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## GLOBAL CONGRESS ON SUSTAINABLE GROWTH & DEVELOPMENT

# GCSGD

Fostering Multi-Disciplinary Collaboration  
For Sustainable Development Goals

## 2024

# BOOK OF ABSTRACTS

12 December 2024



<https://einstein.co.in/gcsgd2024/>

In line with the Sustainable Development Goals (SDGs), to protect and promote sustainable growth and development of people and planet, this global congress initiates to identify the key positive and negative interactions on the SDGs which could serve as the basis for a science-policy initiative on achieving them. As we forge towards digital technology, we face challenges on the decline of biodiversity, energy, food and water security, climate change, economic and agricultural sustainability, human health, and well-being which has been recognized as the greatest threat faced by the human race and the planet. Academic Institutions, industries, and research organizations have major responsibilities to address these issues and come together in researching solutions to bequeath a sustainable world to our future generations and to create awareness among the younger generation.

Global Congress on Sustainable Growth & Development (GCSGD) 2024 aims to:

- Bring together academicians and world experts to present and share their expertise, knowledge and research findings towards sustainability and growth.
- Stimulate and strengthen interdisciplinary research links among researchers and stakeholders worldwide to take the bold and transformative steps to shift the world on to a sustainable and resilient path.

### **Main theme**

### **Fostering Multi-Disciplinary Collaboration for Sustainable Development Goals**

The scope of this conference includes but is not limited to Sustainable Biosciences for Global Health and Ecosystem Preservation, Innovative Health and Life Sciences for Societal Well-Being, Sustainable Engineering for System, Infrastructure, and Climate Resilience, Digital Innovation for Sustainable Development and Inclusive Growth, Sustainable Management for Responsible Governance and Economic Equity. These are segmented into the following Conference Tracks:

- **Health Science**
- **Life Science**
- **Engineering and IT**
- **Education & Management**

All the accepted papers will be submitted to \*Scopus indexed journals and INTI Journal to consider for publication after peer review.

*“We do not inherit the earth from our ancestors; we borrow it from our children...”*



**Track 1: HEALTH SCIENCE TRACK**

**Track 2: LIFE SCIENCE TRACK**

**Track 3: ENGINEERING AND INFORMATION TECHNOLOGY TRACK**

**Track 4: ENGINEERING, IT, EDUCATION & MANAGEMENT TRACK**

**Hybrid: GLOBAL CONGRESS ON SUSTAINABLE GROWTH AND DEVELOPMENT - 2024**  
Theme: **Fostering Multi-Disciplinary Collaboration for Sustainable Development Goals**

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## DESIGN, DEVELOPMENT AND VALIDATION OF A FABRICATED ORGAN BATH USING HEXAD TISSUE COLUMN MODEL FOR IN-VITRO PHARMACOLOGICAL EXPERIMENTS

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### Abstract

In this top-notch modular organ bath that can be used in research and teaching labs for in vitro pharmacological isolated tissue studies. A fabricated organ bath was developed with a hexad tissue column model for in vitro pharmacological experiments applicable for simultaneous multiple assessment of biochemical parameters on tissues. This organ bath system combines the modular digitalized thermometer and thermostat to maintain the optimized temperature in each column. These organ bath systems offer a controlled setting, free from the effects of in vivo systemic factors. All necessary elements for evaluating data from isolated tissue for pharmacological applications and allied fields are also built-in these tissue organ bath systems. This organ bath system has 6 glass columns to mount 6 tissues concomitantly. Each column has graduated scale to measure the exact volume of physiological salt solution required. There is a tiny hook at the bottom of each glass column to fix the tissues. In order to supply carbogen to the isolated tissue, the aerator support is provided in the individual columns along with a regulator control the aeration flow. The duration of the experimentation is prefixed with timers after mounting the superfused tissue in each column. The column's fluid holding capacity up to 30 milliliters and can be adjustable. Each column is connected with one litter reservoirs filled with physiological salt solution. Key Features of fabricated modular organ bath are modulation in design for cost-effective and customization, precise thermal regulation and minimal warm-up time, option for running perfusate in constant flow mode and measurable perfusate volume, fine tissue aeration control via a needle Oxy-tube for constant oxygen supply for prolonged survival of tissue, fully autoclavable glassware assembled for sterile environment, collection of perfusate from each column in different episode of study for various biochemical estimations, multichannel tissue bath to minimize experimental errors with less time consumption, from single animal, possibilities to perform the experiments on different types of tissue preparations.

*Keywords: Innovative, Initiation, fabricated organ bath, hexad tissue column*

## EVALUATING THE COMBINED EFFECT OF ANTIBIOTIC AND NSAID THERAPY ON PERIODONTITIS IN ANIMAL MODEL

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### Abstract

Periodontitis is an inflammatory disease that leads to the progressive destruction of the periodontal ligament and alveolar bone, often resulting in tooth loss. It is primarily caused by microbial infections, triggering an inflammatory response that damages supporting tissues. Traditional treatments for periodontitis include systemic Narrow spectrum antibiotics, broad spectrum antibiotics & NSAID. However, this study investigates the potential of mucopolysaccharide, incorporated into gel form, as a novel therapeutic agent for periodontitis in animal models. Periodontitis was induced by placing ligatures around the incisors and molars of the animal, creating two experimental models: incisor ligated Test 1 and molar ligated Test 2, with a control group. Clinical parameters, including body weight, CBCT x-ray, probing depth, gingival bleeding index, tooth mobility, and gingival tissue consistency, were assessed before and after treatment. Blood samples were taken at baseline and the study's conclusion to monitor systemic changes. Results from this study may offer a promising alternative to traditional antibiotic-based therapies. The aim of this study is to compare the efficacy of two ligature-induced periodontitis models and evaluate the potential of biodegradable carrier formulation loaded drug in promoting periodontal healing and regeneration.

*Keywords: Periodontitis, anti-inflammatory, wound healing, gingiva, ligation*

**EFFICACY OF ETHANOLIC EXTRACT OF *Cuscuta reflexa* LEAVES  
(EECRL) IN THE MANAGEMENT OF CHEMICAL INDUCED  
CARDIOVASCULAR DISORDERS IN EXPERIMENTAL RATS**

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**Abstract**

Cardiovascular complications are a major cause of mortality, impacting people from their adolescence to old age. Early diagnosis, targeted drug delivery to reduce adverse effects, and lifestyle changes can significantly enhance the life expectancy of those affected with cardiovascular complication. *Cuscuta reflexa*, a parasitic plant often found in agricultural fields, produces potent antioxidant compounds like Quercetin and Myricetin in order to survive. This study aims to examine the cardiovascular protective potential of the ethanolic extract of *Cuscuta reflexa* leaves suspension (EECRLS). The research included the formulation and characterization of EECRLS, followed by an evaluation of its cardioprotective effects. The cardioprotective activity of EECRLS was tested against bleomycin-induced cardiotoxicity. A comprehensive analysis was conducted, which included biochemical assessments, electrocardiogram (ECG) evaluations, and histopathological examinations.

*Keywords: Cardiotoxicity, bleomycin, cuscuta reflexa, doxorubicin*

**EXPLORING CARDIOPROTECTIVE POTENTIAL OF ELECTRON  
RELEASING GROUP SUBSTITUTED 5- BENZYLIDENE-1,3-  
THIAZOLIDINE-2,4-DIONE AGAINST ISOPROTERENOL  
INDUCED MYOCARDIAL INFARCTION IN RATS: A BIOCHEMICAL  
AND ELECTROPHYSIOLOGICAL ROLE**

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**Abstract**

Myocardial infarction (MI) remains a leading cause of morbidity and mortality worldwide, necessitating the exploration of novel therapeutic agents. This study investigates the cardioprotective effects of electron-releasing group substituted 5-benzylidene-1,3-thiazolidine-2,4-dione against isoproterenol (ISO)-induced myocardial infarction in rats. Rats were divided into control, ISO-treated, and compound-treated groups. The compound was administered to the treated groups for a specified duration prior to ISO induction. Electrocardiographic (ECG) changes, serum biomarkers (creatinine kinase-MB) and troponin, antioxidant enzyme activities, electrolyte levels, and histopathological changes in cardiac tissue were assessed to evaluate the cardioprotective effects. The compound treated groups demonstrated significant improvements in ECG parameters, including reductions in ST-segment elevation. Serum biomarkers, CK-MB and troponin T, showed substantial decreases compared to the ISO-only group. Antioxidant enzyme activities were enhanced, and electrolyte imbalances were corrected in the compound-treated groups. Histopathological analysis revealed reduced myocardial damage in the treated groups. The cardioprotective effects of the compound are attributed to its ability to improve ECG abnormalities, reduce myocardial injury markers, enhance antioxidant defenses, and restore electrolyte balance. The histopathological findings further support the protective role of the compound against ISO-induced myocardial damage. The electron-releasing group substituted 5-benzylidene-1,3-thiazolidine-2,4-dione exhibits significant cardioprotective effects against ISO-induced myocardial infarction in rats. These findings suggest its potential as a novel therapeutic agent for MI, warranting further studies to elucidate the underlying mechanisms and optimize clinical applicability

*Keywords: Cardioprotection, 5-benzylidene-1,3-thiazolidine-2,4-dione, ECG, biomarkers, antioxidant enzymes, histopathology*



## DEVELOPMENT AND EVALUATION OF A VIRGIN COCONUT OIL-BASED LIPID-SOLUBLE FORMULATION FOR ENHANCED BIOAVAILABILITY OF EPIGALLOCATECHIN GALLATE

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### Abstract

Epigallocatechin gallate (EGCG), a major catechin in green tea, has poor bioavailability, with less than 10% surviving digestion. Virgin coconut oil (VCO), known for its bio-enhancing properties, can improve EGCG delivery by modulating tight junctions (paracellular transport) and fluidizing membranes (transcellular transport). However, EGCG's polar nature limits its solubility in lipid systems, requiring a compatible solvent. Lipid-soluble EGCG formulations were prepared with VCO in ratios from 1:1 to 1:3, using edible, fat-soluble solvents like lecithin and fatty alcohols (C8–C18). Stability studies confirmed stable emulsions. Bioavailability was assessed using a non-everted gut sac model, showing that the 1:1 VCO-EGCG formulation enhanced absorption. Permeability studies revealed a permeability coefficient ( $P_{app}$ ) of  $2.9 \times 10^{-6}$  cm/s and a 4.14-fold increase in absorption after 90 minutes compared to EGCG alone. The improved solubility, stability, and absorption result from the synergistic effects of VCO and the solvent system. These findings suggest that VCO-based lipid formulations can overcome EGCG's bioavailability challenges, supporting broader therapeutic applications. Further studies are needed to assess clinical utility and long-term safety.

**Keywords:** *Epigallocatechin gallate, virgin coconut oil, bio-enhancing properties, absorption enhancement, synergistic effects.*

## ASSESSMENT OF THE SENOLYTIC ACTIVITY OF SUSTAINED- RELEASE EPIGALLOCATECHIN GALLATE TRANSDERMAL PATCH IN A CHRONIC WOUND MODEL

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### Abstract

A study developed a sustained-release transdermal patch for epigallocatechin gallate (EGCG), an antioxidant with potential in wound healing and anti-senescence therapies. The patch was formulated using hydroxypropyl methylcellulose (HPMC) and carboxymethyl cellulose (CMC). Evaluations included physical characterization, drug release studies, FTIR analysis, cytotoxicity assessments, and efficacy tests in vitro and in animal models. The patch displayed a smooth, translucent appearance, indicating good stability. Drug release exhibited an initial burst followed by sustained release over 8 hours due to hydrogen bonding between EGCG and the excipients. In chronic wound models, the patch achieved 67.46% wound contraction by day 14, significantly outperforming direct EGCG application (48.60%) and placebo (14.18%). Immunohistochemical analyses indicated reduced senescence markers and increased antioxidant activity. This sustained-release EGCG patch shows significant promise for therapeutic applications and warrants further research to optimize its design and assess long-term safety and efficacy in clinical settings.

*Keywords: wound healing, sustained-release transdermal patch, anti-senescence therapy*

## NATURAL PHENAZINE METABOLITE OF A MARINE MICROBE INHIBITS EGFR: MOLECULAR DYNAMICS-BASED STABILITY OF THE INDUCED-FIT MODEL FOR CANCER TREATMENT

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### Abstract

Elevated activity of epidermal growth factor receptors (EGFR) is linked to lung, breast, and colorectum cancers. Inhibiting EGFR can influence cellular growth, proliferation, and programmed cell death. We examined natural Streptophenazines (SPs) A-H, metabolites of the Streptomyces strain found in marine sponges, for their potential to inhibit EGFR. This investigation employed induced-fit docking and evaluated stability through molecular dynamics (MD) simulations. For induced-fit docking and MD, Schrodinger's Glide and Desmond software were used. SP structures acquired from PubChem were docked to the flexible binding site of EGFR. The low-energy EGFR-SP complex underwent 100ns MD analysis. The stability of the complex was evaluated using RMSD, RMSF, and the characteristics of EGFR-Streptophenazine interactions. The highest affinity for EGFR was observed with Streptophenazine-H. The complex of Streptophenazine-H and EGFR remained stable throughout the simulation period, with the ligand and protein RMSD stabilizing at 1.75Å after 80 ns. Analysis of the RMSF plot revealed that amino acids in positions 10 to 30 showed the greatest fluctuation, while the interacting residues Met98, Cys102, and Asp105 remained stable. The ester group of Streptophenazine-H formed a hydrogen bond with Met98, which persisted for 88% of the simulation duration, highlighting the importance of this moiety in binding. Water molecules facilitated hydrogen bonds by bridging the gaps between ligand and residue atoms. Thus, by binding to EGFR's cytoplasmic kinase domain and connecting with important C-terminal residues, Streptophenazine-H is expected to inhibit EGFR by preventing the transphosphorylation of tyrosine residues required for EGFR activation.

*Keywords: EGFR, Cancer, Docking, Marine microbial metabolite, Phenazine*

## RETROSPECTIVE ANALYSIS OF INR MANAGEMENT IN VALVE REPLACEMENT PATIENTS TO REDUCE THROMBOEMBOLIC AND BLEEDING COMPLICATIONS

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### Abstract

Effective management of the International Normalized Ratio (INR) is essential for patients undergoing valve replacement surgery to reduce the risk of thromboembolic and bleeding complications. This retrospective study investigates the effectiveness of INR monitoring protocols in patients with mechanical heart valve replacements, a group particularly vulnerable to thrombus formation and associated risks. The primary objectives include assessing the role of routine Prothrombin Time (PT) testing, optimizing anticoagulant dosage adjustments, and evaluating the impact of patient education on adherence to anticoagulation therapy. Using data from clinical records, the study systematically analyzes INR levels, their correlation with adverse events, and the outcomes of implementing consistent monitoring practices. Results highlight the significance of maintaining INR within optimal therapeutic thresholds, which significantly reduces the incidence of thromboembolic and hemorrhagic events. Additionally, advancements in anticoagulation therapies and emerging monitoring technologies are identified as key contributors to improved patient outcomes. The study concludes by emphasizing the necessity of standardized post-surgical INR management protocols to enhance safety and effectiveness in valve replacement patients. These findings provide valuable insights into sustainable healthcare practices by promoting evidence-based strategies for managing anticoagulation therapy, thus contributing to better clinical outcomes and patient well-being.

*Keywords: Prothrombin time, valve replacement, anticoagulation therapy, sustainable healthcare, thromboembolic events, hemorrhage*

HS0924

**COMPARITIVE STUDY ASSESSING THE IMPACT OF PRE- AND POST-WASH DENSITY GRADIENT CENTRIFUGATION METHOD ON PREGNANCY OUTCOMES IN ASSISTED REPRODUCTIVE TECHNIQUES**

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**Abstract**

Assisted reproductive techniques (ART) have revolutionized infertility management. Sperm preparation, including Density Gradient Centrifugation (DGC), plays a crucial role by isolating motile and morphologically normal spermatozoa. This study compares pregnancy outcomes of pre- and post-wash DGC in ART and evaluates clinical pregnancy rates to provide evidence-based guidance for ART protocols. This research was a prospective study which included 13 infertile males undergoing ART, including IVF and ICSI. Semen samples were collected through masturbation and prepared using standard DGC protocols. Data were analyzed with t-tests and logistic regression to adjust for confounders. The clinical pregnancy rate was significantly higher in the post-wash DGC group compared to the pre-wash DGC group ( $p < 0.05$ ). The sperm preparation using post-wash DGC may lead to higher clinical pregnancy and live birth rates compared to pre-wash Density Gradient Centrifugation and the superior outcomes associated may be attributed to its ability to select sperm with intact DNA, potentially reducing the risk of embryo implantation failure and miscarriage. The higher pregnancy outcomes and live birth rates observed in the post-wash group highlight its potential as an effective sperm selection method in ART protocols. These findings provide valuable insights for optimizing fertility treatment strategies and enhancing ART success rates.

*Keywords: Assisted reproductive techniques, density gradient centrifugation, sperm preparation, clinical pregnancy rates, in-vitro fertilization, post-wash*



## ARTIFICIAL INTELLIGENCE FOR PHYSIOTHERAPY IN DIABETIC NEUROPATHY: A SCOPING REVIEW

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### Abstract

Diabetic neuropathy, a common complication of diabetes, significantly affects sensory and motor functions, necessitating effective physiotherapy interventions to manage symptoms and improve quality of life. The integration of artificial intelligence (AI) in healthcare has revolutionized diagnostics, treatment planning, and rehabilitation. In physiotherapy, AI offers innovative approaches to enhance patient outcomes through personalized care, real-time feedback, and automated monitoring. This scoping review aims to explore the current landscape of AI applications in physiotherapy for diabetic neuropathy, identifying advancements, effectiveness, and research gaps to guide future developments in this interdisciplinary field. A systematic scoping review was conducted following the PRISMA-ScR guidelines. Peer-reviewed articles published between 2010 and 2023 were retrieved from databases including PubMed, Scopus, and IEEE Xplore. Inclusion criteria encompassed studies focusing on AI-based tools or methodologies applied in physiotherapy for diabetic neuropathy. Data were extracted and thematically analysed to synthesize key findings. The review identified 35 studies employing AI-driven solutions such as wearable sensors, machine learning algorithms, and robotic-assisted rehabilitation for diabetic neuropathy. These tools demonstrated potential in gait analysis, balance training, and predictive modelling for therapy customization. However, limitations included small sample sizes, a lack of longitudinal studies, and inconsistent reporting of clinical outcomes. AI holds significant promise in transforming physiotherapy for diabetic neuropathy by enabling precise, patient-centric care. Nonetheless, challenges such as data standardization, ethical considerations, and integration into clinical workflows need to be addressed. Future research should focus on validating AI technologies in diverse populations and developing scalable, cost-effective solutions to enhance accessibility and effectiveness in real-world settings.

*Keywords: AI, artificial intelligence, diabetic neuropathy, physiotherapy.*

## EMBEDDING CONCEPTS OF SUSTAINABLE DEVELOPMENT IN ENVIRONMENTAL EDUCATION

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### Abstract

Humans evolved in the realm of nature. During the course of evolution, anthropogenic activities led to an imbalance of natural ecosystems thereby causing environmental disasters. An increase in population, rapid industrialization, urban development, and changes in food consumption patterns are major drivers of environmental degradation. Though these are inevitable as a part of development, the nexus of environmental degradation and economic growth are directly linked with the conservation of various environmental compartments including soil, water, air, and biodiversity. Hence, sustainable development is considered the ultimate goal of the interrelationship of Man and the environment. In this context, environmental education is the need of the hour in educating society about the rational use of natural resources and the importance of Sustainable Development. In order to build a responsible society, the idea of including environmental education in the broader scope of education for development is imperative. Therefore, in order to assess the importance of environmental education for sustainable development, a perspective on Sustainable Development Goals (SDGs) from college students is attempted. The major objective of the paper was to assess the sensitization and dissemination of skills, attitudes, and behavior of the students with respect to Sustainable Development of Goals in Environmental Education. Methods of environmental education for sustainable development were imparted to the experimental and control group of students. Results indicated a significant difference between the groups in terms of environmental education, perception, and skills of the students from both groups. Further, students who imparted the knowledge on SDGs in Environmental Education showed more sensitization and perception with respect to SDGs, especially on water, biodiversity, climate change, poverty & hunger when compared to the students who were exposed to the conventional teaching methods of environmental education. Outcomes of the study contribute to the development of new methods of environmental education for sustainable development among college students.

**Keywords:** *Sustainable development; environmental education; sustainable development goals; teaching methods*

## PHOSPHORUS SOLUBILIZING FUNGAL ISOLATES FROM THE RHIZOSPHERIC SOIL OF BANANA PLANTS

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### Abstract

Phosphorus (P) is an essential macronutrient for plant growth, but much of it exists in insoluble forms, making it inaccessible to crops. Phosphorus-solubilizing fungi (PSF) provide a sustainable alternative by converting insoluble phosphorus into soluble forms through the secretion of organic acids, thereby enhancing plant uptake. In this study, three PSF were isolated from the rhizosphere soil of banana plants (*Musa paradisiaca* Linn.). The fungal isolates were screened through both qualitative (plate assay) and quantitative (broth assay) methods using Pikovskaya's medium with 0.5% Tri-calcium Phosphate (TCP). The plate assay identified the most efficient solubilizers based on halo zone formation, an indicator of phosphorus solubilization activity. Among the isolates, PSF-2 showed the highest Solubilization Efficiency (270%), followed by PSF-1 (230%) and PSF-3 (200%). In the broth assay, phosphorus solubilization was monitored on three consecutive days such as 5th, 7th, and 9th days of incubation. PSF-2 demonstrated the highest solubilization efficiency, with values increasing from 1.614 to 2.055 ppm. The effect of fungal isolates on the pH of the growth medium was also evaluated, as the production of organic acids by the isolates typically lowers the pH, enhancing phosphorus solubilization. PSF-2 showed the greatest reduction in pH, further highlighting its superior solubilization efficiency. The isolates were identified using 18S rRNA sequencing as *Aspergillus niger* (PSF-1), *Aspergillus fumigatus* (PSF-2), and *Aspergillus oryzae* (PSF-3). High-Performance Liquid Chromatography (HPLC) showed the presence of gluconic acid in all the cultural filtrates of fungal isolates, which is crucial for solubilization. Thus, results demonstrate that *Aspergillus fumigatus* (PSF-2) can be used as a bioinoculant, to improve phosphorus availability in soil, providing an eco-friendly solution for sustainable agriculture and reducing dependence on chemical fertilizers.

*Keywords:* Rhizosphere soil, PSF, plate assay, broth assay, pH, HPLC, biofertilizer

## EXPLORING SUSTAINABILITY IN PLANT TISSUE CULTURE: A COMPREHENSIVE REVIEW

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### Abstract

Plant tissue culture has become an essential tool for the propagation, genetic modification, and conservation of plant species. However, traditional methods often involve the use of synthetic chemicals and non-biodegradable materials, leading to significant environmental concerns. This review paper aims to explore sustainable practices in plant tissue culture, focusing on various eco-friendly methods and materials that mitigate environmental impact. Key areas of discussion include the use of biodegradable materials for culture vessels, which reduce plastic waste, and pollution and the adoption of natural growth regulators derived from plants, as opposed to synthetic chemicals. Additionally, water conservation techniques, such as closed-loop irrigation systems and efficient water usage, are highlighted for their role in minimizing resource depletion. The paper also delves into the development of recycling protocols for nutrient media, which can significantly reduce waste and the need for new resources. Furthermore, the integration of energy-efficient equipment and the combination of in situ conservation with tissue culture practices are discussed for their contributions to sustainability. By adopting these sustainable approaches, the plant tissue culture industry can significantly contribute to environmental preservation while maintaining high standards of research and production. This paper highlights the critical importance of sustainability in scientific research and encourages the widespread adoption of green practices in plant tissue culture methodologies.

*Keywords: sustainable practices, plant tissue culture, eco-friendly methods, biodegradable materials.*

## MULTIFACETED APPLICATION OF MICROALGAE AS BIOREMEDIATION AND BIOSTIMULANT

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### **Abstract**

The elevated level of pollutants in water highlights the urgency of effective wastewater treatment. This study addresses the potential of microalgae as an economically and environmentally sustainable solution for wastewater treatment. The current work aims to utilise sustainable sources to achieve multiple objectives, thereby contributing to the attainment of sustainable development goals (SDGs). Initially, the microalgae strain was inoculated and incubated in wastewater for the treatment process. The culture flasks containing wastewater were manually shaken twice a day. Following treatment, the resulting biomass was harvested and utilized for bio-stimulant preparation. Biostimulants were prepared using the acid hydrolysis extraction method and GC-MS and NMR analyses were conducted to estimate compounds in the biostimulant. Microalgae treatment significantly reduced micropollutant concentrations by 99% and 25 %, for Iron and calcium (Ca), and 82 %, and 99 %, for physiological parameters chemical oxygen demand (COD) and biological oxygen demand (BOD) respectively. Bio-stimulant treatment significantly enhanced seed germination and increased shoot and root lengths in maize (*Zea mays*) and beans (*Phaseolus vulgaris*) compared to the control. The GC-MS and NMR analysis study revealed the presence of key compounds in the microalgal extract that contribute substantially to plant growth. This study demonstrates the multifaceted and sustainable application of microalgae as a remediation tool and bio-stimulant, offering a promising approach to environmental sustainability and agricultural productivity.

*Keywords: Microalgae, biomass production, bioremediation, biostimulant*



LS0524

## CHARACTERIZATION AND APPLICATION OF BIOSURFACTANT-PRODUCING BACTERIA AND NANOPARTICLE SYNTHESIS FOR BIOREMEDIATION AND PLANT GROWTH PROMOTION

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### Abstract

Biosurfactants are surface-active biomolecules with significant applications in bioremediation, particularly for the breakdown of hydrocarbon pollutants. This study investigates the isolation and characterization of biosurfactant-producing bacterial strains from oil-contaminated soils in Chennai, India, with a focus on *Enterobacter cloacae*. Screening assays, including hemolysis, oil spreading, and emulsification, identified *Enterobacter cloacae* as the most potential agent. Optimal production conditions at 37°C, pH 7, glucose, and casein as carbon and nitrogen sources yielded a high-performance biosurfactant. This biosurfactant facilitated the synthesis of silver nanoparticles (AgNPs), confirmed by UV-visible, FTIR, SEM, and XRD analyses, demonstrating antimicrobial properties. Bioremediation potential was validated by applying the biosurfactant and its AgNP composite to oil-contaminated soils, showing significant hydrocarbon degradation. Additionally, *Enterobacter cloacae* exhibited plant growth-promoting traits, such as nitrogen fixation and indole acetic acid production. These findings suggest that biosurfactants and biosurfactant-AgNP composites are effective agents for environmental remediation and sustainable agriculture.

*Keywords: Biosurfactant, enterobacter cloacae, bioremediation, hydrocarbon degradation, nanoparticles, plant growth promotion*

**THE IMPACT OF BIOCHAR ADDITION ON PHYSICOCHEMICAL  
CHARACTERISTICS, EARTHWORM GROWTH, AND  
REPRODUCTIVE PERFORMANCE IN BAGASSE-BASED  
VERMICOMPOSTING**

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**Abstract**

Bagasse is the residual fibrous material generated after the extraction of juice from sugarcane in the sugar production process. This fibrous byproduct generally consists of 40 to 60% cellulose, 20 to 30% hemicellulose, and around 20% lignin. Vermicomposting is a basic biotechnological approach to composting that employs earthworms to transform organic waste into a sustainable end product. In this research, bagasse undergoes vermitransformation in amended with biochar. The biochar is incorporated at various concentrations (2, 4, and 6%) along with bagasse and cow dung in three distinct ratios (1:1, 2:1, and 3:1) utilizing *Eudrilus eugeniae* to generate a nutrient-rich vermicompost. The vermicompost were tested for pH, carbon/nitrogen (C: N) ratio, organic carbon, electrical conductivity (EC), as well as micro and macro nutrients. The physiochemical analysis revealed that the combinations supplemented with biochar yielded superior results compared to those without biochar. Notably, the combination C3(BG+CD (1:1) enhanced with 4% biochar exhibited the most favorable outcomes in the physiochemical assessment. Furthermore, the vermicompost mixtures enriched with biochar facilitated improved growth and biomass of earthworms, with the highest growth observed in C3 (BG+CD (1:1) with 4% biochar) and C4 (BG+CD (1:1) with 6% biochar). This study suggests that incorporating biochar at concentrations of 4% and 6% into bagasse as a substrate significantly enhances the growth and reproduction of earthworms.

*Keywords: Bagasse, vermicomposting, vermitransformation, biochar, earthworms*

## DEVELOPMENT AND TOXICOLOGICAL ANALYSIS OF METALLO-POLYESTER HYBRID NANOMATERIAL FOR POSSIBLE BIOMEDICAL USE

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### Abstract

Metallo-polymer nanocomposites are hybrid nanomaterials, i.e., made up of polymers and metal/metal oxides. These nanomaterials possess polymer (flexibility, processability, solubility, biodegradability, biocompatibility) and metal properties (thermostability, electrical, optical, and catalytic). Due to improved properties, metallo-polymer nanocomposites have been extensively used in drug delivery, tissue engineering, biosensing, bioelectronic, bioimaging, and portable bioelectronic applications. In the present study, we have developed a ZnFe<sub>2</sub>O<sub>4</sub>@poly(*t*BGE-*alt*-PA) composite by physical method. The obtained nanocomposite was characterized by different physicochemical techniques. FTIR confirmed nanocomposite formation by functional groups of both copolymer and zinc ferrite nanoparticles. XRD showed the crystalline nature of nanocomposite due to the presence of zinc ferrite. TGA displayed the thermostable nature of the composite, while DSC presented no evidence of chemical interactions between the zinc ferrite nanoparticles and the copolymer. Next, the nanocomposite was nontoxic to mouse fibroblast cells and showed no hemolysis at greater concentrations. Further, before their use in healthcare, the nanocomposite was tested for their behavioral, developmental, and morphological impacts on *Drosophila melanogaster*. The treatment of different doses of nanocomposite was given to both larvae and adult flies, who were permitted to go through their whole life cycle. The treated larvae showed no changes in crawling patterns, suggesting no neurotoxicity produced by the composite. Next, the lesser production of ROS was seen in the nanocomposite-treated larvae's gut during oxidative stress. The treated adult flies showed no changes in their climbing behaviour. Furthermore, no significant deformities were seen in the morphology of adult flies, suggesting the ZnFe<sub>2</sub>O<sub>4</sub>@poly(*t*BGE-*alt*-PA) nanocomposite is significantly less or non-toxic to fruit flies. Based on these results, the nanocomposite is currently being used to develop nanocarriers for targeted drug delivery to cancer cells.

*Keywords: Nanocomposite, Zinc Ferrite, Copolymer, Nanoparticles, Toxicity, Healthcare*

## CHARACTERIZATION OF FACIAL MASK PASTE MADE FROM BANANA PEELS

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### Abstract

Banana peels are a rich source of valuable phytochemicals with notable antimicrobial, anti-inflammatory, and antioxidant properties, yet they are often discarded as waste. The utilization of banana peels as a natural ingredient in cosmetics offered an eco-friendly alternative to synthetic chemicals, addressing the growing demand for sustainable skincare solutions. This study explored the potential of incorporating Berangan banana peel into facial mask formulations by determining the optimal ratio of banana peel to flour for the preparation of the mask paste, and evaluating the paste characteristics including stickiness, spreadability, smoothness, pH, and moisture content. Dried banana peels were blended into a paste using five different peel-to-flour ratios. The findings revealed that the banana peel paste exhibited a pH of 5.0, stickiness of 0.033g, smoothness rated at 4, spreadability of 1.63 cm, and moisture content of 1.31%. These results suggested that the banana peel paste demonstrated potential as an effective natural ingredient for skincare applications.

*Keywords: banana peel, facial mask, sustainable skincare, natural ingredients, texture characteristics*

## GREEN SYNTHESIS OF Cr<sub>2</sub>O<sub>3</sub> NANOPARTICLES: A SUSTAINABLE APPROACH TO DYE DEGRADATION

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### Abstract

The aim of this review is to provide insights into the green synthesis methods of chromium oxide nanoparticles (Cr<sub>2</sub>O<sub>3</sub> NPs) and their photocatalytic applications. While most nanomaterials are currently synthesized using chemical methods, these traditional approaches often pose health and environmental risks. Therefore, green synthesis is becoming increasingly important to mitigate the negative effects associated with conventional techniques. The objective of this review is to explore cost-effective and efficient methods for synthesizing Cr<sub>2</sub>O<sub>3</sub> NPs using plant extracts, which act as reducing agents. Plant extracts are ideal for green synthesis due to their phytochemical properties, including terpenoids, polyphenols, alkaloids, carotenoids, phytosterols, saponins, and fibers. Moreover, the use of plant extracts helps reduce food waste, making the process more sustainable. The review also addresses the growing concern of dye contamination in wastewater, which poses significant threats to both marine life and human health. Additionally, the stability and toxicity of the nanoparticles are summarized, along with the factors influencing their photocatalytic efficiency.

*Keywords: Green synthesis, nanoparticles, chromium oxide (Cr<sub>2</sub>O<sub>3</sub>), dye degradation, environmental remediation.*



**SYNTHESIS OF DIFFERENT METAL NANOPARTICLES: A  
SUSTAINABLE APPROACH FOR OBESITY TREATMENT  
THROUGH LIPASE INHIBITION**

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**Abstract**

Developing sustainable and efficient approaches for synthesizing metal nanoparticles has gained significant attention due to their unique properties and diverse applications. This study focuses on the synthesis of gold nanoparticles (AuNPs), silver nanoparticles (AgNPs), copper nanoparticles (CuNPs), magnetic nanoparticles (MNPs), and zinc oxide nanoparticles (ZnNPs), and their potential as lipase inhibitors. Both green synthesis methods using plant-derived reducing agents and conventional chemical synthesis approaches were employed to produce the nanoparticles, allowing for a comparative evaluation of their properties and environmental impact. Characterization of the nanoparticles confirmed their stability, morphology, and chemical composition. The synthesized nanoparticles exhibited potent lipase inhibitory activity, highlighting their promise for applications in metabolic disorder management and functional food development. Comparative analyses revealed that green-synthesized nanoparticles demonstrated superior biocompatibility and sustainability, while chemically synthesized nanoparticles offered consistent structural properties. This research underscores the potential of these metal nanoparticles as versatile agents for biochemical interventions, advancing nanotechnology for health and food sciences.

*Keywords: Green synthesis, chemical synthesis, nanoparticles, lipase inhibitory*

## DEVELOPMENT OF GARLIC EXTRACT COATED FUCOIDAN INCORPORATED QUERCETIN LOADED LIPID NANOPARTICLES (FGQLNP) FOR VISCERAL LEISHMANIASIS TREATMENT

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### Abstract

Leishmaniasis is a neglected tropical disease caused by a protozoan parasite called *Leishmania*. It continues to be a major health threat worldwide. Generally, chemotherapy is the primary treatment for leishmaniasis; however, it is costly, extremely toxic, and requires prolonged hospitalization, thus creating an extra burden on weak economies. Also, the leishmanial parasites became resistant to various chemo-drugs. Therefore, the new therapeutic regimes are required alone or in combination with the previous treatment options. In this study, we used the nanoprecipitation method to synthesize garlic extract and fucoidan-coated quercetin-loaded lipid hybrid nanoparticles (FGQLNP). The resulting nanoformulation was designed using a quality-based design approach. FTIR results showed the peaks of specific functional groups corresponding to the inclusion of quercetin, allicin, and fucoidan. The calculated hydrodynamic size and average zeta potential of FGQLNP were 296.2 d.nm and - 20.9 mV, respectively. The encapsulation efficiency and drug-loading capacity of quercetin in FGQLNP were 73.8 and 24.6 %, respectively. HRTEM showed the almost spherical shape of FGQLNP. The *in vitro* drug release behaviour for quercetin from FGQLNP at 0.1 N HCl and physiological conditions was slow and controlled. Further, no significant difference was seen for quercetin release from FGQLNP formulation at 0.1 N HCl and physiological conditions. This indicated that the nanoformulation was stable and did not show the initial burst release for the quercetin drug. Next, the drug release kinetics showed the super case II transport for quercetin release, indicating a more complex mechanism that possibly involved significant polymer relaxation or erosion. Moreover, the obtained FGQLNP formulation is currently tested for synergistic therapeutic activity in leishmania donovani-infected animal models.

*Keywords: Leishmaniasis, lipid nanoparticles, quercetin, fucoidan, allicin, anti-leishmanial*

LS1224

**DIVERSE GUT MICROFLORA AND ANTIBIOTIC RESISTANCE IN  
POULTRY: IMPLICATIONS FOR HEALTH AND  
FARMING PRACTICES**

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**Abstract**

This study investigates the gut microflora and antibiotic resistance profiles in broiler chickens, country breed chickens, and quails. Supplemented broiler diets exhibit increased gut microflora diversity, which, while potentially beneficial for host health, also raises concerns about pathogen transmission. Antibiotic susceptibility testing reveals varied resistance levels among the poultry species, with broiler chickens displaying higher resistance. The findings highlight the diet-induced shifts in microbial communities, emphasizing the symbiotic relationship between gut microorganisms and their hosts. This study underscores the necessity of prudent antibiotic management, tailored diets, and stringent hygiene practices in poultry farming. By contributing to the understanding of microbial dynamics, this research has significant implications for poultry welfare and public health.

*Keywords: Gut microflora, antibiotic resistance, pathogen transmission, antibiotic management*

## THEORETICAL RESEARCH ON MULTI-STAKEHOLDERS COLLABORATIVE MECHANISM OF GREEN BUILDING

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### Abstract

Climate change and the environmental problems it brings have become an important challenge facing the world in the 21st century. A large amount of carbon emissions will be generated during the construction and use of urban housing. Externalities and interest conflicts among relevant stakeholders are important issues that hinder the collaborative innovation of green buildings. This paper studies the interactive relationship, decision-making mechanism and evaluation mechanism of multi-agent collaborative innovation, and puts forward the strategy of promoting multi-agent collaborative innovation in green buildings. By following three parts 1. Put forward the evolution process of the innovative development of green buildings; 2. Determination of green building multi-stakeholders participation; 3. Model building and analysis among multi-stakeholders participation. use system modeling and simulation method conduct research. Based on the research on the interactive relationship, decision-making mechanism and evaluation mechanism of multi-stakeholders participation collaborative innovation in green buildings, the promotion strategy of multi-stakeholders participation collaborative innovation in green buildings is proposed, in order to provide decision support and useful reference for the managers of relevant national departments to formulate low-carbon innovation policies, and make contributions to further promoting the development of low-carbon economy. Expected outcomes as follows first, the evolution process of the innovative development of green buildings is proposed. Secondly, according to the policy characteristics of different stages, the optimal cooperative strategy of various entities in different development stages is explored from a static perspective, and a tripartite evolutionary strategic model is constructed by the government, construction enterprises and users. Thirdly, the optimal cooperative strategy of various entities in different development stages is explored from a dynamic perspective considering the continuity of time and the dynamic nature of decision-making. Establish a multi-subject collaborative innovation mechanism for green buildings, can clarify the responsibilities that each participation should bear in the innovation process, and strengthen the sustainable long-term development of low-carbon economy.

*Keywords: Sustainable cities and communities, green building, multi-stakeholders' collaboration, stakeholders, mechanism research*

# RESEARCH ON OPTIMIZING WIND TURBINE OPERATION CONTROL STRATEGY BY PREDICTING METEOROLOGICAL PARAMETERS USING PANGU METEOROLOGICAL MODEL

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## Abstract

This paper discusses how to use the meteorological parameters predicted by the Pangu meteorological model to optimize the control strategy of wind turbine operation. Since its development, the Pangu meteorological model has provided very critical meteorological information for wind power generation, such as wind speed and temperature, with its high accuracy and fast prediction capabilities, which is crucial for the operation control strategy of wind turbines. This paper first introduces the technical characteristics of the Pangu meteorological model and its application potential in the field of wind power generation. This paper analyzes in detail the impact of meteorological parameters on the operation of wind turbines and proposes a control optimization strategy based on these parameters. Through the real-time monitoring and prediction of meteorological parameters by the Pangu model, wind turbines can adjust their operating parameters in time to adapt to wind speed changes, optimize power generation efficiency, and reduce potential equipment damage risks. This paper also discusses how to implement intelligent adjustment schemes for wind turbines through remote control systems. Finally, this paper evaluates the Pangu meteorological model in improving the operating efficiency and reliability of wind turbines, explores the application potential of the Pangu model in the field of wind power generation, and emphasizes its importance in promoting the development of green energy. Through the research in this paper, it is hoped that some effective insights can be provided for the technological progress and sustainable development of the wind power industry.

*Keywords: Pangu meteorological model, wind turbine, product innovation*

**DATA MINING-BASED RESEARCH ON ARTISTIC CREATION AND  
COGNITIVE DEVELOPMENT OF CHILDREN WITH AUTISM:  
MULTIMODAL DATA ANALYSIS IN MEDICAL INTERVENTION**

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**Abstract**

This study aims to explore the cognitive and emotional changes in children with Autism Spectrum Disorder (ASD) during the process of artistic creation, using virtual reality technology and multimodal data analysis to provide personalized art intervention strategies. Through experimental design, 20-50 children with autism were recruited, with a control group of neurotypical children, to investigate the impact of different art styles, colors, geometric shapes, and background music on their brainwave activity, behavioral responses, and art creations. The study found that soft colors and simple geometric shapes promoted cognitive development and emotional expression in children with autism, while complex visual elements increased cognitive load. Through the immersive environment of virtual reality, this research reveals the positive impact of multisensory experiences on the emotions and cognition of children with autism, and proposes personalized intervention strategies based on data analysis. These findings provide scientific evidence and innovative directions for future art therapy for children with autism.

*Keywords: Autism spectrum disorder, artistic creation, multimodal data analysis, cognitive development*



## AIGC MULTIMODAL TOOLS IMPROVE THE EFFICIENCY OF SHORT VIDEO CREATION

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### Abstract

The rise of artificial intelligence generated content (AIGC) has revolutionized the creative industry, including the field of video production. Due to the fast-paced and high-output characteristics of short videos, more and more creators choose to use AI tools to assist in creation, but most of these tools are single-function tools, such as ChatGPT for text production and SUNO for music production. Multimodal AIGC tools integrate text, image, audio and video generation functions, and can improve the efficiency of short video content production by automating tasks such as script writing, visual design, background music production and video editing. This study uses the AIGC multimodal tool developed by the author to explore the effectiveness of multimodal AIGC tools on short video creation in an experimental form, and analyzes the possibilities of multimodal AIGC tools to simplify workflows, reduce production costs and expand creation. In addition, it also studies how these tools can help creators overcome traditional production limitations and promote innovation and diversity in content creation. The results highlight the transformative potential of AIGC in reshaping the short video ecosystem and enhancing the capabilities of digital media platforms.

*Keywords: AIGC, multimodal, short video, ChatGPT, process innovation*

## DIGITAL EMPOWERMENT ENHANCING VOCATIONAL EDUCATION- INDUSTRY COLLABORATION FOR SUSTAINABLE GROWTH

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### Abstract

With the rapid advancement of digital technologies, vocational education faces unprecedented opportunities and challenges, particularly in improving education quality, fostering industry-education integration, and promoting sustainable economic growth. This study proposes a Digital Platform and Industry Demand Matching Model, aimed at achieving precise alignment between educational content and industry needs through the digital empowerment of integrated vocational education and deep industry-education collaboration. The research first analyzes the bottlenecks in industry-education integration within the current vocational education system. A digital platform based on big data and artificial intelligence technologies is then developed, utilizing data analysis and machine learning algorithms to optimize the matching process between educational content and industry demands. Empirical data from multiple industries and regions were analyzed to validate the model's effectiveness in enhancing education quality, driving industrial innovation, and fostering sustainable regional economic growth. The results demonstrate that digital platforms can significantly improve the efficiency of industry-education integration by enabling educational institutions to adjust curricula in real time, ensuring that students acquire skills that align with market needs. This, in turn, substantially increases employment rates and provides talent support for sustainable economic growth. The innovation of this study lies in proposing a novel model for education-industry collaborative development through digital empowerment, offering theoretical foundations and practical guidance for future education reform and industrial upgrading.

*Keywords: Digital empowerment, industry-education integration, education-industry alignment, sustainable economic growth, digital platform*

## FREE PISTON LINEAR ENGINE GENERATOR DRIVEN BY SYNGAS: A REVIEW OF EFFICIENT FUEL OPPORTUNITIES

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### Abstract

The global demand for energy consumption is growing day by day. However, the number of conventional energy resources is depleting. On the other side, conventional engines (using conventional fuel) have higher friction loss and lower efficiency. Free piston linear engine generator is a recent technology that has less friction loss and higher efficiency than conventional engine technology. Therefore, introducing an environment-friendly and unconventional fuel that can be used for a free-piston linear engine generator is a great concern. Syngas is an unconventional fuel that can be a great alternative to conventional fuel. Syngas is produced by the gasification process of biomass, wastes, and coal in higher temperature conditions. Syngas has some charming characteristics such as wide flammability, lower emission, good laminar flame velocity, and sufficient hydrogen content ability which make it interesting for the present research. Using syngas as fuel in a free piston linear engine generator can play a more efficient and environment-friendly impact on vehicle technology. This paper shows the opportunity to use syngas in a free-piston linear engine generator.

*Keywords: Free piston linear engine generator, syngas, dual fueling, combustion, emission, performance.*

## DRIVING FACTORS AND MECHANISMS OF BIM TECHNOLOGY IN PROMOTING GREEN BUILDING DEVELOPMENT IN CHINA

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### Abstract

Green building is an important practice of China's sustainable development strategy; however, challenges such as information gaps and low collaboration remain during its implementation. BIM technology, with its features of visualization, information integration, and collaborative management, holds the potential to address these issues. However, current domestic and international research on "BIM and Green Building" is mostly limited to technological applications, with a lack of in-depth studies on the mechanisms through which BIM drives the development of green buildings. This study identifies several driving factors of BIM for green building through literature analysis and data mining. It then uses the Fuzzy ISM model to analyze the logical relationships between these factors, establishing a multi-level hierarchical structure model. Furthermore, the ANP (Analytic Network Process) method is employed to quantitatively evaluate the driving factors and identify key driving paths. Based on the research results, this paper proposes countermeasures to enhance the driving force of BIM for green buildings, aiming to promote the sustainable development of the construction industry and achieve the "dual carbon goals."

*Keywords: Green building, BIM, dual carbon, ANP*

## AI-DRIVEN AUTOMATION IN SOFTWARE TESTING: ENABLING SME ADOPTION

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### **Abstract**

As the software industry keeps evolving quickly, Artificial Intelligence (AI) in software testing has become a game-changer. It helps Quality Assurance (QA) teams deliver higher-quality software faster than before. This technology is revolutionizing software testing, with powerful capabilities in creating test cases and automation testing. However, many small and medium-sized enterprise (SMEs) hesitate to integrate AI into their software testing due to financial limitations, time constraints, and lack of technical skill resources. The objective of this study is to enable SMEs to implement AI-driven automation in their software testing, that will be aligned to their requirements. The methodology involves surveys and a literature review to assess automation tools used by organizations and their impact on product quality. Surveys will gather data from SMEs on their current software testing practices, challenges, and willingness to adopt AI. The analysis will focus on the SMEs using AI and examine success stories of those who have implemented AI in their software testing processes. Through the survey that would be conduct with SMEs in Malaysia, the best practices and suitable tools that can be used for the software testing will be identified. A process innovation framework will be developed to support SMEs in Malaysia in adopting AI for software testing. The proposed AI-based testing framework addresses key challenges in adopting automated tools by leveraging advanced AI capabilities to streamline the testing process, including test case generation, execution, bug detection, performance analysis, and reporting. This ensures accuracy, scalability, and alignment with software specifications while reducing manual effort and improving efficiency. Seamlessly integrating with Continuous Integration/Continuous Deployment pipelines, the framework supports rapid and reliable software delivery, aligning with modern development practices. It empowers SMEs to enhance software quality, reduce costs, and overcome barriers to automation adoption. The propose AI framework for software testing will significantly advance both academic research and industry practice for SMEs.

*Keywords: Artificial intelligence, quality assurance, small and medium-sized enterprise, software testing, process innovation, continuous integration/continuous deployment*

**THE IMPACT OF CHINA'S CARBON MARKET  
INTERNATIONALIZATION ON SOME COUNTRIES ALONG  
THE BELT AND ROAD INITIATIVE**

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**Abstract**

The Belt and Road Initiative is a transnational economic cooperation zone led by China. China has a strong influence in this region, which can also affect the construction of the international carbon trading market. Actively carrying out carbon trading cooperation with countries participating in the Belt and Road Initiative is of great significance to the realization of the joint construction of a global carbon trading market and the enhancement of the global influence of China's carbon trading market. This paper uses a basic regression model to analyze the impact of various conditions on China's construction of a carbon market with global influence. Due to the different degrees of carbon market development in various countries, in order to meet the needs, China needs to accelerate the international development of the carbon market and enhance the international influence of China's carbon market. Share the experience of China's carbon market development and construction, accelerate the construction of carbon markets in countries along the Belt and Road Initiative, help the low-carbon transformation of countries along the route, and promote the establishment of a global carbon trading market and a global climate governance system with broad participation, all efforts, pragmatism and effectiveness, and win-win cooperation.

*Keywords: Carbon trading, carbon market, carbon market globalization, the belt and road initiative, climate action*



# ADVANCEMENTS IN THE APPLICATION OF MACHINE LEARNING IN ENVIRONMENTAL MONITORING: NEW PATHWAYS TO PROMOTE SUSTAINABLE DEVELOPMENT

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## Abstract

With the rapid increase in environmental data, traditional monitoring methods struggle to meet the demands of sustainable development for environmental quality assessment. With its robust data processing and pattern recognition capabilities, machine learning is increasingly becoming a pivotal tool in environmental monitoring. This paper reviews the latest advancements in applying machine learning to environmental monitoring areas such as air quality, water quality, soil pollution, and biodiversity. It explores how machine learning enhances monitoring efficiency, optimizes resource management, and supports policy-making. Additionally, the paper analyzes current challenges, including data quality and model interpretability, and discusses future development directions. The findings indicate that integrating machine learning into environmental monitoring not only improves the accuracy and timeliness of data analysis but also provides strong support for achieving sustainable development goals.

*Keywords: Machine learning, environmental monitoring, sustainable development, data quality*

## DIGITAL INNOVATION EMPOWERING SUSTAINABLE DEVELOPMENT IN EDUCATION: EXPLORING PATHWAYS FROM THE PERSPECTIVE OF SDG 4

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### Abstract

This study aims to explore how digital innovation can contribute to achieving the United Nations Sustainable Development Goal 4 (SDG 4), which is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." This paper first clarifies the scope of digital innovation in the field of education, covering online learning platforms, mobile learning applications, virtual reality (VR), augmented reality (AR) technologies, and cutting-edge technologies such as artificial intelligence (AI). Through literature review and case analysis, this paper delves into the role of digital innovation in promoting educational accessibility, enhancing educational quality, and increasing educational inclusivity and adaptability, while also analysing its potential to facilitate lifelong learning. Furthermore, this paper examines the opportunities and challenges faced by digital innovation in the process of achieving the specific targets of SDG 4, particularly its role in promoting educational equity, gender equality, and providing high-quality education for diverse groups. The paper further elaborates on how digital innovation can help address educational inequality, such as by using technology to reduce the urban-rural education gap and enhance learning opportunities for students with special needs. Finally, this paper proposes a series of strategies and recommendations aimed at optimizing the application of digital innovation in education, including strengthening policy support, enhancing digital literacy, ensuring data privacy, and promoting public-private partnerships. These recommendations are intended to provide guidance for policymakers, educators, and technology developers to collaboratively advance sustainable development in education.

*Keywords: Digital innovation, sustainable development in education, SDG 4, education equity, educational technology*

## DESIGN AND FABRICATION OF HIGH GAIN DIELECTRIC RESONATOR ANTENNA USING BaTiO<sub>3</sub> and CaTiO<sub>3</sub> PEROVSKITES

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### Abstract

As modern communication devices continue to advance, there is an increasing demand for compact, high-gain antennas. Since the perovskite materials exhibit good dielectric properties, it is used as a resonator in dielectric resonator antennas (DRA). In the present work, BaTiO<sub>3</sub> and CaTiO<sub>3</sub> perovskite materials were synthesized by facile combustion route. The as-prepared samples are calcined at 900 °C for 2 hours. XRD result shows high intensity peaks, single phase and homogenous formation of cubic structured BaTiO<sub>3</sub> and Orthorhombic structured CaTiO<sub>3</sub> materials. The predominant stretching and bending vibrational modes of Ca-O, Bi-O and Ti-O functional groups were analyzed through FTIR analysis. FESEM images of BaTiO<sub>3</sub> and CaTiO<sub>3</sub> shows the spherical and agglomerated morphology of the compound. The synthesized BaTiO<sub>3</sub> and CaTiO<sub>3</sub> materials were pelletized and sintered at 1100 °C to examine the dielectric properties. The CST microwave studio software is used to design and simulate DRA. Simulations were performed to validate S<sub>11</sub> parameters for BaTiO<sub>3</sub> and CaTiO<sub>3</sub>. The high frequency measurements were done with Vector Network Analyzer (VNA) to obtain S<sub>11</sub> parameter. The resonant frequency of DRA was obtained at 4.22 GHz (-18db) and 6.9 GHz (-16.6dB) for BaTiO<sub>3</sub> and CaTiO<sub>3</sub> respectively.

*Keywords: Perovskites, dielectric resonator antenna, VNA, CST*

## ADVANCEMENTS IN ACROPHOBIA ASSESSMENT: A MULTIMODAL BIOSIGNAL ANALYSIS APPROACH

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### Abstract

Acrophobia, a common and debilitating phobia, is traditionally assessed using DSM-5 criteria, various scales, and physician observation. However, these methods are subjective and lack the precision needed to accurately measure the severity of acrophobia. Recent advancements in biosignal analysis technology have made it possible to obtain objective data from acrophobia patients through the monitoring of physiological signals such as heart rate, skin conductance (EDA), electroencephalogram (EEG), and electrocardiogram (ECG). Heart rate and ECG provide insights into cardiac responses to fear stimuli, while EDA reflects emotional arousal through changes in sweat gland activity. EEG captures brain activity in real time, with specific patterns, such as event-related potentials (ERP), linked to fear responses. This study systematically analyzes the experimental methods, physiological monitoring techniques, and results of multiple biosignal analysis studies on acrophobia. By identifying key biosignal indicators, this research aims to establish objective and reliable measures for assessing the severity of acrophobia. The findings provide valuable parameter references for multimodal assessment approaches, enabling more accurate diagnosis and personalized treatment strategies. Ultimately, this study seeks to improve clinical outcomes and enhance the quality of life for individuals suffering from acrophobia by integrating objective biosignal analysis into clinical practice.

*Keywords: Acrophobia, biosignal analysis, heart rate, skin conductance, electroencephalogram multimodal assessment*

## A STUDY ON THE CULTURAL CREATIVE BRAND DESIGN OF OIL-PAPER UMBRELLA TECHNIQUES AS INTANGIBLE CULTURAL HERITAGE THROUGH CULTURAL TRANSLATION

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### Abstract

This study, based on the theory of "cultural translation," explores the modernization design path of the oil-paper umbrella as an intangible cultural heritage (ICH) technique. The goal is to transform the cultural connotations of the traditional oil-paper umbrella into a cultural and creative brand that meets contemporary aesthetic and market demands through cultural translation. The study first analyzes the cultural attributes of the oil-paper umbrella, extracting its core cultural elements from three dimensions: material, behavior, and spirit. It then applies cultural translation theory to reconstruct these cultural symbols, imbuing them with modern design significance, ensuring cultural heritage is preserved while achieving innovation in the contemporary consumer market. This paper designs digital cultural and creative products centered around the oil-paper umbrella, promoting its dissemination and regeneration in the digital age. The research demonstrates that the oil-paper umbrella's cultural and creative brand design, based on cultural translation, not only effectively advances the modernization transformation of traditional techniques but also provides new practical paths for the branding and commercialization of intangible cultural heritage, facilitating the innovative inheritance and reinvention of culture.

*Keywords: Cultural translation, oil-paper umbrella, intangible cultural heritage technique, cultural and creative brand, digital transformation, cultural inheritance*

## IMPROVED KOLMOGOROV-ARNOLD TRANSFORMER FOR TFT-LCD ANOMALY DETECTION

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### Abstract

In the manufacture of Thin Film Transistor (TFT) arrays, defects can arise due to a multitude of factors, including environmental variations, material inconsistencies, and process imperfections. These defects, despite their minute size, can result in catastrophic consequences, often necessitating the disposal of entire LCD panels. This not only entails substantial financial losses but also disrupts production workflows, thereby affecting overall manufacturing efficiency. Traditional manual troubleshooting methods, which are time-consuming and labor-intensive, fall short due to their inherent subjectivity, leading to potential misjudgments and overlooked defects. These limitations severely hinder the production capacity and yield of panel manufacturers in an industry where precision and efficiency are of utmost importance. Consequently, the need for automated defect detection in the complex process of TFT-LCD manufacturing has become crucial. Automated systems offer the promise of overcoming the shortcomings of manual detection by providing consistent, objective, and rapid assessments. In this study, we innovatively apply the Kolmogorov-Arnold Transformer (KAT) to the field of defect anomaly detection in TFT-LCD for the first time. Through extensive testing and analysis, we validate the effectiveness of KAT in accurately identifying defects in TFT-LCD arrays. Additionally, we enhance the performance of KAT by improving its Rational Base Functions through the incorporation of Tanh base functions. This refinement results in a significant improvement in detection accuracy, with experimental results demonstrating a substantial 6% increase in accuracy, achieving an impressive accuracy rate of 80.8%. This groundbreaking achievement holds the potential to revolutionize the defect detection process in TFT-LCD manufacturing, ultimately enhancing production efficiency and yield.

*Keywords: Kolmogorov-arnold transformer, TFT-LCD, anomaly detection*



## ENHANCING STUDENT ENGAGEMENT THROUGH GAMIFICATION: A CASE STUDY OF REWARD SYSTEMS IN EXTRACURRICULAR ACTIVITIES AT UNIVERSITI GEOMATIKA MALAYSIA

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### Abstract

This study presents the "Gamified Extracurricular Activity Management System," a piece of software designed to address the drawback of poor student engagement and participation in extracurricular activities at the university level. The software was developed using HTML and CSS, BOOTSTRAP front-end, and PHP MySQL for back-end development. For holistic development, the University Geomatika Malaysia (UGM) was chosen as a case study. Gamified elements, such as points, leaderboards, badges, and rewards, were designed to create a competitive and interactive environment. Students earned points for participating in activities, which they could redeem for various rewards, fostering both extrinsic and intrinsic motivation. The software was tested using a mixed-methods approach, combining quantitative surveys of 20 students and qualitative interviews with staff and administrators. Findings revealed that gamification significantly increased students' engagement, with leaderboards fostering healthy competition and badges instilling a sense of achievement. The gamified system improved participation rates and elevated the visibility and value of student contributions. This study contributes to the field of educational technology by demonstrating how gamification can transform traditional reward systems into dynamic, student-centered frameworks. It offers practical insights for universities seeking to foster engagement, strengthen community bonds, and support students' personal and professional development through innovative extracurricular activity management.

*Keywords: Gamification, student engagement, extracurricular activities, rewards, leaderboards, badges*

## VIABILITY OF THE HYDROGEN ENERGY

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### Abstract

The potential of hydrogen as a crucial remedy to decarbonise energy systems and lower global greenhouse gas emissions is examined in this presentation study. Numerous manufacturing techniques have been examined in the study, with an emphasis on electrolysis driven by renewable energy sources and an assessment of the technical and environmental difficulties involved in scaling up the production of renewable hydrogen. The lecture assesses the sustainability and efficiency of existing hydrogen-related technology using a variety of studies. The study shows that although significant strides have been made in lowering prices and increasing electrolyser efficiency, obstacles still stand in the way of large-scale adoption because of infrastructure constraints and energy storage problems. According to the study's findings, green hydrogen has a great deal of potential to help with the global energy transition, but widespread adoption will necessitate ongoing funding for infrastructure development, policy support, and research. According to these findings, hydrogen may be essential to reaching net-zero emissions goals soon if it is used with current renewable energy sources.

*Keywords: green hydrogen; renewable energy; energy transition; decarbonization*

## SMART MARKET INSIGHT SYSTEM (SMIS) FOR SUSTAINABLE ECONOMIC EQUITY AND GOVERNANCE

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### Abstract

Stock markets are complex and volatile, requiring advanced solutions to uphold principles of transparency, equity, and sustainability. The integration of Artificial Intelligence, Machine Learning, and the Internet of Things gives transformative opportunities for creating fairer and more accessible financial systems. This research presents the Smart Market Insight System (SMIS), an advanced platform designed by integrating these technologies to foster sustainable financial governance and enhance economic equity in stock market operations. SMIS leverages IoT-powered stock market tickers to collect real-time data streams, which are analyzed using sophisticated ML algorithms for predictive modelling, anomaly detection, and actionable insights. These capabilities aim to empower diverse stakeholders, such as regulators, firms, and retail investors, by enhancing decision-making processes and fostering transparency. A pivotal innovation of SMIS is its incorporation of Natural Language Processing for conducting sentiment analysis of market behaviour, enabling proactive identification of potential fraud and early detection of market disruptions. IoT-based alert mechanisms provide instantaneous notifications for critical market events, ensuring rapid response capabilities. By democratizing access to actionable insights, SMIS bridges the gap between institutional and retail investors, addressing longstanding disparities in financial knowledge and resources. Explainable AI further strengthens transparency by offering insights that are comprehensible to all users. The system integrates cutting-edge tools, including IoT sensors like ESP32 modules, ML techniques such as Random Forest for predictive analytics and Long Short-Term Memory for time-series forecasting, and AI frameworks like TensorFlow for model training and deployment. In alignment with the United Nations Sustainable Development Goals, SMIS advocates responsible economic practices and equitable access to financial resources. This innovative initiative highlights the transformative role of AI, ML, and IoT in building resilient, inclusive, and sustainable financial ecosystems.

*Keywords: Smart market insight system, random forest, ESP 32 module, economic equity, time series forecasting*

## A STUDY ON BLOCK CHAIN AND DECENTRALIZED AI SYSTEMS TOWARDS ACHIEVING SUSTAINABLE DEVELOPMENT GOALS

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### Abstract

In recent years, technological advancements in block chain and artificial intelligence (AI) have been prominent drivers of innovation, facilitating new pathways for sustainable development. This paper explores the intersection of block chain technology and decentralized AI systems, shedding light on their potential roles in achieving the United Nations Sustainable Development Goals (SDGs). By examining the principles of decentralization, transparency, and immutability in block chain, alongside the innovative nature of AI solutions, we discuss how these technologies can collectively address global challenges, ranging from poverty alleviation to climate change. The increasing demand for secure and sustainable systems in various domains such as finance, supply chain management, and healthcare has brought block chain technology to the forefront. However, the selection of an appropriate block chain platform is critical to ensuring the successful implementation of these systems. This paper proposes a decentralized AI-based multi-criteria decision-making (MCDM) method for block chain platform selection. By integrating expert knowledge, stakeholder preferences, and sustainability factors, the proposed approach aims to identify the most suitable block chain platform. The methodology combines qualitative and quantitative data and utilizes machine learning algorithms to enhance decision accuracy. Through case studies and examples, we illustrate the pragmatic applications of these technologies, identify potential barriers, and present challenges for effective integration.

*Keywords: Block chain, MCDM, decentralized AI*

**FACTORS SUPPORTING THE SUCCESS OF THE DEVELOPMENT OF  
A COMPREHENSIVE COMMUNITY LEARNING CENTER  
CASE STUDY: BAN LUEK COMMUNITY, PHOTHARAM DISTRICT,  
RATCHABURI PROVINCE**

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**Abstract**

This research was initiated from the impression of the way of life and culture of the Lao Wiang people in the local area of Ratchaburi Province. They studied and saw the beauty, wisdom and management methods from nature, which are stories that have existed together and have a long history. Therefore, they wanted to create a design work in collaboration with community development work, creating a form and value through the management of wisdom called "Learning Center" by promoting and developing it to lead to more diverse uses. The objective was to study the various supporting factors that lead to the sustainable development of the learning center in Loei Province using the learning center management technique from local cultural data of Ratchaburi Province to create good cultural management that builds on various things from the original community of Ban Luek Community and to be a model for those who are interested in following the guidelines. It was found that in the study of the supporting factors and the success of the development of the integrated community learning center, Ban Luek Community, Photharam District, Ratchaburi Province, the researcher went to the community at Ban Luek Community, Photharam District, Ratchaburi Province in the role of a member of the community by using in-depth interviews. The main tool used is an in-depth interview. The study presents the results of the study by classifying the factors affecting the success of the community learning center into 2 aspects: internal community factors. Internal community factors consist of 6 sub-factors: structural and administrative factors, community leader factors, personnel factors, budget factors, people (members) in the community, and factors of the building and activity locations of the integrated community learning center, Ban Luek Community, Photharam District, Ratchaburi Province. The results of the study found that internal community factors affecting the success of the learning center are at a high level in every factor, except for the budget factor. External community factors consist of 2 sub-factors: educational institution factors and cultural expert factors. The results of the study found that external factors are considered opportunities that are beneficial to the community because the external environment of the community has provided benefits or promoted the learning center's operations. However, a good learning center service committee must always seek opportunities from external factors by analyzing the external environment that is constantly changing, such as the economy, society, politics, technology, and market competition, and taking advantage of those opportunities. This work achieves its objectives and concepts. I can create works that reflect the image of Ratchaburi Province and serve as a guideline for those who are interested to continue their work.

*Keywords: Factors supporting, comprehensive community and learning center*

**RESEARCH ON THE SUSTAINABLE MANAGEMENT OF BLENDED  
LEARNING FOR ALL: ISSUES AND CHALLENGES WITH CASE  
EXEMPLARS**

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**Abstract**

This study explore sustainable management of blended learning (BL) platform(s) as part of Sustainable Development education with evaluation on the use of learning management system (such as Canvas) in undergraduate education. Discussions are made on the effectiveness of BL platforms in improving educational quality and equity in reaching out to all including the marginalized group. Although the selected Canvas e-platform is widely adopted, its specific impact on equity among students from different backgrounds requires thorough investigation. This study aims to assess Canvas's effect on learning outcomes and educational equity through qualitative research methods with 'Cross-Case Analysis' (CCA) and 'Exemplary-Case Analysis' (ECA) reported. Objectives include understanding Canvas usage among Malaysian undergraduates, evaluating its impact on learning outcomes and engagement, identifying challenges, as well as exploring its role in achieving educational equity. The analysis of findings provided insights into students' experiences and feedback to optimize educational technology. Semi-structured face-to-face interviews were conducted with 15 undergraduate students from diverse professional backgrounds at INTI International University Malaysia. Further analysis revealed that 90% of students reported improved academic performance and course participation efficiency through Canvas, despite challenges related to technical stability, network connectivity, and self-discipline. Fairness in Canvas use largely depends on economic conditions and network environment, highlighting the need to address these external factors. This qualitative study offers a comprehensive evaluation of Canvas usage at INTI International University, providing valuable insights for other educational platforms and institutions with suggestions for future studies.

*Keywords: Sustainable development education, blended learning, learning management system, canvas platform, educational equity*



**RESEARCH ON THE CURRENT SITUATION WITH  
COUNTERMEASURES OF THE COOPERATION BETWEEN RURAL  
FAMILIES AND PRIMARY SCHOOLS: CASE EXEMPLAR  
IN INNER MONGOLIA**

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**Abstract**

The cooperation between families and schools is one of the hot issues in the current education sector. Many countries have paid attention to the research and practice of this work. To a certain extent, school education and family education are closely related, and the prerequisite for schools to guide family education in a good direction is the organic integration of the two. Nowadays, rural parents pay much more attention to their children's development than before. However, there are still some problems in rural elementary schools in terms of home-school cooperation. It is important to look into this problem and explore the best strategies of home-school cooperation in rural elementary school in order to promote the healthy development of rural elementary school students and improve the quality of education in rural elementary school. This research investigates the challenges and strategies associated with family-school cooperation in a rural primary school in Inner Mongolia, with a focus on integrating family and school educational efforts to promote child development. Though both home and school education is acknowledged theoretically and practically as interdependent, differences in involvement and communication still exist driven by socioeconomic circumstances and conventional ideas on education responsibilities. The study employs a mixed-method approach using questionnaires and case study to get comprehensive insights from parents, teachers, and school administrators. The quantitative findings reveal that all parental factors significantly and positively influence the effectiveness of home-school cooperation, with communication frequency and quality emerging as the most influential predictor. The qualitative insights highlight challenges such as differences in educational concepts, limited parental involvement due to socioeconomic constraints, teachers' workload pressures, and communication barriers. This research aims to identify robust strategies to enhance parental engagement and optimize educational outcomes in rural settings.

*Keywords: Family-school cooperation, rural education, parental involvement, educational disparities*

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## A STUDY ON ENHANCING DIGITAL LITERACY AND INNOVATIVE ABILITIES OF CHINESE LANGUAGE TEACHERS IN THE CONTEXT OF EDUCATIONAL DIGITALIZATION

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### Abstract

The digital transformation of vocational education is a core element in enhancing teachers' digital literacy and cultivating digital talent, ultimately providing students with high-quality and more convenient educational services. In the context of digital technologies such as artificial intelligence, big data, cloud computing, the Internet of Things (IoT), and 5G, it is essential to promote the digitalization of the "learning-teaching-management-assessment" application scenarios. Teachers need to deeply integrate digital technologies into all aspects and processes of education. Compared to the traditional era, the roles and competencies of teachers are endowed with new connotations. The traditional model of teacher education needs to undergo an innovative upgrade from "using intelligent technologies as carriers" to "intelligent technologies as the mode of existence" in the age of intelligence. This study based on surveys and interviews with high school Chinese language teachers at Zhejiang Mechanical and Electrical Technician College, reveals issues such as a lack of high-quality professional development opportunities, constraints due to time and space, and low willingness for personal transformation in teachers' digital literacy. Therefore, teachers need to improve their literacy in four dimensions: information awareness, computational thinking, digital learning and innovation, and social responsibility in the information age. This holds significant strategic importance for enhancing teachers' digital literacy, fostering their innovative capabilities, and achieving high-quality educational development in the new era.

*Keywords: Vocational education, digital transformation, teacher digital literacy, educational innovation*

## EDUCATIONAL TECHNOLOGY FOR INCLUSIVE EDUCATION: A STUDY OF LEARNING EXPRESS AND STUDENT MOTIVATION

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### Abstract

This study explores how educational technology promotes inclusive education, with a particular focus on analyzing the impact of the Learning Express platform on students' learning motivation. In light of the uneven distribution of educational resources and educational equity issues, the study aims to reveal the effectiveness of Learning Express in enhancing students' learning interest and participation through empirical investigation. Additionally, it emphasizes the importance of integrating sustainable development education into such platforms to foster students' awareness and responsibility towards environmental and social sustainability. The innovation lies in the comprehensive application of qualitative research methods, including in-depth interviews with 15 university teachers from diverse majors and regions, to explore the specific mechanisms of the platform. The results indicate that Learning Express significantly boosts learning motivation for most students, although its effectiveness is influenced by teacher guidance and individual student differences. By incorporating sustainable development education, this study not only provides an empirical basis and theoretical support for optimizing the application of educational technology but also contributes to promoting educational equity and cultivating globally responsible citizens.

*Keywords: Sustainable development education, educational technology, education equity, learning express, student motivation*

## DESIGN AND DEVELOPMENT RESEARCH ON ESD REFORM FOR HIGHER EDUCATION INSTITUTIONS (HEIS) WITH CASE EXEMPLARS

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### Abstract

This article reports part of a bigger scale study to promote educational quality through Sustainable Development Education in Higher Education Institutions (HEIs) with monitoring and evaluation of learning outcomes integrating technology-enhanced transdisciplinary education supported by digital tools. Review of literature includes aspects such as ESD reforms in Science/Social Science studies towards achieving Sustainable Development Goals (SDGs) as aspired by United Nation among collaborative researchers in Malaysia and Thailand. Design and Development Research (DDR) is the research design implemented integrating mixed-method approaches to examine 'Education for Sustainable Development' (ESD) reform for Higher Education Institutions (HEIs) as a vehicle for the nation as suggested in 12th Malaysian Plan to implement SDGs by 2050 to prepare future-ready for Industrial Revolution (IR). This paper only elaborates Stage 1 (Needs analysis through Literature research) and part of Stage 2 of DDR with illustration on design/development of conceptual framework. Highlights are made on the framework with elaboration on the needs to cultivate transdisciplinary practices that reflect SDGs in all disciplines including educational management among HEIs through global digitalization. It is expected that the development of this framework should be able to serve as guide for the proponent to collaborate with co-researchers from diverse backgrounds who are sustainability practitioners. Some collaborators are also administrators who are expected to examine relevant ways to integrate sustainability into institutional curriculum development anchored on their missions/visions through strategic management.

*Keywords: Educational quality, sustainable development education, transdisciplinary practices, framework development, communication technologies, higher education institutions, exemplary-case analysis*

## AUTISM IOT-ENABLED INTERVENTION FOR BEHAVIORAL CHALLENGES IN LEARNING ENVIRONMENT

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### **Abstract**

Autism Spectrum Disorder (ASD) has been a subject of growing understanding for the past 80 years. The increasing prevalence of children diagnosed with ASD aligns with the continuous growth in research to discover adequate knowledge, approaches, and support systems to aid individuals throughout their lives. This study aims to synthesize the literature on the lifelong journey of individuals with ASD, focusing on their significant challenges and the need for robust technological solutions. Specifically, the research investigates how interconnected IoT and wireless technologies can enhance communication, monitoring, and adaptive learning systems to meet the individual needs of children with ASD. A systematic search was focused on the current theory applied to ASD behaviours, screening, assessment, and the understanding of characteristics that interfere with learning and classroom environments, focusing on how technological interventions can enhance these factors. Results: The review explores case studies, theories, and assessment articles that highlight the transformative potential of Assistive Technology (AT) and the Internet of Things (IoT) in addressing behavioral challenges in learning environments for individuals with ASD. Research measuring behavioral functioning, resulting in the productivity of ASD individuals, has been explored less. Creative research and innovation are needed to support policymakers and educators in ensuring inclusive and equitable education. This study contributes to a sustainable, inclusive educational framework, bridging detection and screening gaps and developing tailored support systems.

*Keywords: Autism spectrum disorder, assistive technology and the internet of things*

## SUSTAINABLE FINANCING IN INDONESIAN FINANCING INSTITUTIONS: WHAT DOES THE CURRENT TREND LOOK LIKE?

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### Abstract

The global shift towards sustainability is influencing Indonesian financial institutions to adopt sustainable finance. The Indonesian Financial Services Authority (OJK) supports this transition with POJK 51/2017, which provides a regulatory framework for sustainable finance practices, including encouraging the integration of ESG factors into strategies and financing portfolios. The study explores the development of sustainable portfolios by Indonesian financing institutions since 2019 and their strategic approaches. This study employs both qualitative and quantitative analysis of secondary data from the sustainability reports of 146 companies, selected from an initial population of 217, covering 2019 to 2023. The sample includes multifinance, infrastructure financing (IF), and venture capital (VC) companies, chosen through purposive sampling. Content analysis was applied to assess the composition of sustainable financing portfolios and examine strategic planning. Additionally, in-depth interviews with industry associations enriched the analysis. From 2019 to 2023, sustainable financing portfolios grew, with multifinance companies leading at 153.7%, followed by IF and VC. However, Multifinance only made up 12.4% of total financing, while VC and IF made up 81.41% and 28.37%, respectively. Multifinance and VC focused on SMEs and eco-friendly transportation, while IF focused on renewable energy and energy efficiency. Moving forward, these institutions will maintain their focus on these sectors, but multifinance companies will require full support from OJK to strengthen their capacity, particularly in terms of standardizing portfolios, providing technical assistance, and offering incentives. As OJK encourages more involvement from financing institutions, the recommendations in this research are important for advancing sustainable finance in Indonesia.

*Keywords: Sustainable finance, sustainable financing portfolio, Indonesian financing institutions, sustainability report, small medium enterprises, eco-friendly transportation*

## BUILDING EQUITABLE LEARNING ENVIRONMENTS: THE USE AND CHALLENGES OF INNOVATIVE TECHNOLOGIES IN ENHANCING STUDENT ENGAGEMENT

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### Abstract

This paper provides an in-depth analysis of the application of innovative technologies in the field of education, especially in enhancing student classroom engagement and promoting educational equity, while closely integrating the concept of sustainable development. Through literature review, online interviews and case studies, the study finds that innovative technologies such as artificial intelligence and big data analysis significantly improve teaching efficiency and students' interest in learning, and provide technical support for the realization of educational equity. However, the process of technology application also faces challenges such as network instability and uneven resource distribution, which may affect the balanced access to educational resources and thus constrain the sustainable development of the education sector. In response to these challenges, this paper proposes strategies such as strengthening network infrastructure, optimizing technology resource allocation, and providing technology training for teachers, with the aim of ensuring that every student has equal access to high-quality educational resources and narrowing the education gap. The innovation of this paper is that it closely links the application of innovative technologies with educational equity and sustainable development, and proposes solutions with practical significance, which are of great significance in promoting comprehensive, coordinated and sustainable development in the field of education.

*Keywords: innovative technologies, educational equity, sustainable development*



## THE IMPACT OF LIVE STREAMING SHOPPING WAY ON CONSUMER PURCHASE INTENTION IN TIKTOK PLATFORM

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### **Abstract**

The global rise of live-stream shopping has transformed consumer behavior, with platforms like TikTok playing a crucial role in integrating short video content with e-commerce. This study investigates the impact of key variables—consumer trust, interactivity, and product reviews on consumer purchase intention within the context of live streaming shopping which involves unique mediating factors, such as platform features (algorithms and user interface design) and live streaming content (product demonstrations and streamer communication styles). The research applies a quantitative approach, using structural equation modeling (SEM) and to explore the interplay of these variables. Data were collected from around 400 TikTok users across diverse occupational background, providing insights in highly mature live streaming markets in China. The findings reveal that TikTok's algorithmic recommendations and interactive user interfaces significantly mediate the relationship between consumer trust and purchase intentions. Similarly, the quality of live streaming content and the live host's communication style enhance product reviews' impact on consumer behavior. These mechanisms align with the platform's unique short video and live streaming environment. This study contributes to the growing literature on live streaming shopping and offering strategic insights for businesses to optimize their approach in both mature and emerging markets.

*Keywords: Live streaming shopping, purchase intention, consumer trust, e-commerce*

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