS TAUGHT IN INTERNATIONAL SCHOOLS

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This is a study about teacher perceptions on negotiating culture- related tensions that arise when literary texts are discussed with students in an English Literature classroom. The study aims to find out how students and teachers negotiate the cultural gaps that appear when English literary texts are taught in Sri Lankan classrooms. The study is undertaken in an urban international school setting in Sri Lanka. This qualitative study is based on semi-structured interviews, classroom observations and textbook analysis. It also sheds light on the researcher's self-reflections in the form of reflective journals and analytical memos. This study reveals the numerous culture related tensions that surface when texts are taught, and the solutions provided by the teachers to negotiate these tensions in an effective manner. In place of teachers' complaints with regard to students' lack of emotional responsiveness, it was found that students did express greater emotional involvement if familiar and personal experiences were being discussed. The teachers and students who belonged to conservative cultural backgrounds adhered to the normative agendas of the educational system. These normative ideas were more firmly upheld by the male students as they found the liberal values encapsulated in some of the literary texts a threat to their religious beliefs and cultural mores. This study also reflects on the teachers' strategic management in handling these cultural tensions. Notably, this is an unconscious process which takes place immediately based on the language situation at hand. Some of the various negotiating strategies widely applied are drawn from personal experiences; using historical information, popular culture and visual aids; making parallel cultural connections; and codeswitching. These accommodating strategies were not applied in isolation but were fused with the intention of conveying the literary texts to the students effectively, with the least effort and waste of time.

Keywords: Culture tensions, Literary texts, Negotiation strategies, International schools, Teaching literature

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RECENT DYNAMICS OF THE PRE-SERVICE TEACHER RECRUITMENT CRITERIA OF NCOEs IN SRI LANKA

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Tone of the most critical issues faced by Sri Lankan teacher education programs is the quality development of teacher education. Being the sole pre-service training provider, National Colleges of Education (NCOEs) is entrusted with the duty to develop persons for the teaching profession. The process of recruitment of students to the NCOEs, and the selection criteria have been criticized for their inconsistent nature in the recent past, with allegations that the candidates selected in any given batch have widely varying abilities thus affecting the quality of the output. Assessing the government gazettes from 2015 to 2019 pertaining to the recruitments in a documentary analysis, this paper attempts to investigate the recruitment criteria for pre-service teacher training programmes, the nature of the changes made to the recruitment criteria and their adaptability with the aim of diagnosing their impact on NCOEs output. The analysis assesses the composition of the recruits, evolution of the intake for different disciplines of study with thematic attention on the evolution of the selection criteria for NCOE courses. The study reveals the lack consistency and especially the nonconformity of existing criteria for recruitment especially in screening for candidates with motivation and commitment for the teaching profession. It is ascertained that the criticisms on present day trained teacher quality are a result of a multifaceted reasons espoused with non-existence of standards to appraise teachers and the non-existence of an assessment to diagnose motivation for teaching of the apprentices. The potentials of the NCOEs are found within a restructured and pedagogically evolving context wherein specialized faculties function as trainers. The findings shed light towards reforming the selection criteria for NCOEs and on enriching teacher-training mandate of the NCOEs via viable restructuring.

Keywords: National Colleges of Education (NCOEs), Pre-service teacher recruitment, Teacher motivation, Quality of teacher education

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EFFECT OF OBESITY AND OVERWEIGHT ON ACADEMIC PERFORMANCE AMONG SCHOOL GOING ADOLESCENTS

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Obesity is a problem among school children worldwide. Prevalence of adolescent obesity has increased in recent years in the Jaffna peninsula. Recent studies indicate that obesity affects children's memory functions and cognitive capabilities. The aim of the study was to find the effect of obesity and being overweight on the academic performance of adolescent girls in the Jaffna Municipal Area. A cross sectional descriptive survey design was used in this study. A total of 761 grade ten adolescent girls were selected from four girls' schools in the Jaffna Municipal Council. The first term marks for six core subjects obtained from overweight and obese students and randomly selected same number of normal weight students, were analyzed using the Minitab18 statistical software using Mann-Whitney U test and two sample t-tests to establish the relationship of academic performance. Perceptions, attitudes and the challenges faced by obese and overweight students were assessed using a questionnaire. The prevalence of overweight and obesity were 17%. The marks of the normal weight students were higher for Science, Tamil language, English language and History. But there was no difference in Mathematics and Religion marks. 80% of students were aware of the impact of obesity. Nearly 68% of obese and overweight students were bullied about their body shape by peers and relations. 64% of the obese and overweight girls suffered with other disease related to obesity. Half of them reported that they were dissatisfied about their body shape and their academic performance. Among the overweight and obese girls, 60% reported that daytime drowsiness affected their learning; 55% had shortage of memory; 10% of them had frequent fatigue. However, they were very sociable and possessed leadership qualities. Furthermore, they had the ability to handle their own problems and challenges with self-confidence. It was also reported that 79% of them engaged in activities to reduce their excess bodyweight. They followed a controlled diet and engaged in physical exercises such as walking, jogging, yoga practices and dancing. The findings of this study provide evidence that the overweight and obesity affect the academic performance of adolescent school going girls and its stresses the need for large-scale preventive strategies that need to be implemented in the Jaffna peninsula.

Keywords: Academic performance, Adolescent girls, Obesity, Overweight, Jaffna Municipal Area

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LEARNER PERCEPTIONS TOWARDS BLENDED LEARNING IN THE UNIVERSITY OF COLOMBO INSTITUTE FOR AGRO-TECHNOLOGY AND RURAL SCIENCES

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With the emergence of new technologies, higher education systems all over the world have transferred from traditional face to face instruction to virtual or robotic education. Blended learning (BL) is a combination of Online Learning (OL) or Distance Learning (DL) with the concurrent use of Face to Face (F2F) learning. The instructor should evaluate the feedback of the learners' works to realize the achievability of course objectives. Therefore, the objective of the study is to understand learner perceptions towards Blended Learning (BL) and the Blended Learning environment. This survey was completed at the University of Colombo's Institute for Agro-Technology and rural Sciences, Weligatta, Hambantota, Sri Lanka. 106 undergraduates were selected for this study through a simple random sampling technique. They were first year students who were following the degree on a full-time basis. This sample consisted on 72 female students and 34 male students. Primary data were collected by administering a pre-tested google form as a questionnaire that was shared on the Learning Management System (LMS). Responses from the google form were collected and data were analyzed by using the SPSS statistical software package. Data parameters included preferred learning system, number of occupied hours, the accomplishment of course objectives, ease of understanding the subject, the organization of the Moodle site, engagement due to online activities, and cooperation of the instructor for the modules (Likert scale). From the Chi-square test, the learner's vote towards blended learning was significantly increased (p value < 0.05). From all the respondents, 50.9% selected blended learning, 32.1% selected online learning and 17% preferred face to face learning. Rendering to the one-sample t-test for composed data, all the selected variables such as completion of course objectives, ease of understanding the subject, the organisation of the Moodle site, engagement due to the online activities, cooperation of instructor for the courses were significantly agreed (p value < 0.05) as the alternative hypothesis ($H_1; \mu \neq X$). We can conclude that the learners have a positive and encouraging outlook towards blended learning and the blended learning environment.

Keywords: Blended Learning, Face to face learning, Online Learning, Student perceptions

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REMOTE LEARNING IN THE TIME OF COVID-19 PANDEMIC: PERSPECTIVES OF SRI LANKAN TAMIL MEDIUM SECONDARY SCHOOL STUDENTS

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The present study aims to assess school students' perspectives of their experiences of participating in remote learning activities available to them. To achieve the main purpose of the study, the following objectives have been identified: to assess the awareness among Sri Lankan school students about remote learning resources and activities available to them; to assess the facilities available to them at home to engage in remote learning; to find out student attitudes towards remote learning; and to identify the challenges and issues faced by school students when engaging in remote learning. This study was conducted as a survey. Using the snowball sampling technique, data were collected from 250 Tamil medium school students through a questionnaire administered as a Google Form. Collected data was analysed using mean, standard deviation, and percentage. Analysis of data revealed that majority of respondents (91.2%) were aware of the various remote learning activities (RLAs). Majority of the respondents (88%) used mobile internet and 72% used prepaid services. A high percentage of the respondents (91.7%) used smartphones to access RLAs. Only 40% of them used TV and radio for learning purposes. Further, it was found that half of the respondents found it difficult to afford internet. Around 71% of respondents spent 1-5 hours every day involved in RLAs. In addition, students' perception towards RLAs in terms of self-learning ($M=3.55$, $SD = 0.77$), usefulness of RLAs ($M = 3.5$, $SD = .93$) satisfaction of RLAs ($M = 3.45$, $SD = 1.03$) were almost positive. It is also noteworthy that they felt positively with challenges and problems of engaging in RLA ($M = 3.47$, $SD = .82$). The main challenges they faced were related to affordability, content of RLAs, and cyber security when engaging with RLAs. It is recommended that mobile data be made available to students at low costs and all educational programmes should be made available free of charge to school children. In addition, devices such as tablets should be provided to all students in order to ensure equity of access to education among all children. Further, studies on parents' and teachers' experiences towards - RLAs would complement the findings of this study.

Keywords: COVID-19, Student perceptions, Remote learning activities (RLA), School students

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ALTERNATIVES AND LIMITATIONS OF SELF-DETERMINATION THEORY: PERSPECTIVES OF DIFFERENT LITERATURE

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This paper is based on a theme that emerged while reviewing literature for a larger research that investigated 'Early adolescents' motivation and engagement in learning and the impact of school-related conditions in low socio-economic districts in Sri Lanka'. This study used self-determination theory (SDT) as a conceptual lens. It is a macro-theory that considers human motivation, feelings, and improvement proposed by Ryan and Deci in 1985. Three basic psychological needs are described in SDT and these needs are used in different contexts, such as healthcare, education, work, sport, religion, and psychotherapy. Furthermore, there is a link between the teaching-learning process leading to student satisfaction, which fulfils their basic psychological needs, and intrinsic motivation and autonomous types of extrinsic motivation. Those three needs: autonomy, competence, and relatedness can facilitate positive community development and individual well-being. This review has attempted to incorporate several significant studies that observed the alternatives to SDT. Further, the limitations of SDT is discussed. This review has mainly incorporated research articles and books that investigated the SDT alternatives and limitations. Most of the reviewed literature was published in online journals. The selected articles and books were read, and the information was tabulated according to the objectives of the study. The data analysis was done using thematic analysis. The findings of the literature review suggest that psychological needs have been conceptualized in many ways in the context of diverse theories. Therefore, needs theories are usually debatable. Though, SDT is a significant theory of motivation, there are alternatives to SDT and several limitations to the theory. Drawing on previous literature, this paper attempts to place the significance of SDT in relation to intrinsic motivation. It is recommended that an extensive literature review needs to be conducted when applying theories in any research.

Keywords: Self-determination theory (SDT), SDT alternatives, SDT limitations, Literature review

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THE IMPACT OF THE TRAINING SETTING ON TEACHER TRAINEE DEVELOPMENT

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This study aims to investigate the impact of the training setting on the learning development of teacher trainees. This is achieved by analyzing the nature of the training settings of the Higher National Diploma in English (HNDEn) teaching practicum in relation to the Expansive-Restrictive (ER) Framework. This study investigates whether the work environment has an effective impact on the development of teacher trainees by juxtaposing the expansive and restrictive features of the ER framework with their learning experiences. With the objective of exploring the learning development of teacher trainees, the study examined the utility of opportunities available for moving in multiple communities of practice, access to learning and acquisition, and gaining academic qualifications during training. It examines the work-place learning experiences of teacher trainees who are students of the HNDEn program conducted by the Advanced Technological Institute, Kurunegala functioning under SLIATE. A qualitative approach was adopted and the research was designed as a case study. A purposive sample comprising 20 HNDEn teacher trainees training in government sector schools was employed to obtain qualitative data from semi- structured interviews. Findings were analyzed using thematic analysis and the results indicate the presence of expansive conditions in receiving opportunities for moving in multiple communities of practice and access to learning and acquisition while the training setting is perceived to be less conducive in opening up opportunities to gain further academic qualifications. The establishment of a regular monitoring system at the training settings during the HNDEn practicum is recommended to alleviate the restrictive nature of the work environment.

Keywords: Teacher Training, Training setting, Higher National Diploma in English, Teacher trainees

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A QUALITATIVE STUDY OF TEACHERS' KNOWLEDGE OF INSTRUCTIONAL STRATEGIES FOR THE TEACHING OF ENGLISH LITERATURE

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One important component of a teacher's professional knowledge base is termed Pedagogical Content Knowledge (PCK), a concept developed by Shulman in 1987. Shulman sees PCK as a unique form of teacher knowledge which is a blending of content and pedagogy into an understanding of how subject matter is transformed and presented for instruction, considering the diverse needs and abilities of learners. PCK comprises many interconnecting elements which include, orientations to the subject, knowledge of instructional strategies, knowledge of students and knowledge of the curriculum. The main purpose of this research, which is part of a larger study on the professional knowledge base of teachers of English literature in the Sri Lankan context, is to investigate teachers' knowledge of instructional strategies. Given the exploratory nature of the study a qualitative research design was adopted. A purposive sample of four teachers of English literature from different types of schools and representing different training back grounds were selected as participants of this study. Data was collected through classroom observations and semi-structured interviews. The observational field notes and interview transcripts were analysed qualitatively through a process of thematic analysis. The observational data analysis indicated that all four teachers had adopted a text centered mode of literary analysis and implemented instructional strategies that supported this approach which included macro-level pedagogical frame-works, extensive questioning strategies and expository teaching of literary elements. Furthermore, they incorporated aspects of mother tongue literature to clarify some culturally unfamiliar texts. The findings show that teachers were also able to integrate some aspects of their general pedagogical knowledge as well as their knowledge of language teaching into their literature instruction. The interview data revealed teachers' overall approaches to literary instruction and reasons for their choice of instructional strategies. One important finding of this research was that teachers displayed a wider range and of instructional strategies in relation to particular topics and genres. The study reveals that instructional strategies in teaching English literature needs to be further explored. Such strategies should also be enhanced as part of the ongoing professional development of teachers of English literature in the Sri Lankan context.

Key words: Instructional strategies, Pedagogical content knowledge, Teaching English literature

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GAME BASED LEARNING APPROACH FOR VIRTUAL PROGRAMMING LABORATORY CLASSES

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The exponential growth in technology has triggered the development of cutting-edge technologies that can be embedded in various fields. Education has been one such sector that has automated the traditional pedagogical approach into online teaching. Although considerable research has been devoted to game-based e-learning to increase users' motivation, experience and engagement, less attention has been paid to online learning for programming courses. The extensive use of game-based techniques and elements in learning platforms have been effective among students especially for programming related curriculum.

This paper introduces a study that includes a game based interactive activity that is based on programming language and a questionnaire to evaluate the level of motivation and involvement in attempting the game based interactive activity. This is a progressive approach that encourages the development of fruitful strategies that sustain the engagement of students in a virtual programming laboratory environment via game based. The complex, tedious and logical thought-provoking aspects in the programming language curriculum can be easily mapped to the game-based elements to sustain students' involvement, learning interest, and understanding and enhance problem solving capabilities of the subject matter. The experiment includes students ($n = 200$) enrolled in the first year of the Bachelor of Technology (BTech) programme for programming language. These students participated in a game-based interaction platform and a questionnaire was designed to extract the comparison of the involvement and the interest level between the traditional face to face learning and game based interactive session. This study analyses the level of achievements and engagement to evaluate the significance of achievements of the traditional practical set up and the proposed set up. The results show that game-based interaction system extensively enhanced students' level of involvement, understanding of the subject matter and the learning interest and also the problem solving capabilities compared to that of the traditional face to face practical programming set up. This study proves the need to incorporate game-based learning elements to the current learning management platforms for programming practical laboratory sessions conducted in the OUSL to facilitate the Open and Distance Learning system.

Keywords: Game based learning, Learning management system, Open distance learning

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SOCIAL MEDIA ENRICH E-LEARNING OPPORTUNITIES FOR ICT LITERATE UNDERGRADUATES

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In the modern world the application of social media is not only to stay connected with friends and family but also for other purposes like professional learning, networking, and researching. The combination of students with social media is great if teachers understand and help students to make effective use of social media to build their knowledge base. Many school leavers nowadays prefer to obtain a university education while being employed. Employed undergraduates often find it challenging to attend regular lectures at the university. Moreover, they have very limited time to engage in self-studies. This research aimed to find out the possibility of using social media to enrich the e-learning processes of Information Communication Technology (ICT) literate undergraduates. The research objectives were to identify the types of social media tools used by the ICT literate undergraduates, to analyze how social media can be used to enrich the e-learning process of ICT literate undergraduates. A quantitative research design was used in the study. Sixty-two undergraduates were selected using the simple random sampling technique. A structured questionnaire was used in the survey to collect data from the sample participants. Collected data was analyzed and presented using descriptive statistics. Findings of the research reveal that the participants accessibility to social media can be used to enrich their e-learning process. It helped students to search educational materials and watch educational videos which are available on social media. Also, social media can be used to find solutions to the problems faced by the learners in their learning process. Educators should be encouraged and recommended to use social media as a tool in the electronic teaching and learning process.

Keywords: E-Learning, Information Communication Technology, Social media, Undergraduates

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INFLUENCES OF CO-CURRICULAR ACTIVITIES IN DEVELOPING SOFT SKILLS AMONG SENIOR SECONDARY STUDENTS

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General Education in Sri Lanka provides less opportunities, resources and encouragement to students to participate in co-curricular activities due to the exam-bound nature of the education system. The main objective of this study was to investigate the student participation in co-curricular activities in selected schools and how it has supported the development of soft skills in senior secondary students. The study used a descriptive survey design. It was administered among 450 students, 24 class teachers from grade 10 and 11, and 12 principals in two selected provinces. Semi-structured questionnaires were employed to collect data from students and teachers. An interview schedule was used to collect data from the principals and focus group discussions were conducted with 120 students. This study explored two main types of co-curricular activities in the selected schools, which included participating in societies and engaging in sports activities. The findings of the study revealed that the majority of the senior secondary students of the selected schools have not participated in co-curricular activities leading to deprivation of opportunities to develop soft skills. It was identified that senior secondary education is content loaded, examination- oriented, and the academic education system was such that schools have not paid attention to developing soft skills. Majority of students, teachers and principals in this study perceived that participating in societies encouraged students to develop presentation skills, personality development, creativity and engaging in a different kind of sports activities helped them to improve their leadership skills, cooperative skills, tolerance of both victory and defeat, cultivating discipline, recognition and release of stress.

Keywords: Co-curricular activities, Soft skills, Senior secondary students, Descriptive survey

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PARENTS' EXPECTATIONS OF PRESCHOOL EDUCATION

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Early Childhood Education serves as a preparation for formal education in the education system. It facilitates children to develop their basic skills that need to be achieved before entering the formal schools. Philosophers and educationalists have stressed on the importance of the early years' education and they have focused on the parents' and teachers' adults' duties and responsibilities to ensure a quality education. This study tried to investigate parents' expectations of preschool education. Identifying parents' awareness about the way children learn in the preschools, examining parents' expectations for children's learning while in preschools, identifying any difficulties faced by the parents sending their children to preschools and making suggestions to overcome the difficulties faced by parents' sending their children to preschools have been focused in this study. A qualitative approach was used as the research design in this study. To achieve the objectives, a sample was selected in the Colombo district using the purposive sampling method. The purposive sampling method was used to select twenty preschools for focus group discussions with parents using a semi structure interview schedule. The findings showed that most of the non-government preschool teachers encourage children to write simple letters and numbers. However, eighty percent of the sample from the government preschools did not give more paper activities to their children. Majority of the preschools used paperwork and parents also expected the teachers to carry out paperwork. Activity books, children's papers, story books, storytelling, writing numbers, and letters are used as teaching - learning methods. Parents from non-government and government pre-schools were satisfied with the way the children were welcomed. Except a few parents' groups, majority were satisfied with communication strategies. Parents faced problems due to the lack of awareness on preschool education. Therefore, parents expected the teachers to give their children homework. However, parents have higher expectations and wanted their child to have an enjoyable learning experience while they were in preschool.

Key words: Preschool children, Preschool education, Teaching- learning methods, Teaching-learning process

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ENGINEERING AND TECHNOLOGY



STATISTICAL ANALYSIS OF QUALITY PARAMETERS OF CONCRETE USED FOR WATER RETAINING STRUCTURES

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Concrete is a well-known construction material. The main constituents of concrete are cement, aggregate, chemical admixtures and water. Concrete used to construct structures for the storage of liquids where the exposure conditions are very specific are called concrete for water retaining structures. In order to construct durable and high-quality concrete components, transporting, placing and compacting of fresh concrete should be carried out with care. The aim of this study is to analyse the quality of concrete that is used for water retaining structures by using the Xbar quality control charts. The focus of this study was on the recently completed water supply project in Monaragala. Forty-one fresh and hardened concrete samples were collected from the above construction site, and tests were done in accordance with BS 1881 -Testing concrete of the British Standard Institute at the project laboratory. The tested results were statistically analysed using Xbar quality control charts. The developed Xbar charts for the quality parameters of concrete included: unit weight, seven days and twenty-eight days concrete compressive strengths, strength gain, slump and temperature. Minitab 16 statistical software was used for the statistical analysis. Results were compared with the specification for civil engineering works of National Water Supply and Drainage Board (NWSDB) and the mix designs of concrete. Random variations were observed within the control limits in all X bar charts. When compared with the mix design, there was only a 0.8 % reduction in the unit weight. Moreover, 95.3% of required strength was obtained on the 7th day. The variations in slump were observed within the control limits and the specified limits in the mix design. The average compressive strength gained from the 7th day to the 28th day was 9.4 N/mm². According to the specifications of civil engineering works of NWSDB and Xbar quality control chart analysis, the concrete used for water retaining structure of this study achieved acceptable quality.

Keywords: Concrete quality, Water retaining structures, Quality control chart, Xbar Chart

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DEVELOPING A SUITABLE FABRIC AND CONCEPTUALIZING A DESIGN TO STITCH AN UNDERGARMENT FOR HERPES PATIENTS

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Genital herpes is a common sexually transmitted diseases in the world. It is an infection caused by a virus called Herpes Simplex Virus (HSV). Majority of the infected people do not know whether they are infected, and they do not generally show the symptoms of the disease. This disease is also the most common sexually transmitted disease in Sri Lanka. The strategies used to mitigate the risk of genital herpes transmission are two-fold: controlling measures and preventive measures. The main objective of this research is to develop a suitable fabric with appropriate properties and characteristics to develop a male undergarment that can be worn during sexual activities to prevent possible transmission of the disease. A single jersey knitted fabric material was designed by using micro modal yarns to ensure properties such as comfortability, stretchability and good moisture management. The dyed fabric material was finished with water repellent, and anti-microbial finishes to impart required properties into the fabric material. The developed fabric material was tested for important chemical properties, which are necessary for the intended end-use. It was tested for pH, the presence of Formaldehyde and AZO dyes, water repellency spray test to verify the extent of the fabric material to repel the aqueous solutions and the bacterial filtration efficiency test. All the results of the tests performed showed that the fabric material is suitable for the intended end-use. A suitable pattern was developed to construct the male undergarment with appropriate technical details. A stitching method was developed, and suitable machines and the other important parameters of the sewing were determined. This is a preliminary investigation with a basic design and development concept. Further studies should be carried out to determine the effectiveness of the product, and the necessary improvement should be done based on the findings.

Keywords: Designing fabric materials, Genital herpes, Testing fabric materials, Stitching garments

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FEASIBILITY OF USING EXPANDED POLYSTYRENE BEADS TO PRODUCE LIGHTWEIGHT CEMENT BLOCKS

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In the field of building construction in Sri Lanka, cement blocks can be considered as one of the most commonly used element in the construction of external and internal walls of buildings and boundary walls. Tall buildings constructed in Sri Lanka are framed structures, and the walls within these frames are non-load bearing and serve only the partitioning purposes. If the current practice of using cement blocks can be replaced with a lighter alternative, substantial savings can be made by the reduction of the sizes of the structural members, especially the beams, columns, and the foundation. Different kinds of lightweight materials such as pumice, sawdust, sintered fly ash, expanded shale, Autoclaved Aerated Concrete (AAC), expanded polystyrene (EPS) beads, etc. can be used to produce lightweight blocks. In this study, an attempt was made to produce lightweight cement blocks using EPS beads. EPS is a product which is commercially available, with its in-built lightweight, good energy-absorbing characteristics, and good thermal insulation. Solid cement blocks having dimensions 390 mm × 190 mm × 100 mm conforming to SLS 855 were produced with different percentages of mortar volumes replaced by EPS beads and the tests recommended in SLS 855 were conducted to verify the compliance expected of non-loadbearing cement blocks. A cement: sand ratio of 1:2 was selected based on the results of initial trials as mortar in order to achieve the required strength and bonding properties. Compressive strength, water absorption, moisture content and wet/dry density tests were done as recommended in SLS 855: Part 2 (1989) to determine optimum mix proportion in making a lightweight cement block. The experimental investigation led to the conclusion that 35% replacement with EPS beads, can satisfy all the requirements specified in SLS 855, as the optimum percentage achieving an average compressive strength of 1.7 N/mm² with a 33% reduction in density compared with the control block made without adding EPS. A reduction in dead load of non-loadbearing walls by one third will lead to a substantial saving on the cost of the structure.

Keywords: Lightweight cement blocks, Non-loadbearing, EPS

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FEASIBILITY OF USING CRUSHED LIMESTONE TO PRODUCE CEMENT BLOCKS IN THE NORTHERN PROVINCE OF SRI LANKA

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Burnt clay bricks are not available in the Northern Province of Sri Lanka and the people there use cement blocks instead. Even for the production of conventional cement blocks, the main ingredient, quarry dust crushed from granite, needs to be transported over long distances due to non-availability of quarry dust in the Northern Province. As a result, cement blocks are more expensive there than in other places of Sri Lanka. The geological formation of the Northern Province is of a limestone rock origin and as a result, aggregates crushed from limestone, normally not used for engineering construction works, are freely and abundantly available there. As a solution to this use of high-cost conventional cement blocks, an experimental approach was designed to verify the suitability of using aggregates crushed from limestone to produce cement blocks. Initially, a set of trial mixes varying the cement: crushed limestone proportion was tried to determine the optimum mix proportion satisfying the compressive strength criteria specified in the Sri Lanka Standard SLS855: Part 1 applicable for cement blocks suitable for single storey house construction. Subsequently, blocks made with the optimum mix proportion satisfying the strength criteria were subjected to all other tests specified in SLS855 to verify compliance. A cement block making machine used by a commercial manufacturer of cement blocks was used to make blocks of size 300x100x150 mm in this study using limestone aggregate. The optimum cement: crushed limestone mix proportion satisfying the 1.20 N/mm² crushing strength for single storey houses was 1: 8. Limestone cement blocks made using the 1:8 mix proportion satisfied the compressive strength, drying shrinkage, wetting expansion, water absorption and moisture content requirements specified in SLS 855: Part 1. All these tests were carried out following the test methods specified in SLS855: Part 2. Based on the results obtained from this research study, it can be concluded that crushed limestone, freely available in the Northern Province of Sri Lanka, can be effectively used to produce cement blocks. This can help reduce the cost of blocks by 35% compared with using quarry dust crushed from granite that is transported from long distances to the Northern Province.

Keywords: Crushed limestone, Cement blocks, Northern Province, reduce cost

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STRUCTURAL UPGRADING OF EXISTING RAILWAY TURNING TABLES IN SRI LANKA

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The railway turning table structure is basically a large bridge equipped with end bearing wheels which can revolve in a full circle. The main operation of the turning table is to change the direction of the rail engines by manual operation. They have been provided in terminal stations and engine yards. All of them are either 55' or 60' in length. The turning tables have been designed for steam engines with a maximum of 45 tons. The currently used diesel engines (135 ton) cause the overall end deflection to exceed allowable limits. Hence, the excessive deflection causes the bearing wheels to forcedly touch with rotating ring rail which is mounted on masonry ground pit. Due to these actions, the rotation of the turning table while loading has become difficult. Further increase of locomotive engine weights causes other technical issues such as exceedance of soil bearing capacity and entre pivot capacity. However, the issue related with end deflection was only focused on this study. Therefore, this research was carried out in the view of upgrading these old turning tables to suit current heavier train engines considering end deflection issue. In this study, 3D numerical models were prepared using SAP2000 v.14 general-purpose software package. The loading data of steam and diesel engines were applied to numerical models as point loads on to the two main girders. Then, the structural outputs were obtained. End deflections were verified with manually deflection measurements through dial gauges. The obtained internal forces of the structures were compared with the British code of practices given values and found to be within allowable ranges. Two proposals were made to reduce end deflections. The first option was to increase the stiffness of the main "I" girder by adding "C" sections. The second option was to increase the stiffness of the main girder by increasing the thickness of the top flange of the internal "I" girder. From the results by upgraded models, the end deflection was found to have drastically reduced. Furthermore, it was found that the first option would be more effective for 55' turning table and second option more effective for 60' turning table. With these respective structural modifications, old turning tables can further be used for heavier train engineers of Sri Lanka Railways.

Keywords: Turning tables, Numerical modelling, Structural upgrading, Railway

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REVIEW ON FUEL CELL TECHNOLOGIES WITH RESPECT TO THE SRI LANKAN CONTEXT AND ECONOMIC AND FINANCIAL ASSESSMENT FOR FUEL CELL POWER PLANTS

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The Fuel Cell (FC) technology is a fast-growing green energy technology, and substantial research has been conducted within the last decade in order to enhance the technical viability in power generation applications. Fuel Cells are electrochemical devices that convert chemical energy into electrical energy with no internal moving parts. Generally, FCs have higher efficiency than commonly available electrical energy generation technologies in Sri Lanka such as diesel engines, gas engines, etc. This study is mainly focused on the viability of using FC technology for grid-connected electrical power generation in the Sri Lankan context. In general terms, when assessing the feasibility of newer technologies, technical, economic, and financial feasibility components can make a huge impact on the decision-making process. Technical feasibility is adequately discussed in the past research, and the technology selection in this study was done based on the conclusion of the literature survey. In the economic feasibility analysis, the period considered is highly sensitive to the inflation rate, interest rates on borrowed capital, and tariffs applied. Over this trading period, the revenue and expenditure may be increased to take account of inflation. Hence, it may be difficult to correlate actual amounts with the present value of investment capital. Therefore the Life-Cycle Cost (LCC) assessment and Net Present Value (NPV) calculations basically yield substantial results over time than Simple Payback calculations. Also, the final use of the results of the analysis (LCCA) will affect the level of details that have been done. The framework has been developed to conduct LCC analysis of energy projects, with the focus on two phases of the project's life known as the development, construction, and commissioning phase and the operation phase. The proposed plant size is 10 MW, and the total cost per power unit was as LKR 1.29Million/kW. The commissioning and start-up costs are approximately 3.5% of the total capital cost of the project. The main cost factors of the operation phase are fixed operation and maintenance cost and variable operation and maintenance cost, which were calculated as LKR 3200/kW/year and LKR 0.21Billion/year, respectively. Altogether the operation phase is approximately 6% of the total capital cost. Finally, the cost per energy unit was obtained as LKR 17.77/kWh, and that implies the economy of Fuel cell power plant compared to the other available fuel-based power plants in Sri Lanka.

Keywords: Fuel cell, Economic feasibility, Life-cycle cost, Net present value

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PRODUCTIVITY IMPROVEMENT OF MANGO CHIP DRYING PROCESS

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The dryer is the equipment used to remove the moisture of desired materials such as vegetables and fruits, within a controlled environment. The venture uses an industrial cabinet dryer (tray dryer) to dry the wet mango chips to achieve the moisture content and water activity level. The total mango chip drying process takes about 52 hours per one cycle, and drying stage along takes about 24 hours, which is about 46% of the total cycle time. Hence a reduction of the drying time will adversely affect the total productivity and leads to reduce the cost of production by saving energy consumption. Eight hundred kilograms of wet mango chips are processed in one cycle of operation. Initially, the total production process was evaluated and thereby identified the parameters related to the ongoing drying process. The relative humidity was identified as the key aspect, and further research was carried out to analyze the relative humidity of inlet and outlet drafts of the dryer. This study proposed a feasible and cost-effective modification to the existing dryer to reduce the drying time by manipulating the relative humidity of inlet air. The drying process is evaluated to identify the improvement obtained. A reduction of 47 minutes (3.26%) of drying time per cycle is achieved, and a total energy saving of 121.26kWh (12.65%) is accomplished. The estimated cost for the proposed modifications is about Rs. 109000.00, and according to the cost analysis (considering the energy-saving aspect only) this can be recovered within less than 2 ½ months. Thus, the payback period could be further reduced by incorporating productivity improvement. The proposed modifications could be used to improve the productivity of similar dryers and hence reduce the power consumption of the drying process.

Keywords: Cabinet dryer, Energy saving, Productivity, Relative humidity, Tray dryer

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SELF-ADJUSTING AUTOMOTIVE SIDE MIRROR TO VISUALIZE BLIND SPOTS: A PROTOTYPE DESIGN

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Side mirrors are a compulsory and one of the most important safety features of modern-day automotive vehicles. It assists the driver to see the areas behind the sides of the vehicle. There are two types of mirrors, side-view mirrors, and rear-view mirrors. But, even with the assistance of these mirrors still, there are areas of the road which cannot be seen by the driver. These unseen areas are called 'Blind Spots'. Every driver is at risk of facing an accident simply because of the existence of these blind spots. At present, there are many solutions proposed by the vehicle manufacturers to make these blind spots visible or to inform the state of these blind spots to the driver. These solutions could be broadly divided into Active monitoring systems and Passive monitoring systems. By going through the literature on vehicle accidents, it could be seen that these systems have not solved the issues related to blind spots. All those have addressed limited situations of blind spots and have made an artificial sense for the driver, where the driver must give additional attention to refer them which distracts the driver's concentration and create undue problems. Therefore, a better solution is needed. Under this study, a side mirror is designed, which automatically identifies the necessity and adjusts itself in order to visualize the blind spots to the driver. The inputs are the vehicle speed, steering angle, and the signal light indicator on/off status. The solution is evaluated by a model in which the results justify the performance of the proposed system. The average response time is 2-3 seconds which is acceptable. The solution could be easily adapted to the existing power mirrors with simple modifications. Since almost all the vehicles with auto mirrors (except few luxury ones consists of in-built blind spot detection facility) in Sri Lanka could potentially adopt this system and minimize the blind spot risk. Vehicle manufacturers could incorporate this option to their future vehicles which will be beneficial not only to them, but also to the vehicle owners/drivers and pedestrians.

Keywords: Blind spots, Side mirror, Product design and development, Prototype

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DESIGN AND DEVELOPMENT OF A FLORAL FORM CUTTING MACHINE TO IMPROVE PROCESS EFFICIENCY

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Floriculture industry in Sri Lanka has been growing in the past thirty years, and since 1980 it has been developing as an export-oriented industry, which provided direct employment to many people from semi-urban and rural areas. Today, Sri Lanka is recognized as one of the largest floriculture production centres in the world and has been earning approximately US\$ 16 million foreign exchange by exporting floriculture to countries such as Netherlands, Japan, Saudi Arabia and UAE. The floral foam (FF) is an excellent solid rooting media that is being used by the industry to export rooted cuttings. The FF is imported as one standard-sized block and must be cut to cuboids of four different sizes according to the requirement of different plant type. The Mike Flora (PVT) Ltd, one of the pioneering exporters of foliage plants, has found it difficult to maintain the efficiency and accuracy of resized FF cuboids been cut by existing manual cutting method. This manual method needs highly skilled labour, is time-consuming and is accompanied with high wastage due to irregular cutting, breakages and dust formation. Therefore, this study is focused on designing and developing automated floral foam cutting machine (FFCM) and validate for improved efficiency and product accuracy. An automated FFCM machine is designed and developed. It is powered by grid electricity, where all pneumatic and mechanical operations are handle by a micro-controller to a pre-programmed sequence. Specially designed cutters cut the floral form block in both horizontal and vertical directions, accurately, uniformly with minimum deformation. Cutting time, efficiency, cutting accuracy and wastage were compared with the existing method. The results revealed that the developed machine is more efficient with a 71%-81% improvement and the variance from the expected dimensions is only 0.67. The machines could save 80% of the labour cost, and thereby, the capital cost can be recovered within 08 months. It is noted that on average, a reduction of 69% of the dust formation, which is a considerable drop. It can be concluded that the cutting process-efficiency would tremendously improve using AFFCM, and it enables maintaining the sustainability of the industry.

Keywords: Automation, Cutting machine, Floral foam, Micro controller, Pneumatics

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SMART PEDESTAL FAN

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Cooling fan is a common household commodity, and almost every house in Sri Lanka has at least one fan. There are several types of fans such as ceiling fans, stand fans, wall fans and box fans and most of them have basic features such as three-step rotational speed variation, a timer which could be set to switch off after stipulated time and remotely operating facility. A survey was conducted to examine user satisfaction on available cooling fans and the findings revealed that fans do not satisfy customer expectations. A pedestal smart fan was designed and developed adhering to Product Design Development strategies. The smart fan could change its operational levels by itself with respect to room temperature, humidity, ventilation, real-time (day and night aspects) and location of the user (motion tracking of the user). The health hazards due to continuous exposure to fans also been considered in setting up the functions. This fan is equipped with Bluetooth assisted remote operation via mobile phone/devices that runs on an Android platform. It has four multi-operation modes, which are, 1. Manual Operation Mode, 2. Natural airflow operation mode, 3. Night operation mode, and 4. Auto operation mode. Separate controller scripts/algorithms were fed to the system to facilitate these modes. The speed variation is maintained according to the environment temperature and humidity controls according to the Fuzzy Logic rule base. The smart pedestal fan cost around Rs. 18,000.00 and it has the potential to capture the cooling fan market not only in Sri Lanka but worldwide if pitched appropriately.

Keywords: Android support, Energy saving, Humidity detection, Pedestal fan, Self-speed variation, Temperature detection, Motion detection

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ENGLISH LANGUAGE TEACHING



STORYING L2 TEACHER IMMUNITY: NUANCES OF BEING A SELL-OUT

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A growing empirical literature on teacher personality and teacher development indicate that individual teachers may vastly differ from one another in terms of motivation, commitment as well as attitudes to teaching and professional development. The construct of second language (L2) teacher immunity explicates this phenomenon from a psychological perspective. L2 teachers' constant encounters with challenging experiences at work result in the development of a line of defence termed 'L2 teacher immunity' which supports their survival in the career and, in time, takes a productive or maladaptive turn resulting in a corroborating teacher identity. This paper reports on selected findings of a narrative case study on the development of L2 teacher immunity in the Sri Lankan government school context. Drawing on data from one participant selected through purposive sampling, the paper explores how L2 teacher immunity manifests itself in a teacher belonging to the maladaptively immunized teacher type, 'Sell-out.' The data were generated during December, 2017 using a background profile questionnaire and a semi-structured interview schedule. A pseudonym was adopted to ensure anonymity and confidentiality of data ('Imali' in this case). Data analysis involved constructing Imali's career history in a temporal sequence besides applying both theory and data driven codes, adopting a thematic analytical approach. The study revealed that Imali manifests all key characteristics of a Sell-out—selecting teaching as a career out of self-interest, indifference towards the profession and not valuing teaching as a rewarding career. Further, it appears that self-interest was a crucial drive behind her career persistence. Despite her inability to form an emotional bond with the career and her cynicism towards students, she states that the sole source of her career satisfaction is teaching children. Imali's narrative reflects the accumulative frustration she has been experiencing as a teacher because of being unable to achieve goals that resonate with her personality. Further in-depth study of individuals' narratives of becoming teachers and nuances of teacher types in terms of their manifestation of L2 teacher immunity is recommended. It is expected that such studies would help identify tendencies in teachers to develop maladaptive immunity at early career stages so that remedial measures could be adopted.

Keywords: L2 teacher immunity, Narrative case study, Maladaptive teacher immunity, Teacher types, Teacher professional development

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THE USE OF COMMUNICATION STRATEGIES IN A MULTILINGUAL URBAN WORKPLACE IN SRI LANKA

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The workforce in any service-oriented industry is expected to have a repertoire of skills and expertise in effective communication. In a country like Sri Lanka where multilingual multiethnic communities have been coexisting for centuries, multilinguistic competence of the employees is highly appreciated in commercial organizations. This study focuses on one such company with the overarching objective of uncovering the strategies that are used in communication and the nature of utilization. An exploratory multi-sited ethnographic case study was conducted in four branches. Data was collected through field observations as a participant observer; 61 photographs posted on the company's social media website; 66 questionnaires distributed to the staff members who handle customers from reception to delivery of products and 4 semi-structured interviews of staff selected by purposive sampling based their distinct linguistic capabilities. An inductive bottom-up data driven approach was taken to analyze the data thematically both manually and by using the qualitative data analysis software, Atlas.ti (version 7).

Analysis of data reveals that the staff used English as a tool to showcase their professionalism. In terms of communication strategies, a generous use of direct, interactional and indirect strategies was observed with code switching, rephrasing, self-repair, comprehension check, asking for clarification, use of fillers and repetitions being the most prominent. Participants exhibited accommodative and, non-accommodative behavior as part of their interactions. The results deduced from the analysis indicate that multiple languages are welcome and given their rightful positions by the users. Despite incremental significance of English language at work places, it is not an exclusive requirement. In the event of necessity, communication strategies are used readily often in combination to achieve the desired goal. This study addresses the pedagogical concerns of teaching English to professionals who are employed in the service sector where multiple languages are regularly used. Designing industry oriented tailor-made curricula incorporating communication strategies and taking learning beyond the classroom will be beneficial in achieving high communication standards.

Keywords: Accommodation, Communication strategies, Ethnographic case study, Multilingual workplace, Non-accommodation

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SECOND LANGUAGE: BRIDGE OR BARRIER? EXPLORING THE LINGUISTIC IDENTITIES OF NOVICE INTERNATIONAL SCHOOL ENGLISH TEACHERS IN SRI LANKA

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The popularity of international schools in Sri Lanka is growing considerably while the number of graduates from the local education system seeking career opportunities as English teachers in these schools is also increasing. This study sheds light on the linguistic identities of novice international school English teachers which are being reconstructed and negotiated in response to the conditions and expectations of the international schools they work in. Accordingly, the novice teacher perceptions associated with the use of L1 (Sinhala) and L2 (English) are examined to unveil their anxieties springing from the clashes between their existing (linguistic) identities and the newly assumed role or identity of an international school English teacher. This study adopted a qualitative case study approach. Four international school teachers who are products of the local education system were selected as participants and the data collection was carried out using semi-structured interviews while the data analysis involved the thematic approach. The findings of the study show that novice English teacher anxieties are based on two main thematic strands: whether the English language is a barrier that obstructs student-teacher relationship or whether it acts as a bridge of trust that leads to the acceptance of the novice English teacher. The novice English teacher's struggles and attempts to confront the anxieties involve a constant process of identity negotiation where the existing identities are reconstructed and adapted to fit into the new role of English teacher identity.

Keywords: English teacher, International school, Language anxiety, Teacher identity

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A STUDY ON THE EFFECTIVENESS OF LANGUAGE GAMES AS A GRAMMAR RETENTION STRATEGY FOR ESL LEARNERS

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Language games are often recognized as one of the most important components in the English as a Second Language (ESL) classroom. On the contrary, with reference to the previous research findings, playing games is believed to be highly unproductive in the traditional classroom setting. Given that, this study aims to evaluate the effectiveness of language games as a grammar retention strategy for ESL learners at leading boys' schools in Sri Lanka. The study was conducted using a mixed methods research approach where the sample groups were experimented and observed in the two settings; the traditional classroom and a class where the game-based approach was used for language instruction. For the purpose of data collection, three classes of grade six, with 30 students in each, were randomly selected as the experimental group and the two control groups. While the experimental group was exposed to the game, "The Board Race" when teaching irregular past tense, the control groups were taught the same grammar point following a conventional approach. According to the results which were achieved from the t-test, through a comparison of the mean scores of the pre-test and two post-tests, the experimental group exceeded the two control groups with higher mean values, during the immediate retention stage and the delayed retention stage. The above results were further confirmed by the observations. Thus, this study suggests the need to incorporate games with text-based instructions in the ESL classroom which is helpful for the students to retain grammar, in the long term.

Keywords: Experiment, ESL, Grammar retention, Language games, Traditional classroom

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THE EFFECTIVENESS OF IMPROVISATION IN ENHANCING SPEAKING SKILLS AND CONFIDENCE BUILDING OF YOUNG ESL LEARNERS.

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In the current education system, English is considered as an essential language and students are expected to learn English at a very young age. Yet, generally, most learners find speaking in English challenging, and tend to be silent in English speaking classrooms due to psychological factors like inhibition, fear of making mistakes and language difficulties. In that regard, drama activities can be used as an effective tool to develop speaking skills and boost the confidence level of the ESL learners. This paper presents a qualitative research on identifying the effectiveness of using improvisation to develop English speaking skills and confidence of young learners. The study particularly focuses on young learners, primarily since none of the previous studies have investigated the effectiveness of improvisation on speaking skills of young ESL learners. Thus, the study investigates an area which has not been researched before in the ESL context in Sri Lanka. Fifteen young ESL learners, studying for Cambridge Movers level examination and their teacher were the participants of the study. Prior to the intervention a pre-test and a pre-interview session was held. The research was conducted in five sessions; a two hours' session for a week for a duration of five weeks. During the five weeks, the sessions were handled by the Cambridge teacher while the researcher remained as an observer. At the end of the intervention, a post-test and a post-interview session were held. The findings of the study (through the thematic analysis of the data) indicate that improvisation improves the fluency, accuracy as well as the confidence of young ESL learners. Furthermore, for teachers, it could be a challenging but an effective strategy which could facilitate students to use the target language in a co-operative and a non-threatening environment.

Keywords: Accuracy, Co-operative learning, Confidence, ESL, Improvisation, Fluency, Language Anxiety, SLA, Situational Authenticity, Negotiation of meaning

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PERSPECTIVES AND ATTITUDES OF SRI LANKAN ENGLISH TEACHERS TOWARDS DISCUSSING CONTROVERSIAL SOCIAL ISSUES IN THE CLASSROOM

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This study focuses on exploring Sri Lankan English teachers' perspectives and attitudes in exploring topics embedded in literary texts (LT), which may be viewed as 'controversial social issues,' studied in class. It also aims to explore how the target group respondents' ideologies, values and beliefs impact their decision making in the classroom and the teaching strategies they employ when handling such topics relevant to the core story of the literary text studied in the classroom. Thus, the focal point of this study is the teachers themselves who are a selected group of Grade 9 English Language teachers in a boys' school and a girls' school located in the Western Province. This research attempts to explore their perspectives/attitudes when teaching the novel *Goodnight Mr. Tom* (GMT) by Michelle Magorian read in the Grade 9 English Language classrooms of the target schools, which narrates the tale of a boy called William Beech who is evacuated to a village called 'Weirwold' from London during World War II. A subtle, yet prominent topic embedded within this novel is the physical, verbal and emotional abuse experienced by William – the protagonist of the novel GMT- at the hands of his mother. As a parallel Grade 9 teacher of the said boys' school, I observed that while some of the teachers who taught this text in the parallel Grade 9 classes discussed this topic, some others did not which gave life to the primary research problem of this research. This study uses narrative inquiry data of a selected group of English Language teachers to explore how they perceive, and handle topics embedded in literary texts used in the Language classroom which may be perceived as 'controversial social issues.' Through the narratives of the teacher participants, this study attempted to identify what the teachers perceived to be controversial social topics within their teaching contexts, reasons behind their choices as well as how they handled such topics embedded in literary texts. Through the use of teacher participant background profile questionnaires, and narrative interviews in the form of semi - structured interviews, in depth socio – cultural profiles of the participants were built in order to unravel their perceptions and attitudes along with their views about their role as a teacher when dealing with such issues in the Language classroom. Based on the gathered data it was evident that the topics which were perceived as controversial differed from teacher to teacher and from classroom to classroom. This was influenced by many factors and some of these were teachers' personal experiences, gender of the students, students' personal experiences, students' reception to the lessons, discipline issues in the classroom, as well as practical issues such as time limitations of covering the syllabus. However, as the interview data very clearly demonstrated a knowledge gap in teachers regarding handling controversial topics in the classroom, an open 'participatory workshop' was conducted as a secondary step to fulfill this need. Through an open invitation



to teachers to attend this workshop, a half-day activity-based session was held through which participants were enlightened about different strategies teachers could employ when dealing with controversial social topics. It is hoped that through such an exploration, this research will offer insights to other practitioners about the manner in which Sri Lankan English teachers perceive and handle topics that emerge from literary texts which may be perceived as socially controversial, highlighting the ‘benefit – risk’ dilemma most teachers face in the classroom due to various reasons while simultaneously providing a deeper understanding about alternative roles teachers could adopt to deal with such topics which emerge from literary texts which are studied in the classroom.

Keywords: Controversial social issues, Teacher perspectives, Teacher attitudes, Literary texts

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**SILENCE IN THE ESL CLASSROOM: WHAT IS THE ROLE OF
TEACHER POSITIONING OF LEARNERS?; A QUALITATIVE CASE
STUDY OF BUDDHIST MONKS' LACK OF INTERACTION IN AN
UNDERGRADUATE ESL CLASSROOM IN SRI LANKA**

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Despite the importance given to interaction in second language learning, many students remain unresponsive and passive in their English as a Second Language (ESL) class. Hence, to date, numerous studies focusing on learners have been conducted to understand students' non participation. The present qualitative case study, framed by positioning theory, focused on the role of teacher positioning in students' silence. The study was conducted in a mixed- ability, mixed-sex ESL classroom in the Department of English Language Teaching in a well-known state university in Sri Lanka. The class was taught by two ESL teachers. After two weeks of observation, two Buddhist monks, who were noticeably silent in whole class discussions and who were strongly positioned by the teachers, were selected for closer examination. Classroom observations, in-depth-interviews, stimulated recall interviews, field notes and audio recordings were employed to collect data over a month's period. The study utilized the constant comparative method (Merriam, 2009) and Strauss and Corbin's (1990) coding strategies to analyze data. The results of the study showed that teacher positioning of learners does have an impact on the focal Buddhist monks' silence in the classroom. Overall, the present study encourages teachers to be reflective practitioners in order to understand their own role in students' levels of interaction. In addition, the findings of the study also provide insights on how to better integrate Buddhist monks to ESL classrooms, a dilemma that most Social Sciences and Humanities Faculties in Sri Lankan states universities face.

Keywords Buddhist Monks, Positioning, Silence in the ESL classroom, Interaction

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THE IMPACT OF DRAMA AND THEATER GAMES ON DEVELOPING THE ORAL PROFICIENCY OF ENGLISH AS A SECOND LANGUAGE LEARNERS IN SRI LANKA

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The purpose of this research was to explore the impact of drama and theater games on developing the oral proficiency of English as a second language (ESL) learners as a means of teaching children at the Sri Lanka International Buddhist Academy (SIBA). This was a classroom based quantitative research involving a class of 34 students enrolled for the Diploma in English at SIBA. In order to determine their passive knowledge of the English language, a researcher-made pre-test was given to both the experimental and control group prior to the treatment. In fact, data were gathered during teaching hours as the researcher was simultaneously a lecturer in English at SIBA campus. The analysis of the post-test results was used to clarify the hypotheses of the study; there is an impact of drama and theater games on developing the oral proficiency of ESL learners in Sri Lanka. Research findings revealed the effectiveness of drama and theater games on English lessons to the advantage of ESL learners' oral proficiency in order to communicate in English effectively. It could be concluded that drama and theater games as a Communicative Language Teaching (CLT) approach plays a vital role in enhancing ESL students' oral proficiency. Due to the positive impact made on the English oral skills of students, it is strongly recommended to use drama and theater games on English lessons to improve English speaking skills of the ESL learners in Sri Lanka.

Keywords: Communicative Language Teaching (CLT), Drama and theater games, English as a second language (ESL), oral proficiency

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INTEGRATING FORM AND CONTENT IN BILINGUAL CLASSROOMS: USING BASIC SCIENCE TEXTS FOR IMPROVING ACADEMIC LANGUAGE PROFICIENCY

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As both Form-Focused Instructions (FFI) and Content-Based Instructions (CBI) have advantages and disadvantages in teaching academic language, the integration of FFI and CBI into bilingual classrooms provides an ideal context to attend to form and meaning. One of the strongest rationales for language acquisition is the disadvantages of one approach being compensated by the advantages of the other. When FFI and CBI are integrated in conjunction with passages extracted from school textbooks, learners easily perceive language patterns in the meaningful context, foster content learning and initiate production of the meaningful academic language because the advancement of grammatical accuracy and academic content unveils improvements in academic language proficiency. The present study was conducted with 60 bilingual students in the middle school of a leading boys' school in Colombo, Sri Lanka. The study was carried out over a two month period and the researcher met the participants three hours a week. The participating teachers included three teachers who possessed the same level of experience and qualifications to teach Science in the medium of English. It was found that this integrative pedagogy can be used as a facilitator for academic language proficiency development of bilingual Sinhalese students. This study, with further confirmatory evidence can shed light on improving academic language of the students through Content and Language Integrated Learning (CLIL).

Keywords: Academic language development, Bilingual education, Content-based instruction, Form-focused instruction, Integration

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IDENTITY, IDEOLOGY AND INVESTMENT: UNDERSTANDING ABSENTEEISM OF A MEDICAL UNDERGRADUATE IN AN ELT CLASS AT A SRI LANKAN UNIVERSITY

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Absenteeism in English Language Teaching (ELT) classes at Sri Lankan universities is an issue which remains unaddressed in the field of ELT in Sri Lanka. The objective of the study was to understand the absenteeism of a Medical undergraduate in an ELT class of a Sri Lankan university in the Western Province. The study employed socially informed theories of language learning: identity, ideology and investment to examine absenteeism in ELT classes. It employed a case study research design and data was collected using an in-depth interview. The data was analyzed using thematic analysis method. The participant's identity seemed to have been constructed in and through his mother tongue; Sinhala and he showed to have made strong ideological choices when he had to mingle with the students whose identities were constituted through the target language, English. Moreover, his ideological perceptions about the English language and English language speakers at the particular educational context resulted in him not investing in learning English at the university. In addition, he expressed that accommodating English Language Learners (ELLs) in homogenous classes based on proficiency, marginalizes learners of lower proficiency levels. Based on the findings of the current case study, this paper emphasizes the significance of understanding ELL identities and ideologies in designing ELT curriculum, deciding on teaching methodology, institutional policies and other pedagogical concerns.

Keywords: Absenteeism, English language teaching (ELT), English language learning, Identity, Ideology, Investment

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DEVELOPING ENGLISH LANGUAGE READING SKILLS OF SECOND LANGUAGE LEARNERS THROUGH MULTILEVEL TEACHING

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The learners of any language are heterogeneous. This applies to English language learners as well. This study was carried out in a Grade 7 English language class in the Dehiowita Division to explore the benefits of multilevel teaching. The study looked at how Grade 7 students' reading skills can be improved through a multilevel teaching approach that addressed the needs of learners who were in different proficiency levels. The researcher focused on reading as it is a crucial receptive skill. This action research was conducted using a sample of learners (N=12) who were randomly selected after administering a pretest. The sample consisted of learners who belong to the lower, middle and upper levels of proficiency. The challenges that the learners face in performing reading tasks in English and the different levels of proficiency of the learners were taken into consideration and 20 lessons were planned to enhance the reading skills of the learners. Skimming and scanning strategies were developed through multilevel teaching strategies as they help to improve individual language acquisition. In the teaching process, the lessons that were implemented in the action plan moved through a cycle: planning, implementation, observation and reflection. In addition, multilevel teaching strategies such as group work, pair work, peer tutoring, differentiating tasks, differentiating homework were used to meet the demands of each child. Analyzed data revealed that the manipulated multilevel teaching strategies had a positive impact the development of the reading skills of the learners. The findings also revealed the importance of planning lessons in ways that facilitate each learner instead of targeting one group of learners.

Keywords: English as a Second Language (ESL), Multilevel teaching, Reading skills, Proficiency levels, Skimming, Scanning

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SRI LANKAN ENGLISH BORROWINGS IN CONTEMPORARY SRI LANKAN ENGLISH POETRY: LINGUSITC FEATURES

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Borrowing is an outcome of language and cultural contact among the donor (borrower) and the receptor (borrowing) languages. Usually the borrowed word does not represent a mere rigid linguistic form, but a portrayal of the cultural and historical background of the source language. The present study reports a linguistics analysis of Sri Lankan English borrowings (SLEBs) in contemporary Sri Lankan English (SLE) poetry. The selection of poetry was based on purposive sampling method with the criterion of belonging to a native either Tamil or Sinhala, Sri Lankan English writer of whom publications published in the era between 2000-2019. The classical model of Haugen (1953) was mainly used and conducted a qualitative content analysis in order to identify the nature and the linguistics features of the categorized lexical borrowings. The findings reveal four types of SLEBs were used in SLE poetry, namely, loanwords, loan shifts, loan blends and loan creations. Pure loanwords or loanwords were outstandingly used lexical borrowing category while loan shift was the least. In addition, it indicates productive strategies have employed for the nativization of borrowings. The analysis shed lights on theoretical and methodological basis for SLEBs and enriches the vocabulary of SLE.

Keywords: Contemporary Sri Lankan English poetry, Sri Lankan English borrowings, Nativization, Qualitative content analysis

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ONLINE OR OFFLINE SESSIONS? AN ANALYSIS OF FACTORS THAT INFLUENCE ABSENTEEISM AMONG THE STUDENTS OF ENGLISH FOR ACADEMIC PURPOSES

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English for Academic Purposes – Legal Studies (EAP) is a programme offered by the Department of English Language Teaching which is specifically designed for LLB undergraduates who enroll with the Department of Legal Studies of the Open University of Sri Lanka (OUSL). In an Open and Distant Learning (ODL) context, though student attendance for day schools is not mandatory, face to face sessions are important for language learning. However, it has been persistently observed that student attendance for day schools is very low. The Covid 19 pandemic has proven the importance of digitally enhanced learning spaces that promote greater student autonomy. This calls for a close examination of how substantial online/blended learning would promote student attendance. The review of relevant literature has shown that relatively little research has been carried out in distance education institutes to investigate the fundamental reasons for student non-attendance at second language classes and the relationship between attendance and performance. Hence, taking this need into consideration, the Overall Continuous Assessment Mark (OCAM) has been reviewed in relation to attendance, in this study. A random sample of 154 (30% of the total population) student questionnaires was selected. The tool administered in this study was a short questionnaire with close ended questions and a few open-ended questions. In addition to this, the student attendance records and their OCAM were inspected to observe the relationship between student attendance and performance. Data were analyzed qualitatively and quantitatively. The findings through close ended questions of the present study revealed that the most prominent reason given by students for non-attendance to English classes was because the day schools clashed with their office work. The second ranked factor for missing English classes was due to family commitments. Most interestingly, the third ranked factor was the perception that English classes were not interesting, and that alternative means such as online support and workshops were preferred. Thus, it can be concluded that introducing blended method would facilitate to minimize the problem of non-attendance while catering to the learning needs of ODL students.

Keywords: Blended learning, English for Academic Purposes (EAP), Student non-attendance, Online learning, Open and Distant Learning (ODL)

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TAPPING INTO THE L2 LEARNER'S PSYCHE: DOCUMENTING THE OUGHT-TO SELF OF STUDENT TEACHERS

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Second Language (L2) learner psyche has triggered the interest of researchers worldwide, with motivational theory being one of its fertile research grounds. Dörnyei's introduction of the L2 motivational self-system which includes the ideal self and the ought-to self has produced a wealth of empirical research, proving the validity of the concepts. However, the later developments in the theory identified the complexity of these self-systems and the near impossibility of drawing a linear connection between the self-concept and L2 learning motivation. A key theorist in complementing the theory of motivation with the introduction of the concept of "investment" was Bonny Norton. These theoretical debates have shed light on the fact that any single trait in motivation theory can turn out to be complex and that motivation research should focus on the self. The present study is grounded in these two theoretical traits and the research aims to explore the ought-to self in a group of student teachers. Through the qualitative data collected via a visual produced by the participants, it was evident that the ought-to self is very much present in the future teachers. The ought-to self is a result of an obligation one develops towards oneself and also towards one's immediate family. A future study can explore the influence of this ought to self on the language learning motivation of the participants.

Keywords: Second Language (L2) self-system, Motivation, Obligation, Ought-to self

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SPEAKING CONFIDENTLY IN ENGLISH: CAN ESL LEARNERS BE TRAINED?

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Although a key goal in learning English as a Second Language (ESL) is developing the ability to speak confidently, even learners who are proficient in writing lack the confidence to speak. Not having the necessary language skills to express themselves and the fear of making mistakes contribute to the reluctance to speak. This study was done to find out whether training in Impromptu Speech (IS) could motivate learners who are reluctant and tongue-tied to speak before a small audience. “Impromptu Speech involves delivering a speech without advance preparation” (Trismianti, 2014, para 4). In this action research, a tailor-made IS intervention comprising three cycles was conducted over a period of four weeks. Experts’ (an independent observer and the teacher-researcher) feedback, learner self-reflections via diary entries and self-evaluations were obtained on five aspects of a speech which are: delivery, clarity, introduction, content and ending. Thirty-one ESL learners (15 male and 16 female), aged 15-16 years, studying in grade 11 at an English medium International School, who have successfully completed the ESOL (English for Speakers of Other Languages) Intermediate Level Examination volunteered to participate in the study. Their first language is Sinhala and they had limited exposure to English outside of school. The data revealed that while learner self-evaluations decreased from Cycle I to Cycle III, the researcher’s evaluations increased. It could be inferred that as learners became more aware of the techniques and complexities in delivering a speech, they became more self-critical. This was visible in the decrease in their self-ratings. The increase in knowledge and competence was visible in the expert evaluations and the increase in the level of students’ self confidence. This was noted in their learner diaries as well. The study therefore concludes that when adolescent learners at intermediate level become aware of the techniques of making a speech and are given multiple opportunities to practice along with feedback, they gradually become competent. This in turn, leads to increased confidence. The findings also revealed that impromptu speeches are an enjoyable and novel strategy that can motivate adolescent learners who are anxious, reluctant and tongue tied, to speak confidently in front of a small audience. Furthermore, after the intervention learners became more self-critical and are able to reflect on their own and others’ performance. The confidence and fluency gained through these activities has the potential to impact speaking in English at any forum.

Keywords: Confidence to speak, English as a Second Language (ESL), Impromptu speech (IS), Speaking

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'I AM A LITTLE MAN WHEN I SPEAK ENGLISH': IDEOLOGIES OF SPEAKING ENGLISH AT A STATE UNIVERSITY IN SRI LANKA

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The poststructuralist perspectives of language learning reconceptualise second language learning as second language socialisation, validating second language acquisition as a fundamentally social process of internalising the norms and ideologies of a particular community of practice (Pavlenko, 2002). Reconceptualising learner beliefs as learner ideologies, the construct of language ideology can be used to explore the undergraduates' relationship with English. The use of English for communicative purposes among Sri Lankan state university students has been a topic of concern for many decades. It is generally observed that these undergraduates do not often use English even though they have been learning it for almost thirteen years and are now reading for a bachelor's degree in English. Observations of contradictions highlighting their (in)capabilities to speak English with some degree of disinclination, combined with the institutional requirements to study in English, have paved the way for the present study which reports from a narrative case study that employs a tri-lens of ideology, identity, and investment to explore the reticence and ambivalence in using English. Seven first-year undergraduates were chosen using purposeful sampling and the data were collected using a background profile questionnaire, identity portraits, and narrative interviews, and analysed using the thematic method of narrative exploration. The findings reveal that the ideologies about speaking English expressed by the respondents, although with seeming variations, can be discussed in terms of ideologies about the general act of speaking English, and ideologies about using English for real-life communication in the context under study, and these are primarily shaped by the larger discourses around English as well as the subcultural hegemony in the context. The study highlights how English use evokes negative connotations related to the students' sense of selves as positioned by themselves and others in the context. The study concludes that English use is affected by its discursive positioning of English in the context instigated by the unequal power relations among the Sinhala-speaking majority and the English-speaking minority, and the broader language ideologies related to English speaking in Sri Lanka, which have shaped the micro learner ideologies about using English.

Keywords: Language ideology, Learner ideologies, Speaking English, State university undergraduates, Subcultural hegemony

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ELT PANEL DISCUSSION

DOING RESEARCH IN TIMES OF CHANGE – INSIGHTS FROM RESEARCH IN TEACHING AND LEARNING ENGLISH LANGUAGE AND LITERATURE

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This panel brings together four researchers whose research focuses on teaching and learning English language and literature. Their research, which was conducted in diverse pedagogical and social contexts addresses issues and concerns language and literature educators and students encounter. The focus of this panel is on research methodology in language and literature teaching. One of the biggest challenges a researcher faces as they set out to do research is choosing the correct or the most useful methodology and the data collection tools that will enable them to generate data that can help them to address their research questions. For researchers, finding the most appropriate research methodology is often a struggle. Drawing on from their research, the four panellists will present their research problems and how they adopted and re-envisioned their research methodology and data collection tools to explore their research problems. Each presenter will focus on the challenges and dilemmas they encountered and how they addressed those issues. Based on their experiences, they will shed light on methodological choices we can make when doing research in times of change like today where there is so much uncertainty. At the end of the presentations, the panel will create an opportunity for an open discussion for the audience to ask questions from the panellists and share experiences.

Keywords: English language teaching (ELT), Challenges, Research methodology, Teaching literature, Times of change

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HEALTH SCIENCES



DETECTION OF BIOFILM PRODUCTION AND BIOCHEMICAL IDENTIFICATION OF SELECTED BIOFILM BACTERIAL ISOLATES IN INDWELLING URINARY CATHETERS

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Biofilms are a cluster of bacterial cells enclosed with extra polymeric substances and irreversibly attached onto a surface. Biofilms have a major impact on public health as bacteria associated with biofilms are able to survive and populate in indwelling medical devices, especially in urinary catheters, causing severe nosocomial and recurrent infections. The objective of the preliminary study is to identify and confirm the biofilm production of catheter associated bacterial isolates. The short term (≤ 7 Days), midterm ($7 \leq 28$ Days) and long term (>28 Days) indwelling urinary catheters were collected from the National Hospital of Sri Lanka and New Delmon Hospital, Colombo. Bacterial population removed from the catheters was grown in nutrient agar medium. The randomly selected bacterial colonies were tested for biofilm production by three widely used methods such as Tube method, Congo Red Agar method and Tissue Culture Plate method. The identification of biofilm positive bacterial isolates was done based on their morphological and biochemical characteristics. Among the screened catheters, biofilm production was detected in bacterial isolates from 5 out of 13 catheters. Among the 5 catheters 3 of them were long term catheters. Based on the preliminary investigations done by using gram staining and biochemical screening, the most frequently isolated pathogen (84.61%) in both short term and long term catheters was *E. coli*. It was also noted that bacterial isolates identified from long term catheters were mostly biofilm producers whereas bacteria identified from short term catheters were non-biofilm producers except bacterial isolates from one catheter. Moreover, 75.00 % of isolated *E. coli* were biofilm producers in long term catheters. It indicates that biofilm production by bacteria increases in long term catheterization. Further, in long term catheters, *Staphylococcus aureus* was identified along with *E. coli* indicating the development of diverse bacterial population in long term catheters. It is concluded that the major biofilm producer identified in the present study is *E. coli* in both types of catheters and mostly found in the long term catheters. It is concluded that the biofilm forming bacteria were mostly present in long term catheters than in short term catheters.

Keywords: Biofilm producing bacteria, Biofilm production, Indwelling urinary catheters

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**ASSOCIATION BETWEEN PERSONAL CHARACTERISTICS AND
SELECTED DISEASE OUTCOMES AMONG PATIENTS WITH HEAD
INJURY, ADMITTED TO THE NEURO-TRAUMA UNIT AT NATIONAL
HOSPITAL OF SRI LANKA**

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Traumatic brain injury is a leading cause of death and disability worldwide. A reliable prediction of outcome on admission is of great clinical relevance. The present study suggests to find the relationship between personal characteristic and disease outcome. Aim of this study to investigate the association between selected disease outcomes and personal characteristics among patients with head injuries admitted to the National hospital of Sri Lanka for a period of three months. Quantitative methods were used and data collection was done through the data extraction sheet and observation. Data analysis was conducted by chi-square test. The results reveal that higher amounts of Intra cranial hemorrhage (ICH) patients were transferred from other hospitals (74.3%). Majority of the patients were between 46-60 years of age and were male (89.3%). According to the chi-square test, we found there is a close association between the patient's age and outcome. The study revealed that there is a significant association between personal characteristics and disease outcome among patients with head injury. This finding is useful in improving the knowledge and skills regarding how to manage head injury patients.

Keyword: ICH-Intra cranial hemorrhage, Traumatic brain injury, Personal characteristics

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VALUING POSITIVE EMOTIONS AS A MEDIATOR OF THE ASSOCIATION BETWEEN INDIVIDUALS' AFFECT AND SATISFACTION WITH LIFE

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Individuals' affect may influence the way they feel about their lives; the way individuals feel about their lives may also influence their general affect. The present research tested the relationship between affect and life satisfaction of individuals across cultures. Further, it explored the role of beliefs about emotions, particularly the beliefs that positive emotions are valuable, in the link between affect and life satisfaction. It also examined the link between affect and age. Data were collected from a convenient sample of 607 adults: 308 Sri Lankans, 103 Indians, and 196 Americans. The measures were positive and negative affect scale, beliefs about emotions scale, and life satisfaction scale. Results indicated that positive affect positively correlated with life satisfaction and negative affect negatively correlated with life satisfaction. Accordingly, positive affect positively related and negative affect negatively related with life satisfaction in the entire sample as well as in the American group. There was a significant relationship between positive affect and life satisfaction in the Sri Lankan group. The belief that positive emotions are valuable mediated the link between positive affect and life satisfaction. Positive affect positively related with age and negative affect negatively related with age suggesting that individuals experience less negative affect and more positive affect with age. Considering the three groups, age and positive affect were significantly correlated in Sri Lankans and in Americans.

Keywords: Affect, Age, Beliefs about emotions, Life satisfaction

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**INHALATION OF MEDICATED FUMES (*DHUMAPAANA*) AND
ERRHINE THERAPY (*NASYA*) FOR THE MANAGEMENT OF UPPER
RESPIRATORY TRACT DISEASES - A REVIEW BASED ON
AYURVEDA AUTHENTIC TEXTS**

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Ayurveda being a holistic health science, emphasizes the importance of maintaining a healthy lifestyle for the prevention and treatment of diseases. Novel COVID-19 is an infectious upper respiratory tract disease caused by the most recently discovered corona virus, which infect upper respiratory tract of humans and give common signs like sneezing, sore throat, dry cough, high fever, fatigue and in severe cases may lead to death. The pandemic is moving like a wave and steps like limiting travelling, quarantining, testing have been practicing to slow down the spread. Today, the whole world is searching for solutions from allopathic and integrated medical systems to find a cure for this deadly disease. This study focused on collecting data on treatment modalities for upper respiratory tract diseases with reference to Ayurveda authentic texts. Data was gathered from *Vridhdhatrya* and *Laghutraya*, the main authentic texts of Ayurveda. Importance of *Dhumapaana* (Inhalation of Medicated fumes) and *Nasya* (Errhine therapy) which are prescribed for *Urdhava chathrugatha roga* (diseases above the clavicle) have been stated in these texts. Inhalation of medicated fumes through nasal cavity and exhalation from mouth is known as *Dhumapaana* and insertion of medicines to nostrils is known as *Nasya*. Administration of drugs through nasal route to enter systemic circulation while acting locally on nasal mucosa is expected by these measures. Both of these have been mentioned in Ayurveda *dina charya* (daily routine) as preventive measures to maintain health. *Dhuma varthi* (Medicated cigar) is a therapeutic smoke application, prepared by mixing dried herbal powders with water to get the shape of a cigar, dried and burnt at one end and smoke is inhaled by nostrils and exhaled out by mouth. Drug recipes like *Katphalaadi churna* have been used for many years by Ayurveda physicians in treating respiratory tract diseases. For twenty first century with validated, innovative techniques these preventive and therapeutic measures highlighted in Ayurveda can be used in preventing and implementing effective line of treatment for contagious upper respiratory tract diseases like COVID -19.

Keywords: *Dhumapaana*, *Dina charya*, *Nasya*, *Katphalaadi churna*, Upper respiratory tract diseases

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IMPACT OF A 6 MONTH AEROBIC EXERCISE REGIME ON HUNGER, SATIETY AND FOOD INTAKE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS (T2DM)

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Exercises increase insulin sensitivity and energy expenditure in T2DM patients. The effects of regular exercises on appetite regulation and food intake are less known in T2DM. Thus, understanding the impact of regular exercises on hunger, satiety and food intake is important in diabetic management. Seventy-two diabetics were randomly assigned into an exercise and a control group. Brisk walking 30 min/day, 4-5 days/week for 6 months was introduced to the exercise group. Both groups maintained a 3-day diet diary. Hunger and satiety were assessed subjectively by a Visual Analogue Scale, at -30 min, +30 min, +60 min in relation to a standard breakfast meal. Food consumption was assessed by Nutrisurvey2007 (EBISpro) software. HbA1c was checked at the baseline and at 6 months. The data were analyzed by paired sample t-test. Significance was set at 0.05 level. Level of hunger significantly decreased at -30min (44.78 ± 23.74 vs 19.13 ± 20.01 , $p=0.001$) and +30min (33.94 ± 14.83 vs 19.63 ± 19.90 , $p=0.001$) at 6 months compared to baseline in the exercise group. Although satiety increased at -30min (29.06 ± 19.81 vs 38.58 ± 26.86 , $p=0.095$) and +30 min (44.22 ± 24.09 vs 47.52 ± 31.10 , $p=0.611$) in the exercise group, the changes were not statistically significant. No significant changes were observed in the control group. Moreover, both groups did not show significant changes in hunger and satiety at 60 minutes after the test meal. The exercise group showed significantly reduced intakes of total calorie (1899.13 ± 665.17 cal vs 1783.72 ± 547.69 cal, $p=0.002$), carbohydrate (243.11 ± 103.98 g vs 193.66 ± 103.91 g, $p=0.001$), fat (81.07 ± 31.59 g vs 72.76 ± 31.27 g, $p=0.001$) and protein (58.31 ± 26.28 g vs 39.59 ± 25.62 g, $p=0.001$) after 6 months of regular exercise. Although the control group also showed reduced total calory intake, no significant changes were observed in macronutrient consumption. Further, the exercise group showed significant reduction in HbA1c level ($p=0.047$) which was not seen in the control group ($p=0.796$). Regular aerobic exercises for 6 months reduced hunger thereby leading to less energy and macronutrient intakes in T2DM patients.

Keywords: Exercise, Hunger, Type 2 diabetes, Satiety

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THE EFFECT OF GREEN SYNTHESIZED SILVER NANOPARTICLES ON INTACT WASTEWATER AND SELECTED PATHOGENIC BACTERIA

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Today, untreated wastewater has become a challenge causing health issues as a result of pathogenic microorganisms and environmental pollution. Silver nanoparticles are frequently used nanomaterials with its antimicrobial action. Therefore, the objective of the present study focuses on using the nanoparticles to inhibit the bacterial growth in different contaminated samples. Silver nanoparticles were green synthesized by reacting 2.5% neem leaf extract with 0.001 M silver nitrate at 1:8 ratio. Synthesized silver nanoparticles were initially verified by color change followed by UV-visible spectroscopy. The antimicrobial activity of silver nanoparticles was evaluated with different concentrated silver nanoparticle solutions (20, 25, 30, 40 and 50 µg/mL) tested on wastewater collected from household (kitchen waste) and cattle farm in Ratmalana, Colombo. Wastewater samples and each silver nanoparticle solution were mixed at 1:40, 1:80 and 1:120 ratios and they were shaken for 3 h at 120 rpm. Spread plate method was done by taking 20 µl aliquot from each replica on nutrient agar medium and those were incubated at 37 °C for an overnight in order to check the significance effect of silver nanoparticles against intact wastewater bacterial population. Simultaneously, control experiments were done by replacing each silver nanoparticle solution with distilled water. Further, 25 µg/mL of silver nanoparticles were tested directly against the common pathogenic bacteria such as *Staphylococcus aureus* and *Escherichia coli* by following the same culturing procedure. The incipient color change from pale yellow to ruby red color and an expected absorption peak in the visible range of UV-visible spectroscopy (model U-1800) confirmed the formation of silver nanoparticles. The presence of these particles at an approximate mean concentration range of (25-50) µg/mL at 1:40 ratio inhibited the bacterial growth in the intact wastewater samples by more than 95%. At the same concentration range of silver nanoparticles, a 75% reduction of bacterial population was resulted in *Staphylococcus aureus* and *Escherichia coli*. The present study concludes that silver nanoparticles are found to be effective not only in controlling the growth of bacterial population in wastewater but also it confirms the inhibition of growth of the selected bacterial species such as *Staphylococcus aureus* and *Escherichia coli*.

Keywords: Antibacterial activity, Green synthesized silver nanoparticles, Wastewater

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PROBLEMS FACED BY PATIENTS UNDERGOING HAEMODIALYSIS ADMITTED TO NATIONAL HOSPITAL OF SRI LANKA, COLOMBO

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Chronic Renal Failure (CRF) is identified as a multidimensional public health problem. Haemodialysis is used as the most common method to treat advanced and permanent renal failure. It affects patients' functional status, personal relationships, social and economic status. Purpose of this study was to explore the problems faced by patients undergoing haemodialysis who admitted to National Hospital of Sri Lanka (NHSL). This is a hospital based qualitative study conducted using fifteen participants who were selected purposively at the Vascular and Kidney Transplant Unit of NHSL. This study was conducted for a period of three months with patients who are living with CRF for at least a period of two years. There were both male and female participants aged between 20-60 years. In-depth interviews were conducted after receiving informed consent, using an interview guide with probes. Interviews were audio taped and transcribed verbatim. Conventional content analysis was carried out. Ethical approval for this study was obtained from the Ethics Review Committee, NHSL, Colombo. The findings of the study revealed 'physical deterioration', 'changes in personality', and 'economic barriers' as main themes. 'Body changes' and 'self-care limitations' were the two sub themes that formed the 'physical deterioration' theme. The theme 'changes in personality' derived from three subthemes 'emotional conflicts', 'social limitations', and 'feeling exhausted'. 'Cost of treatments', 'transportation difficulties' and 'loss of income' were the three subthemes that formed the theme of 'economic barriers'. Patients undergoing haemodialysis desire to survive and live a happy life despite their disease condition, dependence on haemodialysis and all the debilitating experience caused by their physical, psychosocial, and economic problems. This study recommends that all patients undergoing haemodialysis must be periodically screened for psychological distress and those who test positive should be referred to the service of a mental health clinic for confirmation of the diagnosis and treatment. Identified physical problems should be treated with necessary guidance. To minimize social and economical problems, there should be a proper plan handled by the government to provide support for patients with chronic renal diseases.

Keywords: Chronic Renal Failure, Haemodialysis, Physical problems, Psychosocial and Economic problems

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DIFFERENCES BETWEEN LONG-TERM MEDITATORS AND NON-MEDITATORS ON SELF-REPORTED LEVELS OF MINDFULNESS, PSYCHOLOGICAL DISTRESS, RESILIENCE AND QUALITY OF LIFE: A PILOT STUDY

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Meditation is a set of self-regulatory practices that result in mental states of relaxation, concentration and calmness. This cross-sectional, comparative and analytical pilot study aimed at 1) investigating and comparing differences in self-reported levels of mindfulness, psychological distress, resilience and quality of life (QOL) between long-term meditators (LTM) and non-meditating controls in a Sri Lankan context, and at 2) reporting pilot study data. A purposive sample of LTM (n=11) and matched non-meditating controls (n=11) completed the culturally adapted and validated Sinhala versions of the Depression, Anxiety, Stress Scale-21 (DASS-21), the abbreviated version of the World Health Organization Quality of Life questionnaire, the Resilience Scale, a demographic details questionnaires and the Five Facet Mindfulness Questionnaire (FFMQ-39) (*content and consensually validated to be used in the current study*) which includes the subscales; *observing, describing, non-reactivity, non-judging* and *acting-with-awareness*. Data was analyzed using IBM SPSS statistics 23 at an alpha level of 0.05, where non-parametric tests (Mann-Whitney U test) were used for data analysis. In terms of, mindfulness, greater *observing* in LTM compared to non-meditators ($U=19, p=.019$) and greater *non-reactivity* in LTM compared to non-meditators ($U=11.5, p=.003$) were observed. Final sample size for FFMQ-39 analysis was, n=20 (LTM; n=10, non-meditators; n=10) and other analyses were conducted with a final sample size of, n=22 (LTM; n=11, non-meditators; n=11). Psychological distress was measured using the three sub-scales of the DASS-21; *depression, anxiety, and stress* where non-meditators showed higher levels of depression than LTM ($U=31.5, p=.047$). LTM ($M=146.10, SD=1.52$) showed moderately high to high resilience (145<) while non-meditators ($M=137.36, SD=3.35$) showed moderate resilience (125-145). QOL; LTM showed higher levels of QOL related to psychological health ($U=16.5, p=.004$) social relationships ($U=30.5, p=.043$) and environment ($U=19.5, p=.007$) compared to non-meditators. Findings of the pilot study suggest the beneficial nature of meditation on facilitating mindfulness in terms of *observing* and *non-reactivity*, reducing levels of depression, and elevating perceived QOL related to psychological health, environment, and social relationships in meditation practitioners in a Sri Lankan context.

Keywords: Anxiety, Depression meditation, Long-term meditators, Mindfulness, Psychological distress, QOL, Quality of life, Stress

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INVESTIGATION OF POTENTIAL ABILITY OF NOVEL BIOPOLYMER MATRIX FOR DEVELOPMENT OF TRANSDERMAL DRUG DELIVERY VEHICLE

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Transdermal Drug Delivery System (TDDS) is used to deliver a specific dosage of drug through the skin. It has taken the higher consideration at present due to its control drug releasing mechanism. Hence, development of a novel control drug releasing polymer-based matrix is essential to enhance the biocompatibility and half-life. The main objectives of this research is to develop a novel biopolymer based controlled release drug delivery system for pharmaceutical and cosmetic industry. Therefore, under this investigation a novel inert biopolymer was developed by using horse gram (HG) starch and corn starch (CS). Diclofenac Sodium (DS) was used as the model drug to intercalate in to biopolymer matrix. Further, the releasing of the model drug and the kinetics of the drug releasing was investigated. The biopolymer matrix films were obtained with different particle size of horse gram (<63 μm , <125 μm , <150 μm) as well as different starch ratio (100%, 50%, 25% w/w). Surface morphology, functional group analysis, water vapor transmission rate (WVTR), transparency, folding endurance and moisture content were used as the characterization parameters for the film. The releasing of model drug from the biopolymer matrix film was studied and quantified by using UV-visible spectroscopy. Phosphate buffered saline solution (pH 7.44) was used as the releasing medium. Mathematical models were used to explain comprehensively about releasing kinetic.

The bio polymer matrix with particle size less than 63 μm containing 100% HG shows significantly higher releasing kinetics than the other formulations. $8.97 \times 10^{-3} \text{ g m}^{-2} \text{ h}^{-1}$ value of WVTR rate was observed for composition 1(100 % < 63 μm Horse gram). DS release models from the polymer matrix demonstrates two type of diffusion. In conclusion, the development of a new biodegradable polymer matrix, shows significant potential as a delivery platform. It could be used as a promising biodegradable drug delivery vehicle in the cosmetics and pharmaceutical industries.

Keywords: Biopolymer, Controlled drug release, Diclofenac sodium, Drug delivery, Drug release kinetics

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NURSES' KNOWLEDGE OF THE PREVENTION OF PRESSURE ULCERS AND ASSOCIATED FACTORS IN THE KARAPITIYA TEACHING HOSPITAL

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Pressure ulcers (PU) remain a crucial health problem in long-term care. In addition to causing significant suffering in patients, it imposes a financial burden on the health care budget. As nurses play a front-line role in the prevention of pressure ulcers, assessing their knowledge is beneficial to improving the quality of care. Thus, this study is aimed at assessing nurses' knowledge of pressure ulcer prevention and identifying factors which influence their knowledge among nurses in the Teaching Hospital of Karapitiya. A descriptive cross-sectional study was conducted among 384 nurses. Data were collected using a pre-tested, self-administered questionnaire from nurses who had ≥ 1 year of experience in PU care and who participated voluntarily in the study. A total of 351 nurses participated in the study yielding a response rate of 91.4%. The majority of the nurses who participated in the study were females (87.5%) and diploma holders (82.9%). Mean \pm SD overall knowledge on PU prevention was 57.4 \pm 15.07 while the majority of nurses (59.8%, n=210) had very low knowledge. With regard to the six domains of knowledge, nurses had the lowest knowledge in risk assessment (48.9%) while knowledge scores in ulcer care, nutrition and management of mechanical load were average (53.8%56.1%). Nurses' knowledge of PU prevention was found to be associated with their gender (p=0.022), civil status (p=0.006) and professional education (p=0.000). There were positive correlations between PU prevention knowledge and nurses' age and duration of experience in nursing and clinical area of practice. In conclusion, nurses' knowledge on PU prevention was found to be inadequate. Their knowledge seems to be associated with the level of exposure they get on pressure ulcer care. Moreover, nurses' knowledge on PU prevention appears to be correlated to their age and on-the-job experience they have acquired during their career. Since nurses' knowledge on PU prevention is important in improving the quality of care and quality of life of patients, appropriate periodic educational sessions are mandatory in improving nurses' knowledge.

Keywords: Knowledge, Nurses, Pressure ulcer, Prevention

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HUMANITIES AND SOCIAL SCIENCES





STUDY ON THE INFLUENCE OF PUSH AND PULL FACTORS ON FOREIGN TOURISTS' RETURN INTENTION TO ELLA, SRI LANKA

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Ella city is one of the most popular tourist destinations in Sri Lanka. Many international tourists visit the Ella city annually. Every year all accommodations are fully booked because of foreign tourist arrivals. This study was conducted to identify the influence of push and pull motivation factors on foreign tourist satisfaction and revisit intention to the Ella area. The research objectives are to discuss the travel motivation of international tourists to Ella city and to examine how to push and pull travel motivation, explain and predict destination satisfaction and return intentions to Ella City. The researcher used a quantitative research approach to conduct this study. The researcher selected a simple random sampling technique for collecting data. 100 tourists who visited Ella were selected as the samples for this study. Both primary and secondary data were used and primary data was based on a five-point Likert scale questionnaire. The conceptual framework illustrated the casual relationship among travel motivation (push and pull factor), destination satisfaction, and return intention. The data were analyzed by SPSS version 21 and it accepted five alternative hypotheses. The findings help both private and public organizations to improve pull factors from its present level. In order to understand tourists' responses, expectations and reactions while they are traveling in Ella. Further, the government authorities can focus on the legal, administrative, and infrastructure development in the Ella area to increase visitor arrivals via satisfaction.

Keywords: Destination satisfaction, Pull factors, Push factors, Return intention

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AN INVESTIGATION OF THE VISITOR SATISFACTION IN HOMESTAYS IN ELLA

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Ella is a popular destination among homestay tourists. Visitor satisfaction with homestays is crucial for the success of the tourism industry in the Ella area. It directly affects tourists' intention to revisit. Even though there are several issues like the lack of language knowledge, knowledge of technology, marketing and promotional skills and training, homestay demand is increasing annually during the peak seasons. Therefore, this study was conducted to examine visitor satisfaction in homestays via service, security, promotion and marketing, and culture. The research objectives are to investigate factors behind visitor satisfaction, to determine the relationship between factors and visitor satisfaction, and to provide suggestions to improve visitor satisfaction in Ella homestays. A quantitative research approach was used and the Ella area was the research site. The participants of this study were the homestay tourist who visited the Ella area during the last quarter of 2019. The 150 respondents are selected as the research sample and a simple random sampling technique was used. Both secondary and primary data were used. Marketing, promotions, service, culture, and security are identified as independent variables in the framework and visitor satisfaction is defined as the dependent variable. Reliability, validity, correlation, ANOVA test, regression analysis are conducted to determine research objectives. Marketing and promotions conducted by homestay owners created a weak positive relationship with visitor satisfaction. Security also created weak positives, but near strong positive relations and homestay culture and service are created with a strong positive relationship with visitor satisfaction. Based on the findings to improve visitor satisfaction in Ella homestays, the owner of homestays should focus on improving their promotion and marketing strategies, and finding alternative cost-effective promotions. In particular, value-added experiences or products need to be offered every season. The findings also revealed the need to improve services that bring out Sri Lankan authenticity. They revealed the need to focus on the local culture and customs as it created a positive relationship. Security enhancement is one considerable factor for tourist satisfaction.

Keywords: Culture, Marketing and promotion, Security, Service, Visitor satisfaction

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THE CROSS-CULTURAL ADAPTATION OF A PROGRAM ON TRANSFORMING MASCULINE NORMS USING THE DELBECQ CONSENSUS METHOD-A PRELIMINARY GUIDELINE

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Cross-cultural adaptation of instruments for cross cultural usage is a popular trend. However, there is a dearth in the use of cross-cultural adaptation processes for the adaptation of programs. Consensus methods are commonly used when adapting programs cross culturally. The present study aims to outline the usage of the Delbecq consensus method for the cross-cultural adaptation of a program named “Parivartan” on transforming masculine gender-based norms. The increasing number of incidences of gender-based violence in Sri Lanka and the need for community level interventions to change masculine norms of dominance and impunity formed the basis for the selection of Parivartan for adaptation. The Parivartan program was first contextualized based on discussions with the original author and reviewing relevant gender norm transformation programs based research. The contextualized version was then translated to Sinhala and Tamil. The Delbecq consensus method was utilized next whereby content and consensual validation was assessed. Experts of varied fields were gathered to review the curriculum, in sections, independently, after which they gave a pre-rating for the main concepts and teaching techniques to be used by cricket coaches and 12-14 year old male cricketers. A discussion of allocated sections in assigned panels followed. The experts then presented their ideas about each section to the rest of the experts and further suggestions for contextualization was gathered. A post-rating was also given following these group discussions. A discussion about the outcome of the Delbecq session was held with the original author before finalizing the manual. Consultation rounds with key stakeholders in several regions in the country followed to gather opinions about possible implementation based issues. A group consensus was reached regarding the main concepts captured in the Parivartan program during the Delbecq and particular sections were revised to suit the local culture. Time based changes that are needed in the implementation of the program were also suggested. The stakeholder discussions highlighted several implementation based issues including the need to change the attitudes of the same stakeholders who might become facilitators for the program.

Keywords: Cross-cultural adaptation, Gender based norms, Gender based violence, Masculinity, Parivartan

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**DECONSTRUCTING SOCIAL, RELIGIOUS AND CULTURAL FACTS
OF THE NATIONAL IDENTITY OF POSTCOLONIAL SRI LANKA IN
THE ENGLISH TRANSLATION OF MARTIN WICKRAMASINGHE'S
VIRAGAYA**

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The way of the Lotus is the English translation of the Sinhala novel *Viragaya* (1956) by Martin Wickramasinghe. It was translated by Prof. Ashley Halpe and first published in 1985. The novel was originally written during a period marked by major socio-political changes in Sri Lanka. It is an autobiography of Aravinda, which provides an intimate exploration of his character through which the social, religious and cultural facets of the national identity of postcolonial Sri Lanka can be examined. A close critical analysis of the English translation of the novel *Viragaya* (1985) was done in order to identify the ways in which dominant ideologies such as social conventions and tradition, religion, gender identities and patriarchal social structure become crucial in shaping the national identity of Sri Lanka after gaining independence. Furthermore, this study attempts to bring out the ways in which *Viragaya* embodies the idea of hybridization by analysing the positive and negative elements of the cultures that existed during colonization and after colonization. The upsurge of nationalism and the ethno-centric movements occurring during this time period greatly influenced the attitudes and practices of society. The psychological insights given through Aravinda's character are used to depict how the writer attempts to construct a new national identity that eliminates all forms of oppression while embracing certain aspects of colonization. The social, cultural and religious aspects of the postcolonial national identity are deconstructed based on the strategy of critical reading introduced by the French philosopher, Jacques Derrida. According to this theory, existing 'centers' or hierarchies within the text are dismantled to provide multiple perspectives or meanings in order to interrupt the formation of hegemonic interpretations of the text. Thus, the method of deconstruction is applied to dismantle dominant facets that shape the postcolonial national identity of Sri Lanka and establish how the novel addresses the need to embrace a culture that is not driven by hegemonic ideas and practices. Secondary resources such as journal articles, books, newspaper articles and other academic work were referred to in order to support the arguments formulated during the research.

Keywords: Aravinda, Deconstruction, Martin Wickramasinghe, National identity, Postcolonial, *Viragaya*

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ECOLOGICAL AWARENESS THROUGH AN ACTION RESEARCH: A SOCIOLOGICAL ANALYSIS OF THE ENVIRONMENT

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The environment is everything around us and there is a unitary relationship between society and the environment. Thus, it has been bound to our lives in various ways for ages. Livelihood, health, education, and art are a few of them. As a Sociological discipline, Environmental Sociology tries to understand peoples' interaction with the environment, environmental problems that arise from population density, mechanisms behind globalization and environmental injustice, and also the ways to deal with them. Against this backdrop, environmental education or environmental awareness seems important in many aspects of human lives. Environmental health and ecological awareness are intertwined fields in this viewpoint. Therefore, this study was conducted mainly with the objective of explaining the importance of improving ecological awareness of herbs among institutionalized children as action research. One probation centre which accommodates children under age 15 following court orders was selected as a research field. 20 participants were randomly selected from the register as per the rules of center based on age and gender. Since the research was not just a one-sided data collection procedure, a participatory program to educate children on the value of natural herbs which they can use to fulfil their everyday health needs was administered. The strategy of work was used in a complementary way in such a way that each person contributes to the whole. This emphasizes the importance of including participants in contrast to the exclusion that they experience as they were in an institutionalized community. The research was an extra important component to enhance their knowledge of the environment. The study focused on the participants' psychological development through practical activities such as planting herbs brought by researchers and taking care of the plants on daily a basis. This was viewed as a habit they can continue even after they leave the program. Most of the environmental activities are preponderate in developing pro- environmental behaviours in terms of motivating environmental protection. Therefore, the results of the study reveal the impact of the development of ecological awareness on children. Moreover, ecological awareness had an indirect impact on their personality development and helped reduce their stress to some extent. These kinds of stress relievers were therapeutic for children who were excluded from society and were spending tie in an institutional setting.

Keywords: Action research, Awareness, Environment, Health, Institutionalization

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ARTIFICIAL HABITATS AND THEIR CONTRIBUTION TO THE DIVERSITY OF FISH SPECIES IN THE NEGOMBO LAGOON

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Increasing human activities in lagoonal environments exerts great pressures on both biotic and abiotic components of the ecosystems. The Negombo lagoon in Sri Lanka receives great pressures due to anthropogenic drivers. Aquatic species in the lagoon are badly affected due to intensifying anthropogenic activities and fish species are at the forefront. Therefore, this study was conducted to assess the fish species composition, diversity, abundance and richness in the Negombo lagoon. 23 fish samples were chosen covering 12 natural habitats, 7 artificial habitats and 4 semi-natural from two banks of the lagoon according to habitat heterogeneity. Areas where human influences are high were considered as artificial habitats. Field survey and observations were carried out consecutively three times by utilizing cast net with mesh size of 1.25 inches in order to collect data. Margalef richness index, Shannon weiner index and abundance index were used to assess the richness, diversity and abundance of fish species respectively. Excel software and Arc GIS 10.1 were used in data analysis. A total of 20 fish species which belong to 7 orders, 18 families and 19 genera were identified. The most common species was *Mystus gulio* (Anguluwa) in the lagoon. According to the habitats, the highest species abundance was found from artificial habitats and the highest species richness and diversity were found in semi natural habitats, with 1.6423 Margalef richness index and 1.2687 Shannon weiner index. The results revealed that the variations in artificial habitats were considerably high. *Acanthopagrus berda* (Thiraliya) fish species was the most common species found in six habitats out of the seven artificial habitats. In the fish massage center and abandoned boat locations, *Acanthopagrus berda* was the dominant species. Within the artificial habitats the highest species diversity was found in constructed canal mouths, including Dutch canal mouth (1.3863), Hamilton canal mouth-L10 (1.3863) and Sewage lines (0.6931). The special characteristic was that both abundance and richness values are also very high in those locations. Within the highly diversified locations around canal mouths the most prominent species was the *Planiliza melinopterus* (Godaya). As an individual habitat, artificial habitat shows inner variations unique to the individual sample locations.

Keywords: Artificial habitat, Negombo lagoon, Diversity, Richness, Fish species

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**THE DEATH OF AN ENDING: WHAT MOTIVATED A STORYTELLER
TO ALTER THE ENDING OF THE FOLKTALE ‘ANIMOSITY
BETWEEN COBRA AND POLANGA’?**

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Folktales have been posited by scholars as narratives that are closer to life experiences of people, suggesting that alterations to a folktale could also be connected to changes in the material sphere. In fact folklore scholars agree that a folktale could change to accommodate what they call the ‘requirement of a new age.’ The popular Sinhala folktales, known as *Nai Polon Vairaya*, or ‘Animosity between Cobra and Polanga,’ has undergone a radical motif-change in the late nineteenth century. The tale was first recorded by the British prisoner of the Kandyan Kingdom Robert Knox, in his 1680 publication *An Historical Relations of the Island of Ceylon*. In his 1910 three-volume publication titled *Village Folk Tales of Ceylon*, Henry Parker, a colonial (British) has recorded the same tale albeit with a radical motif change towards the end. The present study undertakes a careful motif analysis of both tales to identify the nature of the alteration, its limits, and importantly, what that change could suggest about the ‘requirement of the new age’ that might have motivated the change. The findings of this study suggest that the positivist notions of modern medicine as well as hopes of reducing mortality might have inspired the story-teller/collector to change the ending.

Keywords: Folktale, Motif, New age, Story-collector, Story-teller

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THE CORRELATION OF DEMOGRAPHIC FACTORS WITH THE SKILL LEVEL OF MEDITATORS: A PILOT STUDY

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Meditation includes a variety of spiritual and psychophysical practices that emphasize different goals, including the increase in focus, self-awareness, relaxation, and tranquility by training attention and awareness of an individual. Skill-level seems to be leading a meditator to achieve physiological, genetic, and psychological benefits. Hence, the aim of this study was to seek the correlation between skill-level of a meditator with eight factors: (1) age, (2) gender, (3) body mass index (BMI), (4) highest educational achievement, (5) sleeping hours per day, (6) diet type (7) duration of meditation experience (years), and (8) frequency of meditation per day (minutes per day). The sample consisted of meditators who were above 18 years of age ($n=20$) and were not pregnant, breastfeeding, smokers or identified themselves as having a psychiatric disorder. They were given an interviewer-administered questionnaire titled "Intake interview" consisting 30 questions that were validated through the following steps: review of literature, pre-condition, test development, confirmation (empirical analyses), administration, scoring scales and interpretation, and documentation. It was used to assess the skill-level of meditators and it explored 6-areas of skill-level that included: duration and details of meditation practice, heightened peripheral awareness, stable attention, alertness and emotional stability. These were individually scored to calculate a single score that reflected the skill-level of each meditator. In addition, clinical and demographic data were collected. The skill-level of a meditator was correlated with age, BMI, sleeping hours, duration of meditation, and the frequency of meditation per day using Pearson Correlation

Gender, diet type, and highest educational achievement were correlated by Point-Biserial Correlation. The findings of the study revealed that the highest educational achievement (significance (sig)=0.001; Pearson's correlation (r)=0.671), duration of the meditation (years) (mean \pm SD=7.48 \pm 3.81; sig=0.002; r =0.642), and meditation frequency per day (minutes) (mean \pm SD=78.8 \pm 6.71; sig=<0.001; r =0.792) were significantly correlated with the skill-level of a meditator, However, significant correlations were not observed between age, gender, BMI, diet type and sleeping hours.



This study has shown that the skill-level of meditators is closely correlated with the highest educational achievement, duration of meditation experience (years), and meditation frequency per day (minutes). This pilot study suggests that exploring the correlation between skill-level of meditators with age, gender, BMI, diet type, sleeping hours per day, highest educational achievement, duration of the meditation experience (years) and frequency of meditation per day (minutes) context to be feasible.

Keywords: Clinical data, Demographic factors, Intake interview, Meditation, Pilot study, Skill level

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TEMPORALITY OF HISTORY: A READING OF THE CONTEMPORANEITY OF THE PAST IN POST-WAR SRI LANKA.

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This paper offers a reading of how temporality interacts with individual conceptualizations of and responses to the past with a particular focus on the case of post-war Sri Lanka. This paper reads temporality as an integral part of individual consciousness and by extension, of one's perceptions of the past, present and future. In this paper, a theoretical reading of time and imagination of history foregrounds the reading of shifting configurations of a number of war-related socio-political constructs in post-war Sri Lanka; namely, the war victory, the image of the soldier, and political choice. It is observed that the history told and memories shared bear the stamp of the time of telling with the lived reality of the present altering one's perception of and relation to the past. This in turn has a significant impact on collective social and political practices. Further, it is suggested that comprehending how temporality works in recalled and narrated past phenomena would facilitate empathetic consideration of past phenomena itself as well as various viewpoints on our shared past. Such an understating would further encourage conscious engagement with the temporal effects on our own seeing, hearing, remembering and telling as agents located in and conditioned by time.

Keywords: History, Political choice, Soldier, Sri Lanka, Temporality, War

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THE ENVIRONMENTAL IMPACT OF SOIL DEGRADATION IN THE BOGAWANTHALAWA SOUTH GRAMA NILADHARI DIVISION IN THE NUWARA ELIYA DISTRICT

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Soil degradation has become a crucial environmental problem in Sri Lanka. This is particularly so in the upcountry areas such as the Nuwara Eliya district. Bogawantalawa South Grama Niladhari Division has been identified as a vulnerably area for soil degradation. This division has shown a drastically increasing trend in soil degradation, due to unplanned human activities. The main objective of this study is to identify the environmental impacts of soil degradation in the Bogawantalawa South Grama Niladhari Division. This study followed quantitative and qualitative methods to collect data, applying purposive sampling techniques. 86 affected families were selected to respond to a questionnaire survey. This was coupled with field observations, structured interviews and multiple discussions. The data was analysed using MS-Excel and SPSS. According to the findings, there is a higher variability of environmental impacts, such as natural disasters (landslide and flood) -(31%), water pollution (24%), modification of natural terrains (21%), decreased soil quality (19%) and soil organism (5%). The vulnerabilities have increased, due to gem mining (40%), vegetable cultivation (24%), tea cultivation (21%), and infrastructure development (15%). This makes a call to all stakeholders to participate in minimizing the environmental impacts of soil degradation, through an integrated approach. This study further suggests promoting environmentally friendly gem mining activities by way of protecting the extracted soil, refilling the gem mining pits, prohibiting illegal and unregulated gem mining. Recycling polluted water, using organic fertilizers, finding hazardous areas through a hazardous map and conserving them are other suggested measures to minimize soil degradation in the area. Similarly, it is important to practice sustainable soil-conservation and farming methods, while ensuring strict implementation of existing soil conservation laws against illegal activities and providing frequent public awareness and education on environmentally friendly practices to the general public.

Keywords: Natural disaster, Nuwara Eliya, Soil conservation, Soil degradation

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BUILDING A RESERVOIR FOR KIDS: ANTHROPOLOGY OF A 'CULTURE OF UNDERDEVELOPMENT'

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Though Sri Lanka has been often identified as an agricultural society which mainly focused on subsistence, there seems to be less attention paid to the request made by the peasants of the country. They are often identified as a 'powerless' and 'voiceless' group and used only as voting machines for various political parties, a trend started with the introduction of the Five Great Forces (Pancha Maha Balawegaya) in which the clergy, native doctors, teachers, farmers and labourers were included in the election campaigns spearheaded by the former Prime Minister S.W.R.D. Bandaranaike in 1952. The peasants are forced to depend on the specialists and policy makers who always represent the elite of the society and who often live many miles away from their homes or villages. In this context, the current paper describes the struggle for building a reservoir which has been continuing for three generations in a small village called Mudungama in Bibile. The discussion in this paper is based on interviews conducted on a sample of 110 villagers in the month of August 2019. A group of elderly peasants of Mudungama developed a proposal to build a dam across Sudu Oya with the hope of creating a reservoir for the village. Most of the members from whom this idea originated in the 1960s are no more and the second generation continues the struggle expecting to achieve it for the third generation. The villagers are very much hopeful that the materialization of the proposed reservoir construction will empower them to cultivate in both Yala and Maha seasons putting an end to the acute poverty in the area. The research findings suggest that the peasant community of the area is engaged in a continuous struggle in a peaceful way through the existing democratic model. The research findings witness the connection between the aspirations of the peasants and the politician-led development projects. Moreover, this also provides a witness to the functional politics at grass root levels and the possibilities and shifting of alliances operating within the politicised setting which put their lives into further misery. The empirically grounded fieldwork offers an anthropological framework with its ethnographic insights and analytical tools. It helps to explain the complexities connected to development needs and real delivery and also explains the two worlds of the development planners and beneficiaries. The capacity of anthropologists to cultivate sentiments of solidarity with interlocutors enable them to explain practices 'from within' that explain the complexity of 'the superficial' and 'the taken-for-granted' situations. This paper will explain the impact of the politician-led development and the destitution of the people who are trapped in it, which this researcher wishes to treat as a manifestation of a "culture of underdevelopment" which has become the order of the day. This paper is an attempt to explain the cultural dimensions connected to underdevelopment which is a taken-for-



granted situation in the everyday social lives of the peasants in Sri Lanka. This will continue as a cycle of creation of expectations and frustrations from time to time. Moreover, it illustrates the gap between the centre (Colombo) and the periphery of the development process which originates from the Marxist explanation of development. In countries like Sri Lanka this dependency is connected to the existing (political) culture of decision making as explained by Serena Tennakoon in 1988. This is partially or fully linked to the Sri Lankan notion of “political citizenship” which is hugely shaped by “patron-client” relationships explained by James Brow in 1996 than the ideals promoted by the social citizenship concept put forward by T.H. Marshal in 1949. This paper argues, the need for thinking of an alternative citizenship type, may be the social citizenship, as a path to assure the rights of the marginalized people to take part in decision making and guaranteeing their development and wellbeing.

Keywords: Agricultural villages, Culture of underdevelopment, Peasants, Politicians led development

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**“THE DEMANDS OF DUTIFUL SUBJECTS”: COLONIAL EDUCATION
AND GOVERNMENTALITY IN CEYLON AT THE TURN OF THE 20TH
CENTURY**

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Recent interest in the histories of colonial education has often focused on the ideological role that education played in buttressing colonial rule. However, it has proved to be more difficult to identify and discuss a more explicit link between colonial governance and colonial education. This essay seeks to address this lacuna by examining how Ceylonese elites foregrounded colonial education to shape Constitutional reform efforts at the turn of the 20th Century in Ceylon. This paper draws from memoranda, commission reports and proceedings, newspaper coverage as well as correspondence between the Secretary of State for the Colonies, the Earl of Crewe and the Sir Henry McCallum, the Governor of Ceylon. It demonstrates the tensions imbricated in emphasizing colonial education as a terrain for challenging a form of colonial governmentality that was premised primarily on racial representation.

Keywords: Ceylon, Colonialism, Crewe-McCallum reforms, Democracy, Education

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LANGUAGE CHOICE AND MUSIC VIDEOS: AN ANALYSIS OF TRANSLANGUAGING IDEOLOGY IN SELECTED WORKS OF IRAJ WEERARATHNE

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Language choice is a pervasive phenomenon and is encoded in multilingual social practices. Language choice is always discursive, and almost always a means of shaping, negotiating, constructing and performing identity. In a bi/multilingual speech community like Sri Lanka language choice e.g. translanguaging in particular contexts constitutes performances of power and/or solidarity. As Heller (1992) put it, language choice is "a political strategy". It is now widely accepted that language choice is a key aspect of identity construction in multilingual and bilingual communities. This study takes the position that social identity is constructed through discourse (Le Page and Tabouret-Keller, 1985; Blackledge and Pavlenko, 2001). Therefore, it is possible to decipher language ideology in discourse. The focus of this study is translanguaging/code-switching practices in a selection of music videos because "music video is a significant and interesting form of contemporary popular culture, one which is widely circulated, complex and important" (Railton and Watson, 2013:1). Thus, the study attempts to analyse the discursive practices of Sinhala-English translanguaging in music videos written and performed by Iraj Weeraratne, who is a well-known and controversial hiphop artist in Sri Lanka. Through the analysis, this study aims to uncover language ideology specially with regard to English in Sri Lanka. The methodology used in this study is an interpretive approach and the music videos were transcribed, translated and coded primarily using Discourse Analysis of Code switching and translanguaging. The study found that different codes/languages are utilized in articulating various ideologies related to language in cultural products such as music videos. The semiotic processes of language ideology (Irvine and Gal, 2000) with regard to English in Sri Lanka as articulated in the selection of music videos are iconization fractal recursivity and erasure. The ambiguous attitudes towards English --- at once a language of prestige, and having "Extra Linguistic Value" (Parakrama, 2016) and at the same time a language that lacks authenticity of feeling and solidarity, and when mixed with Sinhala a language indexing gangsters and the underworld-- in Sri Lanka manifest themselves in the music videos, demonstrating that English can no longer be viewed simplistically as a 'Kaduwa' (e.g. Kandiah, 1984), a weapon of the elite but as a language and a repertoire, and practice of bi/multilingual speakers from which different identities can be negotiated and shaped.

Keywords: Code switching, English in Sri Lanka, Hiphop music in Sri Lanka, Language ideology, Translanguaging

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LAW



STANDARDIZATION OF THE SRI LANKAN CYBER-CRIME REGIME: THE UNDERLYING PRINCIPLE OF 'PROPORTIONAL PUNISHMENT'

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This research focuses on the Cyber Spectrum of Sri Lanka and, cyber-crimes. The developments taking place in the digital space mandates a system with adequate security measures. The attempts to curb cyber-crimes that were initiated long way back were finally implemented in 2007, as the Computer Crimes Act. It was based on the guidelines of the Budapest Convention. Despite the attempts of the Sri Lankan Government, there are numerous fallbacks in the Sri Lankan cyber-crime framework such as ambiguous definitions in the legislation, ineffective enforcement mechanism and power devolution, inadequate punishments, the lack of technical facilities and knowledge among practitioners. The central objective of this research is to identify the drawbacks of the Sri Lankan cyber-crime framework. This study adopts a qualitative method. The author collected the data for this research from primary and secondary sources. Laws passed by the Parliament of Sri Lanka and other countries, international laws such as conventions, directives, treaties, resolutions and judicial decisions are the primary sources of data for the research. Furthermore, journal articles, statistic reports and other articles were referred to as secondary sources through the library and digital databases. The research attempts to highlight that the punishment should be proportional and adequate with the potential damage of offence. The paper concludes that there is a necessity to reassess Sri Lanka's cyber-crime framework and such urge should be accompanied by the principle of 'Proportional Punishment'.

Keywords: Computer Crime, Cyber Crime, Information Technology Law, Sri Lanka

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CONSERVATION OF BIO DIVERSITY AND IMPLEMENTATION OF DEVELOPMENT PROJECTS

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This study seeks to analyze the ecological threat associated with the construction of a sanitary land fill in an ecologically sensitive area and the national legal framework in relation to the conservation of bio diversity. As disposal of solid waste is a major issue in Sri Lanka, a sanitary land fill was proposed to be constructed in Aruwakkalu, Puttalam. However, the Environmental Impact Assessment Report identifies the project site as an area which carries an ecological and archeological importance. Therefore, the proposed project was considered as a threat to the ecological and paleo bio diversity of the area. The methodological approach of this study is a mixed method and data were collected through interviews, observations, Environmental Impact Assessment Report of the proposed project and other legal and non-legal literature. The results indicate that the national legal framework although *prima facie* appears to be in conformity with international standards, contains certain drawbacks. The flawed process involved in project approval and environmental impact assessment, absence of a strong mechanism to ensure post environmental impact assessment monitoring and the absence of legal provisions which promote reforestation were identified as the main contributors towards the implementation of hazardous development projects. This study concludes by recommending measures that needs to be taken in order to conserve the bio diversity of Sri Lanka. The amendments to the law relating to project approval process, expansion of the prescribed list of projects which require environmental impact assessment, consideration of the cumulative impact of multiple projects in the environmental impact assessment, adoption of mechanisms which facilitate the public participation in project approval process, strengthening of monitoring process involved in approved projects and adoption of legal provisions which facilitate reforestation were identified as measures which needs to be taken in order to conserve the bio diversity and facilitate sustainable development.

Keywords: Bio diversity, Sanitary landfill, Sustainable development

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APPLICABILITY OF VIDEOGRAPHIC EVIDENCE TOWARDS A STRONG PROCEDURAL CRIMINAL JUSTICE SYSTEM: A COMPARATIVE ANALYSIS WITH SRI LANKA AND JAPAN

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At present, the Evidence Law of Sri Lanka has evolved to give recognition to electronic evidence to pave the way to justice. The Assistance to and Protection of Victims of Crime and Witnesses Act 2015 and its amendment in 2017 has accommodated victims and witnesses to give evidence through electronic evidence where there is a threat or danger to their lives while delivering evidence in front of the suspect under the Sri Lankan Evidence law. Therefore, this research aims to find out to what extent the electronic evidence has been effectively utilized to protect the transparency of evidence given by the suspect when interrogating the suspect within the criminal justice system. The objectives of this research are to identify the prevailing legal system relating to transparency of interrogation of suspects, to recognize whether the rights of suspects and victims are protected equally in the process of concluding the case and to propose necessary amendments to the existing legal regime to address the gaps in law. This research was mainly conducted using the observation method, specifically court observations which are a primary source of law. Further, the Black-Letter methodology as well as comparative research methodology has been simultaneously adopted. With regard to the case observations, it was identified that there are several issues including violation of rights of suspects due to the non-transparency of collection of evidence in interrogations, question on whether the evidence given by them is self-incriminatory and ambiguous prescriptive time period for the conclusion of a criminal case. In comparison, a clear difference between the interrogation systems in Sri Lanka and Japan were identified as the Japanese system makes it a mandatory requirement to video record even at the time of the arrest of a suspect until the end of the interrogation process. Thus, the study concludes with a view that there is an urgent need to make recommendations to protect the rights of the suspect by specifying a reasonable prescriptive period to conclude every criminal case and a reform shall be introduced to the Evidence Ordinance to protect rights of both the victim and suspect by way of video recordings in interrogations to improve the efficiency of the process for a way towards a strong procedural criminal justice system.

Keywords: Interrogation, Procedural criminal justice system, Videographic evidence

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A NATURAL RIGHTS PERSPECTIVE ON ABOLITION OF PRESCRIPTION OF LAND THROUGH THE NEW TITLE REGISTRATION LAW

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Registration of Title Act seeks, *inter alia*, to preclude prescription of land in Sri Lanka with the aim of establishing certainty and clarity in ownership. This research examines whether acquisitive prescription is defensible from a natural rights perspective and if so, how the Prescriptions Ordinance can be amended in congruity with the classical natural theory. This is a normative research based on a qualitative survey of primary sources of statutory and case law as well as secondary literature. It proceeds from the premise, that the term “Acquisitive Prescription” is a misnomer and that it is in fact a mode of acquisition of land. The historical insight that physical possession was the natural mode of acquisition of *terra nullius* led to the recognition of property as a natural right. Although there is no *terra nullius* within the state at present, a recurring theme within the natural rights discourse is how “quasi-state of nature” dynamics, like revolution, subvert modern institutions at critical moments. The research explores the remarkable parallel between Lockean revolution and adverse possession. It looks at decided cases to study how acquisitive prescription delivers justice in complex disputes. Moreover, threat of adverse possession motivates owners to utilize their land which is the historic purpose of private ownership. The research compares natural rights justice with extreme positivist positions such as allowing title holders to remain unchallenged *ad infinitum* even if they neglect their land entirely. It explores the natural reciprocity between the title and the possession. Recommended reforms include requiring direct occupation by the claimant comparable to “First Possession” and requiring sufficient utilization/improvement of the land in line with Locke’s Labour Theory. Proposed amendments will ensure that only those claimants committed to revitalizing derelict land for long periods of time can benefit. They will also reduce the number of claims, making prescription more compatible with the stability sought by the new system.

Keywords: Acquisitive prescription, Adverse possession natural rights, *Bim Saviya* John Locke

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THE INTERPLAY BETWEEN PUBLIC INTEREST AND INDIVIDUAL RIGHTS DURING THE COVID-19 OUTBREAK IN SRI LANKA: A COMPARATIVE LEGAL ANALYSIS WITH SELECTED JURISDICTIONS

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The outbreak of the coronavirus disease (COVID-19) in early 2020, has changed the world with its unintended consequences on the humankind. Besides, the COVID-19 outbreak has significantly affected law enforcement, policing and administration of justice. There has been a considerable increase of government attempts to contain the spread of COVID-19, through exercising the prevailing pandemic control laws and imposing stringent isolation orders and social distancing measures. These interventions have raised heated debates on the executive overreach, proportionality and fairness of the restrictive measures and the approaches of law enforcement agencies. Only a few countries have been successful in these efforts, while most of the other countries have been experiencing difficulties and failures in balancing individual rights and public interest in exercising public power to mitigate the impact of COVID-19. This research focuses on whether the COVID-19 measures enforced in Sri Lanka can be challenged on the grounds of arbitrariness and disproportionality. The key findings of this research reveal that centuries-old enabling legislation of the prevention of infectious diseases and its vaguely construed provisions, lack of clarity of the measures to balance public interest and individual rights, and possible overlapping of hundreds of regulations may have caused to blur the public interest construction of COVID-19 measures in Sri Lanka. However, a closer inspection on Sri Lanka's constitutional mandate to regulate public interest and health would reveal a legitimate connection between COVID-19 restrictions and the exercise of public power. Further, a question remains which aspects should be considered in introducing a robust legal mechanism to overcome the prevailing weaknesses of the Sri Lankan law. Given the approach to COVID-19 in constitutional law and public interest seems to be contextual, this research adopts an extensive review of literature and comparative analysis of the constitutional foundation of COVID-19 measures in selected jurisdictions to emphasize the need of a balanced pandemic control law for Sri Lanka.

Key words: COVID-19 outbreak, Individual rights, Public interests

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AN ANALYSIS ON THE MODERN GROUNDS ON JUDICIAL REVIEW OF ADMINISTRATIVE ACTION IN SRI LANKA

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Judicial Review of administrative actions is based on various principles in administrative law. Doctrine of ultra vires is not the sole foundation of judicial review. The judiciary has played a creative and imaginative role in developing the grounds of judicial review. Simultaneously, it has paid its attention to both upholding the principle of rule of law in the country and protecting the substantive rights of the individuals. Grounds of judicial review are varying in Sri Lanka according to the gradual development of the core principles underpinning Administrative Law. Sri Lanka handles this matter with a written constitution and concepts like rule of law are enshrined in the Constitution. This paper explores the modern grounds on judicial review of administrative action in Sri Lanka. The comprehensive literature review research methodology was used in this research. While some scholars argue that doctrine of ultra vires is the sole ground for judicial review, others argue that there are many grounds such as public trust doctrine, legitimate expectation and proportionality. Sri Lanka has developed its own way of judicial review of administrative actions in the backdrop of applying the principles of Constitutionalism. It has a very clear diverged path namely the writs which are descriptively mentioned in Article 140, 154P. (4) in the constitution and fundamental rights guaranteed by the chapter III of the constitution with Article 126 of the constitution regarding the breach of fundamental rights. Sri Lanka has developed various grounds for judicial review of administrative actions from time to time using innovative grounds of review such as public trust doctrine and public interest litigation, proportionality, legitimate expectation, natural justice and right to equality by the active and creative contribution of the judiciary. The literature substantiated the proposition that Sri Lankan judiciary has developed various grounds for judicial review. The ultimate purpose of those grounds is ensuring the rights of the people by controlling the administrative discretion. Further it is recommended to codify these grounds as directive principles for the judiciary to be applied in the future to have consistency of the application of those grounds in the courts.

Keywords: Judicial Review, Rights - based approach, Ultra Vires Doctrine

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PATENTABILITY OF SOFTWARE RELATED INVENTIONS IN SRI LANKA: SPECIFIC GUIDELINES WITH REFERENCE TO SOPHISTICATED JURISDICTIONS

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Recent technological developments and globalization has converted the implementing of intellectual inventions as well. Recently, software has become an inventive output of human intellect and can be recognized as an intellectual property. Oxford Dictionary definition for software, is cited as 'the program etc. used to operate a computer: application /system, design, educational musical sharing etc.' A software can be recognized as an invention which includes both literary and technical aspects. Various international legal instruments such as the Bern Convention, Universal Copyright Convention, World Intellectual Property Organization Copyright Treaty have recognized software under the protection of copyright. Most of these legal instruments ensure the protection of the literal aspects of software related inventions not the technical aspects. It can be said that copyright laws do not adequately protect the complete package of software. Recently, a global trend of recognizing software within the ambit of patent protection has been identified. The main purpose of granting a patent for an invention is to stimulate industrial inventions and also granting limited monopoly rights to the inventors. As mentioned in the section 63 of the Intellectual Property Act of 2003 of Sri Lanka an invention is patentable if it is new, involves an inventive step and is industrially applicable. Generally, some of those software related inventions did not fulfill the requirements of novelty and the innovative steps and thus, lost the patentability. The objective of this research is to analyze the possibilities of recognizing software related inventions under patent requirements of Sri Lankan Intellectual property law. The methodology of this research is based on more specifically, a doctrinal analysis of foreign legislations on software patentability and reviewing of research articles and policy reports. The purpose is to analyze some progressive jurisdictional, legal and policy backgrounds which can be taken as a positive guideline to ensure the patentability of software in the event that the Sri Lankan judiciary face controversial issues related to patenting software in the future.

Keywords: Copyrights, Guidelines, Patentability, Software, Technological developments

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MANAGEMENT



THE IMPACT OF HUMAN RESOURCE MANAGEMENT PRACTICES ON EMPLOYEE INTENTION TO RETAIN: WITH SPECIAL REFERENCE TO THE MG APPAREL (PVT) LTD IMBULANA IN SRI LANKA

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The present research is aimed at determining the impact of Human Resource Management (HRM) practices of career development, supervisor support, working environment, rewards, and work-life policies on employee intention to retain at MG Apparel (Pvt) Ltd Imbulana which is Sri Lanka's biggest garment manufacturing organization. This research closely looked at the following broad factors: career development, supervisor support, working environment, rewards, and work-life policies. The sub-objectives of this research is to identify the impact of the most influential factor for employee intention to retain and to identify the impact of reasoning to increase the employee intention to retain of MG Apparel (Pvt) Ltd. Out of the 600 employees, using the Morgan table, 232 employees were selected as a sample for the present study and employed a purposive sampling technique. The study achieved a response rate of 79%. The dependent variable and independent variables were tested with a closed-ended questionnaire and they were statistically investigated using descriptive analysis, correlation, and multiple regression analysis using SPSS 21 version. Tested Cronbach's alpha of the questionnaire was 0.932. The major finding of the research was that HRM Practices such as career development, supervisor support, working environment, rewards, and work-life policies were the explanatory factors having a positive and significant impact on employee' intention to retain. $R^2 = 0.498$ and it describes 49.8% of the variance in employees' intention to retain is explained by five human resource management practices. According to the research outcomes, the most influential factor is the working environment. Further, it was recommended that career development, supervisor support, working environment, rewards, and work-life policies as the most critical HRM Practices to be implemented by MG Apparel to Retain the Employee.

Keywords- Employee retention, Human resource management practices, Working environment, career development, Garment manufacturing

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THE IMPACT OF OCCUPATIONAL HEALTH AND SAFETY ON JOB PERFORMANCE: WITH SPECIAL REFERENCE TO THE SMART SHIRTS (LANKA) LTD HARAGAMA SRI LANKA

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This paper discusses the significant commonalities in highly contentious concepts: occupational health and safety towards job performance. Among all other resources that organizations utilize to operate, the human takes the first place. The reason is the uniqueness of human resources. Human beings have special capabilities that other resources do not have. Health and safety have a big concern in society and a considerable component in any organization. Health and safety practices are imposed by rules and regulations that are imposed by the government. Some regulations are imposed by culture. Workplace health and safety is one of the main factors that should be considered when utilizing human beings. Safety is placed second in Maslow's hierarchy of needs because of its importance. In the apparel sector, there are so many health and safety issues as they deal with machines and electricity and is focused on tight production targets. This study aimed to investigate the health and safety in the apparel sector organizations and the relationship between health and safety towards the performance of employees. Accordingly, an apparel sector organization was selected to conduct this study and non-managerial level employees were selected as the population. A questionnaire was distributed among the selected sample (97 non-managerial level employees). All the members in the sample responded, thus the response rate was 100%. The statements in the questionnaire were developed using a five-point Likert scale. Collected data were analyzed using statistical methods and the Statistical Package for Social Sciences (SPSS 21). The study found that there is a positive relationship between occupational health and safety and job performance in non-managerial employees. As per the findings of the research, the managers suggested increasing the number of programs that enhance the quality of occupational health and safety of the organization to enhance the job performance of non-managerial employees.

Keywords: Job-Performance, Occupational health, Occupational safety

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A PRELIMINARY STUDY OF THE FACTORS INFLUENCING PEOPLE'S INVOLVEMENT IN PRO-POOR TOURISM

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This study aims to identify the factors influencing People's Involvement (PI) in Pro-Poor Tourism (PPT). This is a quantitative study and data was collected from 61 respondents through self-administered questionnaires with 1-5 Likert scale in Pasikuda, Batticaloa District of Sri Lanka. The results revealed that trust on the tourists (bridging capital), language skills and training in hospitality industry (capacity), lack of social violation and lack of corruption (social harmful capital), employment opportunity in hospitality sector, and tourism infrastructure facilities are positive influences on the PI in PPT. Further, community perceptions about the contribution to poverty reduction, market opportunity, opportunity to get involved in decision making, and collective action in tourism affairs (social bonding capital) moderately influenced the PI in PPT. Besides, linking social capital (connection of local people with Non-Government Organization, and government authorities) poorly contributes to the PI in PPT. Therefore, this study recommends that tourism policymakers prepare appropriate mechanisms to improve social bonding, bridging, linking, and social harmful capital to enhance the PI in PPT.

Keywords: People's involvement, Pro-Poor tourism, Social capital

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THE DIVIDEND POLICY AND ITS IMPACT ON SHAREHOLDERS' WEALTH IN FOOD, BEVERAGE AND TOBACCO INDUSTRIES IN SRI LANKA

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Formulating the Dividend Policy is one of the foremost important decisions in corporate finance. The prime aim of this research is to pinpoint the effect of the dividend policy on shareholders' wealth, the food, beverage and tobacco industries listed in the Colombo Stock Exchange. The data for this study was collected from 20 companies for a period of 8 years ranging from 2012 to 2019. The researchers used random sampling and selected 20 out of 50 companies listed as food, beverage and tobacco industries. In order to address the research objective, the researchers analyzed the data using software Eviews9 with the statistical tools of Ordinary Least Square Regression and Variance Inflation Factor Test. The Market Value per Share was used as the dependent variable representing shareholders' wealth and Dividend Payout Ratio, Dividend Yield, Dividend Per Share were used as the independent variables representing the Dividend Policy. In addition, Firm Size was used as the control variable. It is revealed from the analysis that the Dividend Payout Ratio and Dividend Yield negatively impact shareholders' wealth. In contrast, shareholders' wealth gets affected positively by the Dividend Per Share and Firm Size. Hence, the findings do not support the Agency Theory, the Bird in Hand Theory or the Signaling theory.

Keywords: Beverage and tobacco industries, Dividend payout ratio, Dividend per share, Dividend yield, Food, Market value per share

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THE IMPACT OF BOARD CHARACTERISTICS ON THE FIRM PERFORMANCE WITH REFERENCE TO REAL ESTATE FIRMS IN SRI LANKA

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Many business failures occur due to ineffective corporate governance practices existing in both developed and developing countries. In order to resolve this issue, organizations must keep an eye on the attributes of its board. Therefore, the researchers' ultimate intention is to ascertain how the board characteristics of entities listed in Colombo Stock Exchange under real estate industry have an influence over their financial performance. The purposive sampling method was utilized for choosing a sample out of 25 companies. Using the annual reports of 13 companies in the real estate industry from 2012 to 2019, the researchers analyzed and investigated the data. The software Eviews9 was employed to obtain the final output with the statistical ordinary least square regression and variance inflation factor analysis is used for multicollinearity testing. The results disclose that there is a negative impact of Board Size and Board Meetings over Return on Assets. As a result, only hypotheses H1b, H1c and H1d are accepted. At the same time, the Board Size, Board Independence and Board Meetings showed a negative effect over Return on Equity whereas it resulted in acceptance of H2b and H2c hypotheses. The agency theory supports the current study as the findings show that when the number of non-executive directors and independent directors increase in the board, the effectiveness of the board will be improved. Due to this, the firm performance may be strengthened.

Keywords: Board independence, Board meetings, Board size, Financial performance

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IDENTIFYING NEEDS OF MAINSTREAMING CIRCULAR BUSINESS MODELS AND ANALYZING HOW CRADLE TO CRADLE CERTIFICATION CATER TO THOSE NEEDS IN THE TEXTILE AND FASHION INDUSTRY

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The present global pattern of over-consumption, overproduction and trading, is highly unsustainable. The fashion and textile industry contribute immensely to the resource depletion, emission, energy wastage, climate change and environmental pollution. The current model of fast fashion creates unsustainability in a crucial status. The textile and fashion as a high value incurring sector in the global economy is considered one of the most polluting and resource-consuming industry in the world. Hence it is necessary to establish a sustainable industry by adapting to Circular Economic (CE) practices. The Circular Business Models (CMB) possess the tools to achieve it. The purpose of this paper is to find out the business needs of mainstreaming circular business models and how the existing “cradle to cradle” certification caters to these business needs. This research is an exploratory case study, and the data for this study is drawn from various publicly available sources such as academic articles, books and websites. The business needs for mainstreaming circular business models can be divided into three categories. Those are pollution reduction, flexible design and modularity for Rs’ (reduce, reuse, refurbish, remanufacture and recycle) and transparency. The cradle to cradle certification caters to the business needs of mainstreaming circular business models. This research explores a divergent approach to the circular economy and circular business model literature, where business needs for mainstreaming circular business models were studied against the existing standard certification which caters to circularity and sustainability.

Keywords: Certification, Circular business models, Circular economy, Sustainability

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INTRODUCING A NOVEL APPROACH USING BINARY LOGISTIC REGRESSION TO DETERMINE MULTI-DIMENSIONAL POVERTY INDEX FOR SRI LANKA: A CRITICAL REVIEW

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There are two types of poverty: monetary poverty and non- monetary poverty. Monetary poverty is measured using the income approach where it determines whether the income of a person falls below the poverty line. Non - monetary poverty known as multidimensional poverty is measured using the direct method where it measures whether a person satisfies a set of specified basic needs such as health, education, standard of living and deprivation of basic rights (Alkire & Santos, 2013). To implement the direct approach in measuring multidimensional poverty, in 2010 the Oxford Poverty and Human Development Initiative in collaboration with the United Nation's Development Program's Human Development Report Office developed the Multidimensional Poverty Index (MPI). The aim of this study is to review critically the multidimensional poverty measurement approaches in recent articles and introduce a novel approach to determine MPI which is valid in Sri Lankan context. A review was conducted on multidimensional poverty measurement approaches of studies published in peer reviewed journals between 2009 to 2018. The main source of literature was the Publications Archive of the Oxford Poverty & Human Development Initiative (OPHI) in the University of Oxford which includes the working papers presented from 2007 to date on multi- dimensional poverty. Except a few, in most of the studies, MPIs which were calculated according to the methodology proposed by Alkire and Santos (2010) included only three dimensions with ten indicators and used the equal weighting system. In the Sri Lankan socio-cultural context more dimensions and indicators with an unequal weighting structure should be employed to obtain more accurate national and regional MPIs. Based on the analysis, it is recommended to introduce a new data oriented weighting structure using the logistic regression statistical approach. Furthermore, to implement efficient poverty reduction strategies nationally and at district level a revised household income and expenditure survey with more dimensions and indicators should be employed. This will enable policy makers to have more accurate national and regional MPIs.

Keywords: Multidimensional poverty, Non-Monetary poverty, Oxford poverty and human development initiative, Weighting structure

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DO BOARD OF DIRECTORS' CHARACTERISTICS AFFECT FIRM PERFORMANCE? EVIDENCE FROM LISTED BEVERAGE, FOOD AND TOBACCO COMPANIES IN SRI LANKA

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The boards of directors play a critical role in monitoring companies in Sri Lanka. This study is an attempt to investigate the relationship between board of directors' characteristics and firm performance of listed beverage, food and tobacco companies in Sri Lanka. This research focused on secondary data collection methods and information was drawn from 15 listed beverage, food and tobacco companies during the 5 years from 2014 to 2018. The sample was selected using the random sampling method. Furthermore, Pearson's correlation and regression were utilized to examine the relationship between the board of directors' characteristics (such as the board size, board independence, director ownership, gender diversity and board meeting) and firm performance (Tobin's Q). Firm size was selected as a control variable. The results of this study revealed that the board size and director ownership have significant positive relationship with firm performance whilst board meetings have no significant relationship with firm performance in the selected sample. The findings provided some implications for future researchers regarding the effectiveness of the board of directors towards the performance of the firm.

Keywords: Board independence, Board size, Director ownership, Gender diversity, Tobin's Q

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INFLUENCE OF BUSINESS LOCATION ON TAX COMPLIANCE: AN APPLICATION OF THE SLIPPERY-SLOPE FRAMEWORK

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This study attempts to explore the influence of urban-rural business classification on tax compliance patterns among SME taxpayers in Sri Lanka from the perspective of the Slippery-Slope Framework. Proper integration between the enforcement of power of the revenue body and the development of mutual trust in tax authority is vital in the process of collecting tax. The study empirically examines how taxpayers in urban-rural locations behave according to the faith in authority and power of the tax regime. The data for this study was obtained from 408 survey respondents. Pearson Correlation was used to measure the relationships between power and faith with voluntary and enforced compliance. The coefficient of correlation used to explain the degree of association between voluntary compliance, enforced compliance, and total compliance in urban and rural settings separately. The findings suggest that both in rural and urban locations, trust and voluntary compliance should improve for effective tax compliance. However, among the rural business community, the power of authority reduces tax compliance. Further, the results reveal the need for tax authorities to review the strategies of in the tax policy. This research expects to contribute new information to the revenue authority, policymakers and academics to explore factors that encourage taxpayer compliance.

Keywords: Power, SME taxpayer, Tax compliance, Trust, Urban-rural business

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PHYSICAL SCIENCES





AN ANALYSIS OF THE FEASIBILITY OF SOLAR POWER GENERATION: A MATHEMATICAL MODELLING APPROACH

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Sri Lanka mainly uses hydroelectricity, thermal heating, coal power and other alternative energy generation methods to fulfill the electricity requirement. Ceylon Electricity Board (CEB) along with solar power companies have implemented a solar power scheme called Net Metering in the year 2010 to export excess electricity generated by the solar power system to the national grid. The Net Metering concept has been further developed with the introduction of two solar power schemes: Net Accounting and Net Plus. This study is focused on the Net Accounting solar power scheme. In Net Accounting, CEB makes a payment to the customer if the solar power system generates excess energy and, the consumer must make a payment to the CEB for excess energy consumption under existing tariff. Sometimes, solar power schemes are not profitable due to high capital costs of the solar power system. Also, CEB or solar power companies does not provide enough information about the types of solar power systems suitable for the customers. Therefore, the objective of the study is to find out a break-even point of monthly usage of an electricity bill of a household consumer in Net Accounting over the on-grid system. In Net Accounting, the break-even points can be found for both cases where the monthly consumption is higher and lower than monthly production of the solar electricity system. The cost functions and the benefit functions are developed based on the variation of the monthly electricity bill of a household consumer considering the durability of the solar electricity system. The present values of these functions are developed using the annuity method. Then for both cases, the break-even points are found out by comparing the present values. The findings of the study have proven that solar energy is profitable for some residential sector and household consumers with higher monthly consumption. The two cases of Net Accounting have proved that the household consumers who have monthly consumption which equals the monthly production of the solar power system will get the maximum benefits in 10 years.

Keywords: Break-even point, Net Metering, Net Accounting, Net Plus

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MODELING MONTHLY MEAN TEMPERATURE IN COLOMBO, SRI LANKA USING SARIMA MODEL

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Temperature is one of the most vital elements of the climate system and it has essential implications for the social, business and economic activities of the country. Time series analysis plays a major role in predicting and analyzing climatological data. The objective of this study is to identify a suitable time series model for monthly mean temperature in the Colombo region. This study applies the Box-Jenkins time series Seasonal Auto Regression Integrated Moving Average (SARIMA) approach for prediction of temperature on monthly scales. The temperature data have been collected from Meteorological department, Colombo Sri Lanka over a period from January 2000 to December 2019 for the Colombo meteorological station. The preliminary graphical analysis has been done with the analysis of auto correlation (ACF) and partial auto correlation functions (PACF) which reveals the series is stationarity and has a seasonal effect. The series was then differenced to eliminate the seasonality. Also, the Augmented Dickey Fuller (ADF) unit root test was used to find the stationarity of a series. The ACF and the PACF were analysed to determine the seasonal and non-seasonal orders. Several models were developed, and the best SARIMA model was selected based on the minimum values of Akaike Information Criterion (AIC) and mean square error (MSE) for forecasting monthly mean temperature. Thus, SARIMA (1,0,1) (0,1,1)₁₂ model was selected as the suitable model for further process. Ljung-Box test and normality test of residuals were performed to check the adequacy of the selected model. In addition, under the forecasting error, three criteria (Root mean square error (RMSE), Mean absolute percentage error (MAPE), Mean absolute error (MAE)) were used to test the forecasting accuracy. The results indicate that the SARIMA (1,0,1) (0,1,1)₁₂ model was the best fit model to predict the monthly mean temperature.

Keywords: Box-Jenkins, Climate change, Forecasting, SARIMA model, Mean temperature

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MODELING COVID-19 CASES IN SRI LANKA USING ARIMA MODELS

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COVID-19 (Novel Coronavirus) is a pandemic which spread around the world at an alarming rate. As of 10th June 2020, 1,880 infections and 11 deaths were reported in Sri Lanka due to COVID-19. The number of infections increase day by day requiring research on modelling the pandemic. Modelling of COVID 19 cases will be useful to understand the behavioural patterns of the disease and hence to identify control mechanisms. The aim of this study is to model and predict the daily cumulative COVID-19 cases in Sri Lanka. Autoregressive Integrated Moving Average (ARIMA) technique was applied to model the reported COVID-19 cases in Sri Lanka. Data from 11th March - 1st of June 2020 were used for the model development and data from 2nd - 10th June 2020 (10% of data) were used for model validation. In the analysis, second order differencing removed the non-stationarity of the original series. Different candidate ARIMA models were tested based on ACF and PACF plots and the best ARIMA model was selected based on minimum AIC and BIC measures. The most appropriate ARIMA model for the COVID-19 cases in Sri Lanka is ARIMA (2,2,2). After verifying the assumptions of the model, MAPE of the validation set revealed 1.86%. Therefore, the selected most appropriate model was used to forecast the future COVID-19 cases in Sri Lanka. According to the forecasted values of the model, it can be concluded that COVID-19 cases in Sri Lanka will increase slowly in the upcoming days. ARIMA technique is appropriate in only short-term forecasting. Availability of an effective prediction model will be helpful in anticipating the cases and to take timely action to control the COVID-19 incidence. Unexpected recordings cannot be modelled and predicted by the fitted models. Uncertainties limit the effectiveness of a model, specially, in an epidemic like novel coronavirus.

Keywords: Auto-regressive integrated moving average (ARIMA), COVID-19 (Novel Coronavirus), Modelling, Forecasting

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INVESTIGATION OF THE POSSIBILITY TO PREVENT BROWN COLOUR FORMATION IN GROUND WATER USING BIOMATERIAL

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In Chavakachcheri (Jaffna District), in some dug wells and tube wells, the water is reddish-brown in colour. In certain tube wells, once the water is taken out, it turns brown with time. Brown colouration of water causes many adverse effects. The aim of the research is to identify the colour causing inorganic substances and to investigate the possibility of colour removal or prevention of colour formation using two bio-sorbents- charcoals developed using coconut shell (CCS) and rice husk (CRH) and to optimize the ability. Conditions of wells (depth, width, surrounding situation, soil composition), climatic conditions (temperature, humidity, rain-fall pattern), pH and dissolved oxygen (DO) affect the composition of inorganic substances in water. Rainwater dissolves iron and seeps into groundwater sources of wells. Iron is mainly present in water as Fe^{2+} or Fe^{3+} . High K_{sp} of $\text{Fe}(\text{OH})_2$ ($4.87 \times 10^{-17} \text{ mol}^3 \text{ dm}^{-9}$ at 25°C) prevents precipitation of Fe^{2+} but when oxidized by dissolved oxygen to Fe^{3+} it forms a reddish-brown colour $\text{Fe}(\text{OH})_3$ ($K_{sp} 2.79 \times 10^{-39} \text{ mol}^4 \text{ dm}^{-12}$ at 25°C). Qualitative and quantitative analysis (physical and chemical) were carried out for both coloured (C) (precipitate and filtrate) and non-coloured (NC) water samples using standard methods. CRH and CCS were prepared with particle size $<212 \mu\text{m}$ and $<600 \mu\text{m}$ respectively. Total iron (0.2 ppm), SO_4^{2-} (103 ppm), Cl^- (486 ppm) in the filtrate of C, Fe^{3+} (6.2 ppm) in the precipitate of C and SO_4^{2-} (326 ppm) and Cl^- (75 ppm) in NC were found. With these results, it was suspected that $\text{Fe}(\text{OH})_3$ is the coloured substance. pH studies with different $[\text{Fe}^{2+}]$ and $[\text{Fe}^{3+}]$ revealed that formation of hydroxides/colour can be prevented irrespective of pH if $[\text{Fe}^{3+}]$ can be decreased to < 2 ppm and $[\text{Fe}^{2+}]$ to < 4 ppm. Optimum weight and time for colour removal by both bio-sorbents were 0.025 g and 1 min. (for 25 mL of 7 ppm of iron at pH 8.5 equilibrated at 100 rpm) with $>93\%$ reduction for both Fe^{2+} and Fe^{3+} . The findings were applied to laboratory prepared water samples of Fe^{2+} and Fe^{3+} separately (25 mL of 7 ppm, pH 4.0, equilibrated at 100 rpm) and the reduction was 30% (Fe^{2+}) and 0% (Fe^{3+}) with CRH and 36% (Fe^{2+}) and 30% (Fe^{3+}) with CCS. Both CRH and CCS (0.025 g for 25 mL of water, equilibrated at 100 rpm) were effective in removing iron of tube well water ($>78\%$) within 1min. of equilibration. Both bio-sorbents were able to remove and to prevent color formation successfully.

Keywords: Biosorption, Charcoal of rice husk, Charcoal of coconut shell, Brown color formation in water

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IDENTIFICATION OF THE MOST FAVORABLE BINDING SITE OF PKM2 ENZYME FOR AS(III): QM/MM AND MD STUDIES

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The heavy metal arsenic is considered a health disaster when highly exposed and it is a promising cancer chemotherapeutic drug as well. Previous studies on arsenic in identifying it as a drug suggest that arsenic reacts with adjacent cysteine residues of proteins with high amounts of cysteine residues. Experimentalists have found out, PKM2 as an arsenic binding protein. However, they suppose different ideas on the activity of the enzyme with the binding of arsenic. In the present study, the binding of As(III) with PKM2 enzyme was examined through computational techniques, ONIOM two-layer calculation method, and molecular dynamics simulations. With the use of ONIOM two-layer calculations, the best binding cavity of the enzyme with the metal ion was identified. The study was carried out with QM/MM calculations along with molecular dynamics simulations. The cavities of the enzyme were identified using the CavityPlus web server, and twenty different cavities were found for the enzyme. By placing As(III) in five random positions in each of the cavities, average binding energy was calculated through the ONIOM two-layer calculation method. MD simulation for 100 ns with Kirkwood Buff force field was carried out for the enzyme while placing As(III) in the active site of the enzyme. The corresponding binding energy for the metal ion with the active site of the enzyme was also calculated through the ONIOM method using the final structure of the 100 ns MD simulation. Further studies were done to find the best binding site using secondary structure analysis through the STRIDE server. Among the binding energies, the energy of the simulated system showed more negative value implying that the active site has more tendency in binding with As(III), concluding that PKM2 is an arsenic binding protein. A high number of residues showing the alpha-helix and beta-strands in the active site of the simulated system confirmed that As(III) could be accumulated in the active site of the enzyme.

Keywords: CavityPlus web server, PKM2 enzyme, ONIOM two-layer calculation, QM/MM calculation, ONIOM two-layer calculation

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ANALYSIS OF MAJOR CAROTENOIDS AND CHLOROPHYLL PIGMENTS PRESENT IN THE LEAVES OF *Micromelum minutum* GROWING IN SRI LANKA

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Micromelum minutum, is a lesser known plant grown in Sri Lanka, but a popular plant in Bangladesh, India and other Asian countries as a herb used in cooking. It is a shrub or a small tree that belongs to the family Rutaceae. Due to its great medicinal properties as well as health benefits, *M. minutum* is used in Ayurvedic medicine practices in Sri Lanka. The secondary plant metabolites such as phenols, flavonoids and carotenoids found in many medicinal plants are reported to be potent, free radical scavengers and possess antioxidant properties. Three major classes of pigments namely carotenes, xanthophylls and chlorophylls present in the *M. minutum* leaf extracts were evaluated in this study by High Performance Liquid Chromatography (HPLC) on a reversed phase column with a UV-visible photodiode array (PDA) detector. The detection of pigment peaks were confirmed based on their retention times, the position of the absorption maxima (λ_{max}) and their spectral fine structures. Xanthophylls (oxygenated derivatives of carotenoids), carotenes (hydrocarbon carotenoids) and chlorophylls were the three different pigments identified in *M. minutum*. The major xanthophyll identified was lutein which consists of more than 21% of the total carotenoids and chlorophyll content. Neoxanthin, another xanthophyll was detected in minor quantities. Chlorophyll a and b were identified by their retention times and spectral shapes of absorption spectra obtained through PAD detector. The total chlorophyll (a and b) with area percentage > 53 % was the most abundant pigments out of the three pigments identified in this study. The major carotene identified in leaf extract of *M. minutum* was β -carotene. Appearance of *cis* carotenoid peak in the UV-vis absorption spectra for carotenoid eluted at 57.167 min indicates that the *cis*- β -carotene is also present in minor quantities in the leaf extract of *M. minutum*. This study provides an identification of important plant pigments such as carotenes, xanthophylls and chlorophylls present in leaf extracts of *M. minutum* which can be used as an excellent source of natural bioactive compounds in pharmacology.

Keywords: Carotenoids, Chlorophylls, *Micromelum minutum*, HPLC chromatogram

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EFFECT OF PH ON THE FLUORESCENCE QUENCHING OF 5-CHLORO-1, 10 PHENANTHROLINE BY Fe(II)

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1,10-Phenanthroline and its derivatives are known for non-fluorescent complex formation with Fe(II). Therefore, the strong chelation ability of phenanthroline to Fe(II) enables development of phenanthroline based turn-off fluorescence sensors for the selective analysis of Fe(II). The effect of pH in tuning the photophysical properties of 5-chloro-1,10-phenanthroline was analyzed using a fluorescence quenching study by Fe(II). The excitation wavelength was set at the molecule's maximum absorption, 286 nm, and the fluorescence emission was observed at 379 nm. When decreasing the pH of the medium, the fluorescence intensity at 379 nm was observed to be decreasing with a concomitant emergence of broadband at 440 nm due to the protonation of the 5-chloro-1,10-phenanthroline ligand. The lowest pH that can be used without protonation of the ligand was found to be pH 2.80 in the analysis of Fe(II). The magnitude of the slopes of Stern-Volmer plots, corresponding to the sensitivity of quenching by Fe(II) were compared at varying pH to analyze the effect of pH on the formation constant of complexation. When decreasing the pH of the medium, the slopes increased, indicating a higher efficiency of metal-ligand complex formation in acidic media. The highest formation constants were reported in the range of pH 3.80 to 4.10. The magnitude of fluorescence quenching by Fe(II) was observed to be higher than that of Cu(II) and Ni(II), irrespective of the pH, indicating higher selectivity for Fe(II). The interference by Cu(II) and Ni(II) was minimum at pH 3.80, may be due to the lower stability of the metal-ligand complexes formed between the interfering ion and the fluorophore at lower pH values which in contrast, favours the complexation between Fe(II) and 5-chloro-1,10-phenanthroline. Therefore, through variation of pH, photophysical properties of 5-chloro-1,10-phenanthroline can be carefully tuned to enhance the fluorescence quenching sensitivity by Fe(II).

Keywords: Fluorescence, Quenching, 1, 10-phenanthroline derivatives, Turn-off sensors

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PERFORMANCE ENHANCEMENT OF DYE SENSITIZED SOLAR CELLS BY TREATMENT OF DYE EXTRACT OF BLACK NIGHTSHADE FRUIT AND FRUIT SKIN WITH ACETIC ACID

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Anthocyanins rich natural dye extracts obtained from both fruits and their skins of Black Nightshade (*Solanum nigrum*) were used as the sensitizer in dye-sensitized solar cells (DSSCs). Pigments from Black Nightshade fruit and their skins were collected either in to ethanol or water separately and part of the above extracts were subjected to acetic acid treatments. DSSCs were fabricated with TiO₂ based photoanodes soaked in these four different dye solutions and their performances were compared. The highest photovoltaic efficiency of 0.55 % was obtained for both the cells which were fabricated with acidified fruit dye in distilled water and acidified fruit skin dye in ethanol. Also, nearly equal highest short circuit photo current densities of 2.06 mA cm⁻² and 2.12 mA cm⁻² and fill factors of 61.10 % and 58.27% were obtained for above DSSCs respectively. The enhancement in the efficiency and short circuit photo current densities of these DSSCs with acetic acid treatment of dye can be attributed to the intensification of absorption spectrum of visible light by acidification of dye solutions as evidence from UV visible spectroscopy. The photo voltage of the cells made with both the extracts in ethanol is always higher than that in water where the adsorption of pigments is strongly determined by the polarity of the solvent. The cell sensitized with ethanol diluted fruit dye has the highest photo voltage. This could be due to the presence of phenolic compounds in the flesh of the fruit than in the skin that passivate trap states in the TiO₂ film.

Keywords: Acetic acid, Anthocyanin Black nightshade, Photovoltaic efficiency

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GOLD NANOPARTICLE GRAFTED ZINC OXIDE NANOFLOWERS: ENHANCING THE NANOSCALE ACTIVITY THROUGH OPTIMAL SURFACE FUNCTIONALIZATION

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Zinc oxide nanoparticles (ZnO NPs) have received much attention due to their unique physical and chemical properties such as photocatalysis, broad spectral absorption, high photostability, and pronounced non-toxicity. It is notable that the applicability of ZnO is limited as it is photo responsive only within the ultraviolet wavelength range. To overcome this limitation, the surface of ZnO is functionalized with photo-responsive agents, which broadens the photo-activity of ZnO NPs. As a consequence, ZnO NPs may begin to exhibit photo-activity in both UV and visible wavelengths. This effect is more pronounced when the degree of functionalization on the nanoparticles are higher. Hence, it has become essential to explore the possibility to produce nanoparticles of novel morphologies where the surface area available for functionalization is greater. Thus, the motive of this study was to devise a novel nanocomposite of ZnO with high surface area, functionalized with various photo-responsive agents, and to understand its efficiency in photocatalysis and anti-bacterial action. Accordingly, gold nanoparticles (AuNPs), well known to produce modest intensification of nanoscale properties upon functionalization on a given material, was selected as the anchoring agent. Direct precipitation was used for the synthesis of ZnO NPs, while the Turkevich method was used for the synthesis of AuNPs, with *in situ* and post-synthetic anchoring of AuNPs onto ZnO. Nanomaterials were characterized using electron microscopy and the general morphology of ZnO nanoparticles was found to be flower-like, formed by the assembly of individual nanosheets. The average diameter of the nanoflowers were 1600 ± 3.7 nm and the average thickness of a nanosheets were 68.6 ± 0.5 nm. It was hypothesized that the surface area of the synthesized ZnO nanoparticles are significantly greater when compared to spherical shaped nanoparticles due to the crevices formed by the assembly of individual nanosheets. Overall, *in situ* AuNP anchored ZnO NPs showed most promising antimicrobial activity compared to both pure ZnO NPs and post-synthesis AuNP anchored ZnO nanoflowers. Hence, *in situ* anchored ZnO NPs are a good alternative for activity enhanced ZnO NPs. This ensures optimal surface functionalization, allowing it to be efficiently utilized in an array of novel technological applications.

Keywords: Anti-microbial, Curcumin, Surface-functionalized, Nanoparticles, ZnO

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CURCUMIN ANCHORED ZINC OXIDE NANOFLOWERS: A NOVEL COMPOSITE NANOMATERIAL WITH SYNERGISTICALLY ENHANCED ANTIMICROBIAL ACTIVITY

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ZnO nanoparticles are widely used in many applications such as hydrogen evolution, photo-electrochemical conversion, anti-microbial activity, antioxidant activity, photo-catalysis, cosmetic applications, and biomedical applications, etc. However, the application of ZnO becomes limited, specifically in those that require the activation of the nanoparticles via electromagnetic radiation, while the response of ZnO is greatly limited to ultraviolet wavelengths. A strategy that has been commonly adopted to overcome this limitation is to functionalize the nanoparticle surface with photo-responsive agents that would hence allow the amplification of the photo-activity of ZnO nanoparticles. This strategy, as reported in recent literature has allowed modest improvements in the intrinsic properties of ZnO. Intuitively one can assume that the enhancement in the properties here is proportional to the degree of surface functionalization. Hence, the challenge at hand is to devise novel nanostructures of ZnO with the increased surface area such as to allow increased levels of functionalization with a given photo-responsive agent. Thus, the focus of this study was to synthesize a ZnO nanomaterial with an increased degree of surface functionalization. Accordingly, ZnO nanoflowers were synthesized via facile and fast synthesis method at 50 °C using $Zn(NO_3)_2 \cdot 6H_2O$ and NaOH as reagents. Electron microscopic images indicated that the ZnO nanoflowers were assembled by thin ZnO nanosheets with a thickness of approximately 85 ± 20 nm, leading to nanoflowers with a diameter of approximately 1996 ± 423 nm, which effectively creates nanoscale crevices into which molecules may travel, thereby effectively amplifying the surface area available for molecular level functionalization. Eventually, curcumin, a well-known agent that possess anti-microbial, anti-cancer, and antioxidant activities, were anchored onto the ZnO nanoflowers. It was observed that the novel nanostructures indicate a coverage of approximately 2000 ppm of curcumin, resulting from the increased surface area available for functionalization. According to the investigation of antimicrobial properties, curcumin anchored ZnO showed the highest inhibition for all microorganisms tested except *C. albicans*, thereby indicating the potential to result in synergistic improvements in nanoscale properties as hypothesized herein for the curcumin anchored ZnO nanoparticles.

Keywords: Anti-microbial, Curcumin, Nanoparticles, Surface-functionalized, ZnO

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NATURAL DYE EXTRACTED FROM *Carissa spinarum* FRUITS AND INVESTIGATION OF ITS POTENTIAL IN DYE SENSITIZED SOLAR CELLS

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In this work Dye Sensitized Solar Cells (DSSCs) were fabricated using natural dye extracted from Heen Karamba (*Carissa spinarum*). Even though the full *Carissa spinarum* fruit is a source of anthocyanin, alkaloid, tannin and ascorbic acid (vitamin C) compounds, pigments were extracted from the full fruit, fruit skin and flesh of the fruit. DSSCs fabricated with the TiO₂ photoanode sensitized with the pigments obtained from the full fruit and the flesh of the fruit showed the highest efficiency of 0.294 %. The highest short circuit current density of 2.01 mA cm⁻² with 322 mV photovoltage and 45.42 % fill factor was obtained from the DSSCs sensitized with the pigments extracted from the full fruit. The highest photovoltage of 384 mV was obtained for dye extraction of flesh of fruit with 1.63 mA cm⁻² short circuit current density and 46.97 % fill factor. The short circuit current density of dye extraction of fruit skin was 1.31 mA cm⁻² with 349 mV photovoltage, 44.4 % fill factor and 0.203 % efficiency. One of the reasons for this lower performance could be due to the unavailability of some of the aforementioned constituents in the extract obtained from the skin of the fruit than the extract obtained from the full fruit and the flesh of the fruit. The charge transfer resistance at photoanode/electrolyte interface was measured by impedance spectroscopy and it was the minimum for the TiO₂ photoelectrode fabricated with the dye extracted from the full fruit. The UV-Visible absorbance spectra of the dye extraction obtained from the full fruit showed a peak at around 520 nm. These results suggest that natural dyes consist of several pigments may be one of the solutions for obtaining DSSCs with higher efficiencies in natural dye sensitized solar cells.

Keywords: *Carissa spinarum*, Dye Sensitized Solar Cells, Sensitizer

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SYNTHESIS AND CHARACTERIZATION OF NANOSTRUCTURED P-TYPE CUPROUS OXIDE USING BENEDICT'S SOLUTION

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In this paper we report a simple method for the synthesis of p-type cuprous oxide nanoparticles by reduction of Benedict's solution, using glucose. In this process, yellow, orange and red colour precipitations of Cu₂O nanoparticles were collected at temperatures around 50 °C, 60 °C and 80 °C respectively when the Benedict's solution was heated on a hot plate set at 100 °C in the presence of glucose. The three coloured Cu₂O nanoparticles were characterized by Mott-Schottky analysis and X-ray diffraction (XRD). The p-type nature of Cu₂O was confirmed from Mott-Schottky analysis and the values of the flat band potential of the yellow, orange and red colour p-type Cu₂O were 0.87 V, 0.85 V, and 0.75 V respectively. The acceptor concentration of the Cu₂O samples were also calculated from the Mott-Schottky relation and it was highest with the yellow colour Cu₂O sample. The average crystallite sizes calculated from Debye Scherrer equation for line broadening at the half width of X Ray diffraction peaks of above three coloured Cu₂O nanoparticle are found to be around 18 nm, 40 nm and 76 nm respectively.

Keywords: Benedict's solution, Cuprous oxide, Nanoparticles

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SPECTROSCOPIC QUANTIFICATION OF METHANOL IN WINE: METHOD DEVELOPMENT, METHOD VALIDATION AND SAMPLE ANALYSIS

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Methanol poisoning is a significant social concern, specifically in developing countries. Such poisoning usually occurs via the consumption of alcoholic beverages containing methanol. Notably, most alcoholic beverages contain methanol; especially fermented liquors such as wine. Current methods for the quantification of methanol in alcoholic beverages require sophisticated instruments and technical expertise. Hence, simple methods for detecting methanol in alcoholic beverages is warranted in combating the threat of alcohol poisoning. Here, a method for the detection of methanol was developed by conducting apt modifications on the ISO 1388/8 visual colorimetric method. This method is only applicable to concentrations between 1,000 – 15,000 ppm. Hence, the method was modified to quantify methanol concentration between 100 – 1,000 ppm in alcoholic beverages. As per the results, a good correlation was observed in the method while limit of detection (LOD), limit of quantification (LOQ) and recovery was 26 ppm, 79 ppm and 93.66 - 101.31%, respectively. The method was validated further by comparison to gas chromatography. Furthermore, the modified colorimetric method was used to quantify methanol content in commercially available red wine samples and homemade wine samples. Experimental results revealed that all commercial red wine samples contained methanol below the permissible level of methanol in alcoholic beverages, while all homemade wine samples contained methanol at levels below 30 ppm. Overall, the method developed was simple, accurate and sensitive towards lower levels of methanol, indicating a promising potential for the detection of methanol in alcoholic beverages.

Keywords: Colorimetry, Gas chromatography, Methanol, Wine

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A SURVEY ON SRI LANKAN WESTERN PROVINCE CAR MARKET AND PREDICTION OF PRICE OF A USED CAR

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Used car price prediction is an important topic discussed globally. With the fast growth of the Sri Lankan vehicle market, prediction of prices of used cars has earned much emphasis and has become an absolute necessity. Hence, this study highlights the factors associated with used car prices in the Western Province of Sri Lanka with a suitable predictive and interpretable model. In this study, 347 observations were selected randomly with stratified sampling technique (stratified by car brands) from newspaper advertisements and the data collection was conducted through a telephone survey. A preliminary analysis was conducted prior to the advanced analysis which included the visualization of data together with association tests conducted between the dependent variable, car price (in LKR) and explanatory variables. The detailed descriptive analysis summarized that manufactured year, registered year, car brand, model, vehicle type and origin country had associations with prices of used cars. In addition, some associations between explanatory variables was figured out from correlation coefficients and Goodman and Kruskal Tau measure. Moreover, the presence of multicollinearity in the collected dataset was confirmed by using the VIF test. Objectives were achieved in the advanced analysis with the insights obtained at the preliminary analysis. Several models including Generalized Linear Model with Gamma distribution, ridge, lasso and elastic net regression were built to obtain the best predictive model. The Lasso model was selected as the best model with 93.01% R^2 for prediction, inferential and interpretational purposes. Car condition, brand, model, country, manufactured year, registered year, vehicle type, engine capacity, km reading, gear box type, fuel type and fuel consumption were identified as most associated factors with prices of used cars. Finally, the model diagnostics were concluded that the final model satisfies all the model assumptions accordingly. Moreover, this study can be developed by getting more data from car selling websites as well. Further, the accuracy of models can be improved by a detailed unsupervised machine learning procedure like clustering with large number of data and developing appropriate models for each cluster.

Keywords: Gamma, Elastic net regression, Multicollinearity, Ridge, Lasso

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