

VOL. 001

IRCYS 2023



ABSTRACT COLLECTIVE *of* IRCYS

United in Ideas, Diverse in Perspectives

Organized by:



OCTOBER 19th - 20th, 2023

BALI, INDONESIA

Welcome Message

Dear Participants,

On behalf of the Bandung Creative Society, it is my great pleasure to welcome you to the *Abstract Collective of IRCYS 2023*. This gathering represents not only the creativity and dedication of young researchers, but also the spirit of collaboration and innovation that drives the future of science and knowledge-sharing.

Through your abstracts, ideas, and perspectives, we celebrate diversity in thought, discipline, and culture. We believe this collection will inspire meaningful dialogue, foster cross-border connections, and spark fresh opportunities for discovery.

Thank you for contributing your work to IRCYS 2023. May this collective be a source of learning, pride, and inspiration for us all.

Warm regards,

Rahadian Sri Pamungkas

Project Manager of IRCYS 2023

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About IRCYS 2023

The International Research Competition for Young Scientists (IRCYS) 2023 is a global platform dedicated to showcasing the creativity, innovation, and research excellence of young minds from around the world. Organized by Bandung Creative Society, the competition brings together students and early-career researchers between the ages of 10 and 24, providing a stage for presenting scientific ideas, prototypes, and solutions that address real-world challenges.

Held in Bali, Indonesia, IRCYS 2023 gathered participants across disciplines such as science, technology, engineering, and social innovation. The event encouraged participants not only to compete, but also to learn from one another, exchange perspectives, and experience the richness of cross-cultural collaboration. Through exhibitions, presentations, and dialogues, young scientists had the opportunity to sharpen their communication skills, expand their networks, and gain international recognition.

At its core, IRCYS 2023 reflects a commitment to nurturing future leaders in research and innovation. By celebrating diversity of thought and fostering a spirit of inquiry, the competition empowers youth to become problem-solvers and change-makers in their communities. The achievements of this year's participants serve as a powerful reminder that with curiosity, collaboration, and perseverance, young researchers can drive meaningful progress for a better world.

People of Excellence

Steering Committee

Prof. Goib Wiranto., B.S El.Eng.	:	Badan Riset dan Inovasi Nasional
Prof. Dr. Lilik Hasanah, S.Si, M Si.	:	Universitas Pendidikan Indonesia
Dr. Indrawati	:	SEAMEO QITEP in Science

Organizing Committee

Rahadian Sri Pamungkas, S.Si.	:	Project Manager
Nafira Mapparaja Radi Pakki, S.Si.	:	Secretary
Alvien Zein Shandy, S.Pd.	:	Event
M. Dena Nugraha, S.Si.	:	Volunteer Coordinator
M. Ismi Raskanda, S.Pd.	:	Vendor
Fitri Kafiyani, S.Pd.	:	Public Relations
Bayu Widhiansyah, S.Pd.	:	Design
Galih Dwi Putra, S.Pd.	:	IT
Regiana Dewi, S.Pd.	:	Documentation

Judges

Prof. Goib Wiranto., B.S El.Eng.	:	Badan Riset dan Inovasi Nasional
Prof. Dr. Lilik Hasanah, S.Si, M Si.	:	Universitas Pendidikan Indonesia
Prof. Dr. Chaerul Rochman, M.Pd.	:	UIN Sunan Gunung Djati Indonesia
Tn. Razmi bin Abdul Razak	:	MYSO
Dr. Indrawati	:	SEAMEO QITEP in Science
Nguyen Thi Hau	:	Science Vietnam

Editor

Ahmad Yusuf S.Si., M.T.
Rofiq Fadillah Awal S.Si.

Conference Schedule

Parallel session Room 1

Time	Title	Participants Code	Author
10.00 – 10.15	Analyzing the Concentration of Fecal Bacteria Along Waller Creek	SH-I23-19	Cayden Liu Ayu Winati
10.15 – 10.30	Assessing The Impact of Climate Change on Horticultural Crop Production in Enrekang District, South Sulawesi	SH-I23-22	Aisyah Nafhah Ariqoh Kahar Bakti Ehmita Analisa Muhtar Nayyara Zahra Wirantri Drs. Dedi Rimantho, M.Si.
10.30 - 10.45	Surabaya Water Legacy: Investigating The Water Quality by Differentiating the Economic Regions	SH-I23-46	Regina Stella Djohari Samuel Julius Tansil Christophorus Aditia Tresno Jason Richard Chang Ang Christopher Owen Juwati Ureyang
10.45 – 11.00	The Effects of Social Proof towards Canisius College Jakarta's 12th Graders Opinion about Gamelan's Melodic Resonance	SH-I23-51	Phillip Maxwell Kenneth Emanuel Nursalim Kandida Prajnaparamita
11.00 – 11.15	The Impact of Sleep Deprivation on Attention Span of SMA Cita Hati Students	SH-I23-53	Putri Isabella Jusuf Michelle Tang Rachel Imogene Kamadjaja Hoo Kimiko Felice Humardani Pristi Andika
11.15 – 11.30	BYE TB!: A Prototype Website as a Potential Elimination Tuberculosis Accelerator in Manado, Indonesia	CA-I23-25	Novri Lorens Nontah Gezzy Injilia Makal Adelia Elisabeth Pinontoan Sabrina Prisscilya Magdalena Pinontoan
11.30 – 11.45	Electrocoagulation Automation System	CA-I23-31	Hadian Gian Prayoga Farhan Abdurrahmat Muhammad Aditya Nugraha Vega Fauzy Kamal Al Islami
11.45 – 12.00	Utilization of Wood Waste as Building Insulation Material for Energy Conservation and Carbon Dioxide Gas Emission Reduction	CA-I23-72	Randy Mediawan Mayello Muhammad Fadhil Firdaus Nur Mauludan Naufal Alden Alfayed Naufal Zain Permana Zaidan Akmal Rabbani Gita Novian Hermana
Break			
13.30 – 13.45	Exploration of Natural Anticancer Compounds from <i>Opuntia cochenillifera</i> in Inhibiting Cell Proliferation Breast Cancer MDA-MB-231 Targeted Metastatic Pathway Apoptotic and Cell Cycle Arrest to Support National Drug Independence	CA-I23-92	Hasan Shodiq Alaydrus Muhammad Rafael Rizqimahindra Retno Asti Werdhani

13.45 – 14.00	Biomass Waste-Derived Hard Carbon for Energy Storage Materials Application to Protect Against Energy Crises and Global Warming	CT-I23-77	Sulaeman Hidayat Sulthan Hanif Pahlavi Nirmala Cahya Kusuma Ken Ken Kusumah Ramadhan Dewi Idamayanti
14.00 – 14.15	The Pomegranate (Punica granatum) Peel Waste to Worth: Producing Skin Lotion for UV Radiation Shielding	SA-I23-49	Karen Castalia The Christabella Gunawan Michelle Audrey Moeljadi Carmen Louise Samantha Kuntara Freya Abigail Chen Juwati Ureyang
14.15 – 14.30	Natural Preservatives from Eco-enzymes and Their Effects on Foodstuffs	SA-I23-67	Maheswara Bimasena Tedja Davis Leon Palsha Sitorus Muhammad Rangga Cindraputra Samuel Christoper Nathan Marvello Amandry Kandida Prajnaparamita
14.30 – 15.00	Effectiveness of Sunflower Seed Oil as the Basic Ingredient of Sustainable Vehicle Fuel	SA-I23-74	Javier Nicholas Vito Uisan Wilbert Lee Wilson Thamadeus Tjahjadi Laszlo Uria Mh William Sasuga Dickension Kandida Prajnaparamita
15.15 – 15.30	Hydromotech- an IoT-Based Automated Monitoring System for Water Pollution, Acidity, and Temperature	SA-I23-42	Sophia Sandrin Mendoza Remodo Francia Ginalyn Pardiñas Santiago Barbie Joy Barquilla Tristan James Rodriguez Marco Generoso Gonzaga Conmigo
Break			
16.00 – 16.15	FSDS: a Community-Based Flood Severity Detector System through Ultrasonic Sensor and SMS Alert	SA-I23-44	Triccia Angela Duran Diaz Juan Lorenzo Froyalde Jonah Ruby Precilla Pan Trisha Mae Colis Solano Engr. Famela Bisera Tibayan
16.15 – 16.30	Microbit Irrigation Solar System	EA-I23-2	Saufee Qaliff Bin Zebree Adib Ziqri Bin Nurul Amri Ahmad Ziqri Bin Aidil Azwan Razeen Bin Adam Rafik Thiagarajah Muhammad Ikhwan Shamir Bin Ahmad Fauzi Aishah Binti Shamsul Bahri

Parallel Session Room 2

Time	Title	Participants Code	Author
10.00 – 10.15	Global Warming	JH-I23-37	Nguyễn Phương Nghi Nguyễn Trần Khôi Nguyên Trần Nguyễn An Bình Nguyễn Hằng Thy
10.15 – 10.30	Preventing Financial Disaster: Building Financial Literacy among Students through Improving Financial Understanding of Teachers and Educators	JH-I23-56	Dietrich Mahendraly Ms. Kenyo Endah Prawesti, S.E., M.M.
10.30 - 10.45	Social Acceptability, Economic Importance and Environment Advantage of the Solar-Powered Deep Well in Goa, Camarines Sur, Philippines	JH-I23-59	Sophia Marie Luzada Prado Hannah Nicole Palaypayon Arriola Niel Karlos Nicholas Perit Vargas Ketchie Gonzales Magonles
10.45 – 11.00	Future Education: The Impact of ChatGPT Integration on Scholar Comprehension	JH-I23-71	Stephanie Thalia Go Patrice Emmanuel Hendra Karila Wisudayanti
11.00 – 11.15	The Importance of T.U.C.A.D (Trekking Ailments and Difficulties) Program: A Case Study Review	JH-I23-81	Cassandra Cherina Barroga Chavez Viccel Robbie Precilla Pan Michelle Ann Torio Botial
11.15 – 11.30	Two-Level Filtration System from Natural Absorbents and Periphyton with Corrugated Plastic System	ST-I23-105	Nguyễn Cát Phương Trần Lê Anh Thư Lê Ngọc Minh Tâm Nguyễn Ngọc Phương Uyên Trương Bảo Ngọc
11.30 – 11.45	PAINDESITE: TiO ₂ /Andesite Based Paint as a Pollutant Degradation Media	ST-I23-117	Raden Raditya Daniswara Raihani Sofia Karla Ameera Raswanda Amirul Fauzan Adzima Naurisa Hapsari Athazhar Rakhman Jani Permana
11.45 – 12.00	Rauwolfia Serpentina (Serpentina) and Peperomia Pellucida (Pansit-Pansitan) as an Antiparasitic Spray Against Rhipicephalus Sanguineus Latreille (Common Ticks)	ST-I23-7	Mahmooda Aziza Marites Hugo
Break			
13.30 – 13.45	Exposing Visual Impairment: Harnessing AI-Powered Online Games for Early Myopia Detection in School-Age Children	ST-I23-76	Keichia Marvelle Bani Billy Adinata Hermawan Dunstan Godwin Susanto Holly Natasha Sutantio Jeremiah Jason Chen Dian Yenita Pranotodiharjo
13.45 – 14.00	Isolation and Identification of Sulphur Dye Degrading and Odor-Restricting Bacteria	ST-I23-82	Duong Gia Han Nguyen Thuy Bao Vy Tran My Khanh Phan Le My Ngoc Dinh Quang Hieu
14.00 – 14.15	Controlling Methane Gas in Reducing Global Warming with the Bacteria <i>Methylothermobacterium buryatense</i> 5GB1C	ST-I23-84	Daniel Christian Partangiang Siahaan Sri Berthalina dr, SpTHT - BKL

14.15 – 14.30	Research on Manufacturing Fruit Preservative from Pectin Extracted from Dragon Fruit's Peel	SA-I23-34	Tran Khue Anh Nguyen Le Dong Nghi Le Thanh Vinh
14.30 – 15.00	Investigating the Antioxidant and Antibacterial Properties of the Leaf extract from the Chameleon plant (<i>Houttuynia cordata</i>)	SA-I23-38	Khoi Phan Minh Trang Dao Phuong Phuong Phi Hoang Mai Thu Phung Duy Anh Anh Truong Ngoc LÄnh
15.15 – 15.30	Antimicrobial Activity of Microwave Assisted Extraction of Perepat (<i>Sonneratia Alba Sm.</i>) Toward Injury Causing Bacteria	SA-I23-41	Hugo Ernesto Hamdri I Made Darren Marlon Gunawan Ade Kuswara, S.Pd., Gr
Break			
16.00 – 16.15	Beepernia Bio Seed Paper Made from Water Hyacinth (<i>Eichhornia Crassipes</i>) As A Material for Making Eco-Friendly Paper	SA-I23-75	Naura Rahmanisa Maulidya Zabeltha Najla Sukayat Kiki Taurista, S.Si., M.Pd.
16.15 – 16.30	Utilizing Indonesia's Abundant Pleurotus Mushroom Resources to Fulfil the Average Human Nutritional Intake in The Form of Plant-Based Meat	SA-I23-79	Rania Kamala Azzahra Keviano Azzami Tsaqif Fitri Rizqy Hilda Sari Deasy Purnama Sari

Parallel Session Room 3

Time	Title	Participants Code	Author
10.00 – 10.15	Solutions to Deforestation in Vietnam	JT-I23-33	Phung Doan Quy Lam Ly Hai Long Nguyễn Thái Cẩm Nhung
10.15 – 10.30	Arduino-Based Air Pollution Monitoring Application: A Theoretical Study	JT-I23-43	Lee Asher Laguerta Abastillas Jaymark Laynesa Reyes Ma. Ferly Aguilar Periera
10.30 - 10.45	Internet of Things (IoT): A Theoretical Study on Water Monitoring System	JT-I23-47	Chloe Franchesca Mutya Raguero Ave Regina Oferio Oquialda Ma. Ferly Aguilar Periera
10.45 – 11.00	Bioethanol Made of Fruits as A Solution for Fossil Fuel Crisis	JT-I23-65	Nizar Arfa Izdihar Muhammad Razin Hanif Muhammad Ghani Iلمي Rizky Fahrian Albar, S.Pd.
11.00 – 11.15	Seed Sowing Robot Based on ROV (Remotely Operated Vehicle) to Increase Reforestation Rates Following Forest Fires	JA-I23-108	Ivana Adelia Tsany Hasya Amira Anshori Vivin Retno Guntari, S.Pd
11.15 – 11.30	Protein Decomposition in School Cafeteria Waste by Enzyme Protease Used for Application in Agriculture	JA-I23-32	Chau Hong Thien An Han Tran Gia BÀI Thái Lan Anh
11.30 – 11.45	Vendo Waste: Goa Science High School Arduino-Based Waste Segregation Vending Machine	JA-I23-45	Franshane Mikee Tubao Obado Ashley Jane Rivero Atole Kirsten Chloe Rivero De Hitta James Benedict Mira Rivero Jennifer Poche Siarot
11.45 – 12.00	Comparison of Physical Quality Tests of Body Scrub Bar from Red Dragon Fruit (<i>Hylocereus polyrhizus</i>) Peel and Orange Fruit (<i>Citrus sinensis</i>) Peel Extracts	JA-I23-6	Yasmine Bitu Roshanfekrana Kalindra Syaza Khairunissa Hilya Aulia, S.Si
Break			
13.30 – 13.45	Styrofoam Biodegradation by Superworm (<i>Zophobas</i> sp.) with a Diet of Cabbage (<i>Brassica oleracea</i> var. <i>capitata</i> L.) and Pok Choi (<i>Brassica rapa</i> L. Ssp. <i>chinensis</i> (L.))	JA-I23-64	Teresa Azarel Gayatri Lamiang Clara Dhisa Sumunaring Ratna, S.Si
13.45 – 14.00	Micro Hydro Power Plant Related to Global Warming	JA-I23-73	Andra Bakti Angjaya Putu Aditya Kusuma Wibawa Komang Widhi Prajanantha Agatha Emmanuella Santoso Gede Eka Juni Purwasila
14.00 – 14.15	Seashell-Derived Filters for Sustainable Air Purification: Efficacy of Seashell Filters and Solar Panel Technology in Removing Airborne Pollutants	JA-I23-94	Bintang Noor Rochim Lusanno Azkaputra Purwito Danendrabhamakerti May Puspitasari
14.15 – 14.30	Analyse The Correlation the Use of AI to The Teacher Productivity	JA-I23-99	Aldrich Bryan Calvin Lee Emily Sidharta Jeff Axellino Jennifer Keisha Halim Nathanael Surijan Vince Ernawati Missa

14.30 – 15.00	PH Reducer Product of Detergent Waste with Eggshell Activated Carbon as Utilization of Food Waste	SA-I23-102	Jhordy Putra Pratama Ferdyanur Yuthi Azka Rusyda Shabrina Ruhyatul Fauziyah S.Pd
15.15 – 15.30	Integrating Thermoelectric Generator from High and Low Temperatures on a Thermos	SA-I23-121	Jonnevan Chandra Jonathan Chandra Russell Darren Wilaysono
			Claus Abednego Tesiman Bernardinus Fernando Lili Agus Jarwanto
Break			
16.00 – 16.15	Synthesis of TiO ₂ Nanoparticles for Wastewater Treatment in Van Phuc Silk Village	SA-I23-203	Le Tran Phuong Uyen Mai Xuan Khoi Nguyen Huu An Nguyen Giang Vinh Loc Dam Duc Huy Nguyen Cao Khang
16.15 – 16.30	Characterization and Evaluation of Cobalt Ferrite Nanoparticles Synthesized for Drug Delivery Applications	SA-I23-204	Nguyen Hiep Khoi Nguyen Huu Dinh Son Nguyen Bao Linh Nguyen Thu Giang Nguyen Anh Thu Nguyen Cao Khang
16.30 – 16.45	SAGANA: Sustainable Agricultural Gadget for Achieving Natural pest control and Abundant Harvest	SA-I23-27	Edan Viel C. Aguada Joel C. Magday, Jr.

Abstract per Categories

Theoretical Studies

School	Title	Participants Code	Author
Lawrence S.Ting School	Solutions to Deforestation in Vietnam	JT-I23-33	Phung Doan Quy Lam Ly Hai Long Nguyễn Thái Cẩm Nhung
Goa Science High School	Arduino-Based Air Pollution Monitoring Application: A Theoretical Study	JT-I23-43	Lee Asher Laguerta Abastillas Jaymark Laynesa Reyes Ma. Ferly Aguilar Periera
Goa Science High School	Internet of Things (IoT): A Theoretical Study on Water Monitoring System	JT-I23-47	Chloe Franchesca Mutya Raguero Ave Regina Oferio Oquialda Ma. Ferly Aguilar Periera
SMPN 34 Bandung SMP Islam Cendekia Muda SMPN 2 Bandung	Bioethanol Made of Fruits as A Solution for Fossil Fuel Crisis	JT-I23-65	Nizar Arfa Izdihar Muhammad Razin Hanif Muhammad Ghani Ilmi Rizky Fahrrian Albar, S.Pd.
SMA Cita Hati Christian School, Surabaya	Exposing Visual Impairment: Harnessing AI-Powered Online Games for Early Myopia Detection in School-Age Children	ST-I23-76	Keichia Marvelle Bani Billy Adinata Hermawan Dunstan Godwin Susanto Holly Natasha Sutantio Jeremiah Jason Chen Dian Yenita Pranotodiharjo
Lawrence S.Ting School	Isolation and Identification of Sulphur Dye Degrading and Odor-Restricting Bacteria	ST-I23-82	Duong Gia Han Nguyen Thuy Bao Vy Tran My Khanh Phan Le My Ngoc Dinh Quang Hieu
SMAK St. Louis 1	Controlling Methane Gas in Reducing Global Warming with the Bacteria <i>Methylovumicrobium buryatense5GB1C</i>	ST-I23-84	Daniel Christian Partangiang Siahaan Sri Berthalina dr, SpTHT - BKL
Lawrence S.Ting School	Two-Level Filtration System from Natural Absorbents and Periphyton with Corrugated Plastic System	ST-I23-105	Nguyễn Cát Phương Trần Lê Anh Thư Lê Ngọc Minh Tâm Nguyễn Ngọc Phương Uyên Trương Bảo Ngọc
SMAN 68 Jakarta	PAINDESITE: TiO ₂ /Andesite Based Paint as a Pollutant Degradation Media	ST-I23-117	Raden Raditya Daniswara Raihani Sofia Karla Ameera Raswanda Amirul Fauzan Adzima Naurisa Hapsari Athazhar Rakhman Jani Permana
City of San Jose del Monte National Science High School	<i>Rauvolfia Serpentina</i> (Serpentina) and <i>Peperomia Pellucida</i> (Pansit-Pansitan) as an Antiparasitic Spray Against <i>Rhipicephalus Sanguineus</i> Latreille (Common Ticks)	CT-I23-7	Mahmooda Aziza Marites Hugo
Bandung Polytechnic for Manufacturing	Biomass Waste-Derived Hard Carbon for Energy Storage Materials Application to Protect Against Energy Crises and Global Warming	CT-I23-77	Sulaeman Hidayat Sulthan Hanif Pahlavi Nirmala Cahya Kusuma Ken Ken Kusumah Ramadhan Dewi Idamayanti

Applied Studies

School	Title	Participants Code	Author
Sekolah Kebangsaan Telok Ramunia	Microbit Irrigation Solar System	EA-I23-2	Saufee Qaliff Bin Zebree Adib Ziqri Bin Nurul Amri Ahmad Ziqri Bin Aidil Azwan Razeen Bin Adam Rafik Thiagarajah Muhammad Ikhwan Shamir Bin Ahmad Fauzi Aishah Binti Shamsul Bahri
SMP Pribadi Bandung	Comparison of Physical Quality Tests of Body Scrub Bar from Red Dragon Fruit (<i>Hylocereus polyrhizus</i>) Peel and Orange Fruit (<i>Citrus sinensis</i>) Peel Extracts	JA-I23-6	Yasmine Bitu Roshanfekrana Kalindra Syaza Khairunissa Hilya Aulia, S.Si
Lawrence S.Ting School	Protein Decomposition in School Cafeteria Waste by Enzyme Protease Used for Application in Agriculture	JA-I23-32	Chau Hong Thien An Han Tran Gia BÃi Thá Lan Anh
Goa Science High School	Vendo Waste: Goa Science High School Arduino-Based Waste Segregation Vending Machine	JA-I23-45	Franshane Mikee Tubao Obado Ashley Jane Rivero Atole Kirsten Chloe Rivero De Hitta James Benedict Mira Rivero Jennifer Poche Siarot
SMP Montessori Yogyakarta	Styrofoam Biodegradation by Superworm (<i>Zophobas</i> sp.) with a Diet of Cabbage (<i>Brassica oleracea</i> var. <i>capitata</i> L.) and Pok Choi (<i>Brassica rapa</i> L. Ssp. <i>chinensis</i> (L.))	JA-I23-64	Teresa Azarel Gayatri Lamiang Clara Dhisa Sumunaring Ratna, S.Si
SMP Kristen 1 Harapan	Micro Hydro Power Plant Related to Global Warming	JA-I23-73	Andra Bakti Angjaya Putu Aditya Kusuma Wibawa Komang Widhi Prajanantha Agatha Emmanuella Santoso Gede Eka Juni Purwasila
SMPN 3 Surabaya SMP Muhammadiyah 5 Surabaya SMPI Al Azhar Kelapa Gading Surabaya	Seashell-Derived Filters for Sustainable Air Purification: Efficacy of Seashell Filters and Solar Panel Technology in Removing Airborne Pollutants	JA-I23-94	Bintang Noor Rochim Lusanno Azkaputra Purwito Danendrabhamakerti May Puspitasari
SMP Xin Zhong Surabaya	Analyse The Correlation the Use of AI to The Teacher Productivity	JA-I23-99	Aldrich Bryan Calvin Lee Emily Sidharta Jeff Axellino Jennifer Keisha Halim Nathanael Surijan Vince Ernawati Missa
SMP Muhammadiyah 7 Surakarta	Seed Sowing Robot Based on ROV (Remotely Operated Vehicle) to Increase Reforestation Rates Following Forest Fires	JA-I23-108	Ivana Adelia Tsany Hasya Amira Anshori Vivin Retno Guntari, S.Pd
Philippine Science High School - Cagayan Valley Campus	SAGANA: Sustainable Agricultural Gadget for Achieving Natural pest control and Abundant Harvest	SA-I23-27	Edan Viel C. Aguada Joel C. Magday, Jr.
Lawrence S.Ting School	Research on Manufacturing Fruit Preservative from Pectin	SA-I23-34	Tran Khue Anh Nguyen Le Dong Nghi

	Extracted from Dragon Fruit's Peel		Le Thanh Vinh
Lawrence S.Ting School	Investigating the Antioxidant and Antibacterial Properties of the Leaf extract from the Chameleon plant (<i>Houttuynia cordata</i>)	SA-I23-38	Khoi Phan Minh Trang Dao Phuong Phuong Phi Hoang Mai Thu Phung Duy Anh Anh Truong Ngoc L'Anh
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Politeknik Kesehatan Kementerian Kesehatan Manado	BYE TB!: A Prototype Website as a Potential Elimination Tuberculosis Accelerator in Manado, Indonesia	CA-I23-25	Novri Lorens Nontah Gezzy Injilia Makal Adelia Elisabeth Pinontoan Sabrina Prisscilya Magdalena Pinontoan
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THEORETICAL STUDIES

ABSTRACT COLLECTIVE of IRCYS

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BANDUNG CREATIVE SOCIETY

Solutions to Deforestation in Vietnam

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This theoretical research investigates what has driven deforestation in Vietnam since the 2000s and its consequences. Accordingly, it suggests solutions to deforestation in Vietnam. This study uses the data from the UN Food and Agriculture Organization's Forest Resources Assessment (UN FAO) and the Global Forest Watch (GFW). Population growth and agricultural expansion are two main reasons for deforestation. People must clear hectares of trees to build factories, businesses, or homes. People need a place and food to survive, so forests are cleared for farmland. Besides, forests are burned by wildfires. This research finds that forest loss leads to global climate change and worsens natural disaster risks. Forest degradation and deforestation contribute significantly to the ongoing loss of biodiversity. Therefore, our study suggests solutions to deforestation in Vietnam, which requires impactful actions from individuals, communities, and the government. First, people must be aware of the severe consequences of deforestation. Besides, people should recycle and buy recycled products to support the recycling economy. Furthermore, the Vietnamese government must have policies to support ethnic people living in highlands near forests. The government also requires severe punishment for illegal forest exploitation and strict handling of the levelling of hills to divide and sell plots.

Keywords: deforestation, forest loss, forest degradation, climate change, natural disaster

Arduino-Based Air Pollution Monitoring Application: A Theoretical Study

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Air pollution is a major threat to the environment and its people. Air pollution causes heart disease, lung cancer and respiratory disease such as emphysema. And air pollution might also cause lasting nerve damage to people, such as brains, kidneys, liver, and elsewhere in the body. This study introduces Arduino-Based Air Pollution Monitoring Device, an air pollution warning application that indicates whether there are harmful contaminants in the area that it is monitoring. The Arduino-Based Air Pollution Monitoring App aims to deliver fast and precise information to the area and its citizens. The Air pollution monitoring device will first focus on Goa, Camarines Sur, Philippines and will continuously be introduced around the world. An IoT based air pollution monitoring system was developed by Aquib, M. (2016). It tracks air quality via an internet-connected web server and sounds an alarm when it falls below a certain threshold, which happens when dangerous pollutants like CO₂, smoking, alcohol, benzene, and NH₃ are present in sufficient amounts. Anabi H.K (2022) conducted a related project, which uses a low-cost Internet of Things (IoT) air quality monitoring technology to track air pollution. It uses carbon monoxide and air quality sensors to monitor gaseous contaminants. Poonam, P. (2017), and Abdullah, M. (2018), both did additional studies and projects on the air-quality monitoring system. S. Kainoven (2020), and S. Vishwas (2021). As a result, this paper comes to the conclusion that a system or application for monitoring air pollution is necessary to control and lower exposure. In light of this, the Arduino-based Air Pollution Monitoring Application is a perfect project for utilizing a variety of atmospheric parameters, such as methane, temperature, humidity, and carbon monoxide, which will all be detected using appropriate sensors in an air quality monitoring system based on an Arduino microcontroller.

Keywords: air pollution, disease, Arduino, air quality, monitoring application

Internet of Things (IoT): A Theoretical Study on Water Monitoring System

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Water contamination is bad for the ecosystem, wildlife, and people. Diseases including poliomyelitis, typhoid, dysentery, and diarrhea are brought on by it. Furthermore, water pollution is produced when pollutants contaminate the water like chemicals, garbage, bacteria, and parasites. IoT: Monitoring of Water Pollutants, a machine that detects harmful impurities in the water, such as rubbish and harmful chemicals that might harm aquatic life, is introduced by the researchers as a solution to this problem. Additionally, the device alerts the user if there are potentially harmful substances in the water in real time. Jayti B. et al. (2016) proposed real-time monitoring of water quality based on IoT to ensure a safe supply of drinking water. The system comprises a few sensors that monitor water quality indicators. Malche T. et al. (2021) also proposed an IoT-based portable water pollution monitoring device that can monitor water pollution and report it in real time. If the pollution level is critical, the alarm is set off. Another study made by Sannayila A. et al. (2023) a system which is an efficient and inexpensive IoT solution for real-time water quality monitoring, consists of microcontroller unit with a sensor network that takes samples every 10 seconds from the water sample Hyderabad Metropolitan City supply water and ground water. Other studies on monitoring water pollutants were also conducted by Senhaji S. et al. (2021), Rangaraj S. et.al (2023), Mishra N. (2022), et.al. This study concluded that, especially in countries with poor water quality, a monitoring system for water pollution ensures both safe drinking water and environmental management. The public can be immediately informed when the pollution level reaches critical levels by the authorities using water monitoring systems to monitor the pollution levels in water bodies.

Keywords: water, contamination, water pollution, monitoring water

Bioethanol Made of Fruits as A Solution for Fossil Fuel Crisis

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Recently, the availability of fossil fuel has been run out everywhere around the world. Therefore, it is believed that bioethanol can be a promising alternative solution in the future. Indonesia as one of countries with a lot of fructose contained plants, of course, has great potential since the basic material of bioethanol is these plants. For now, bioethanol is produced by using the waste of fruits. These fruits waste are including the rinds of Kepok banana, orange, strawberry, and pineapple, because these parts of fruits are not consumable. In general, the making process of bioethanol is through some ways: hydrolysis, fermentation, catalysis, and distillation. Bioethanol is such an interesting invention to develop further since the need for fuel is more increasing. Furthermore, bioethanol is considered as eco-friendly fuel. Based on research result, the waste of banana rind resulted in 40% level of bioethanol, strawberry rind resulted in 2.8%, orange rind resulted in 12.5%, and pineapple rind resulted in 31.9%. As a conclusion, the most suitable waste of fruits for basic material of bioethanol is the rinds of banana and pineapple.

Keywords: fossil fuel, bioethanol, waste of fruits, eco-friendly fuel

Exposing Visual Impairment: Harnessing AI-Powered Online Games for Early Myopia Detection in School-Age Children

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Myopia occurs when the eye's axial length becomes too long, causing light to focus in front of the retina instead of directly on it, resulting in distant objects appearing blurry. Numerous genetic studies have identified specific genes associated with myopia susceptibility, suggesting a hereditary component (Tedja et al., 2018). Myopia prevalence is predicted to increase rapidly, the WHO predicted that by 2050 half of the world's population will have myopia. School-age children (9-11 years old) are most vulnerable to myopia with a prevalence of 60% due to the elongation of axial length which affects their eye's refractive status. This ushers in the importance of early myopia detection before irreversible visual impairment occurs. However, myopia detection can be challenging for school-age children, particularly those distant from detection facilities or reluctant to share their visual impairment. A trending topic lately, Artificial Intelligence (AI) is defined as the ability of a computer to carry out functions normally done by intelligent beings. AI has the potential to play a part in the early detection of myopia and has the capability to do so in a fun way and widely. The flowchart above is the concept of detecting myopia using AI that's promoted in this research. By using Deep Learning (DL) and Machine Learning (ML) mechanics, the results will generate a representation of the retinal refractive status and axial length needed for the calculation. These mechanics will be inserted into a game software which is free to download. In the distant future, game software will be validated using real human myopia cases, and over time, it's expected to expand its capabilities to detect other eye conditions such as hyperopia and glaucoma. Nonetheless, AI's cognitive and visual processing theories hold promise for early myopia detection.

Keywords: school-age children, myopia detection, AI, retinal refractive status, optical coherence tomography, fundus photography, game software, Deep Learning, Machine Learning.

Isolation and Identification of Sulfur Dye Degrading and Odor-restricting Bacteria.

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Fashion has always been an important part of our lives over time. While in the past, fashion represented the position of its owner in society, in today's world, it also represents our characteristics and style or even our mindset in life. The fashion industry is praised for its production and the satisfaction it gives but also has been criticized for its negative impact of being one of the biggest contributors to the world's crucial problem - water pollution. According to the Organization for Economic Cooperation and Development (OECD), the fashion industry consumes approximately 93 billion cubic meters of water per year, which in comparison, is 37% of the amount of freshwater around the globe. The article "Environmental Sustainability in the Fashion Industry " on Geneva Environment Network also stated: "Fashion production makes up 10% of humanity's carbon emissions, dries up water sources, and pollutes rivers and streams". As a consequence of creating eye-catching fabrics, the fashion industry releases tons of chemical waste into the environment, harming human and animal health. One of the most used dyes for clothes, or fabric in general, is Sulfur dye. Besides its excellent ability of wash-fastness and ease of application, the production of Sulfur dye involves large amounts of water and energy, and the dyeing process using this type of dye can release hazardous waste products into the environment. It also releases H₂S - a chemical compound with a bad rotten egg odor while decomposing. Reading about the negative impact of Sulfur dyes, a thought crossed our mind. With our experiences and knowledge in researching and studying bacteria at school, we came up with the idea of isolating and identifying a species of bacteria that can degrade the Sulfur dye. The project includes isolating the potential species from the water sample near the textile factory and later identifying the most effective species based on the efficiency of degrading the substance without releasing the odor. As a result, we can use the species to create a bioproduct that can be used in the nearby areas of the textile factories to avoid the harm of this dye on the habitat.

Keywords: fashion, industry, water, chemical waste, sulfur

Controlling Methane Gas in Reducing Global Warming with The Bacteria *Methylovimicrobium Buryatense* 5gb1c

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Global warming has become a major problem recently. The earth is getting hotter and this has a bad effect on humans. Humans have done various ways to reduce global warming. Methane is the gas that causes global warming, second only to carbon dioxide. Each unit of methane gas has the potential to heat the earth 21 times more than carbon dioxide. Methanotrophic bacteria were discovered as bacteria that feed on methane as the only source of energy for these bacteria. But methanotrophic bacteria only live in places where methane gas is high, namely 5000 - 10000 ppm. Until finally the bacterium *Methylovimicrobium buryatense* 5GB1C was discovered which could live at methane gas concentrations as low as 500 ppm. These bacteria can feed on methane at lower concentrations. This research examines the bacteria *Methylovimicrobium buryatense* 5GB1C by means of a literature review by analyzing the latest journals obtained using Google Scholar in the last five years. It was found that *Methylovimicrobium buryatense* 5GB1C can live at a concentration of 200 ppm. Even though the actual concentration of methane in our air is around 1.9 ppm. *Methylovimicrobium buryatense* 5GB1C is one of the answers to reducing global warming.

Keywords: global warming, carbon dioxide, bacteria, *Methylovimicrobium buryatense* 5GB1C

Two-Level Filtration System from Natural Absorbents and Periphyton with Corrugated Plastic System

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Vietnam is facing a serious problem with polluted water creating an unsafe and concerning living environment, especially in big cities like Ho Chi Minh or Ha Noi. According to UNICEF, Vietnam is in the top five countries with the most contaminated water. In Ha Noi, there is around 1.000m³ of garbage being thrown out daily, yet only 10% of it is being recycled while the rest is left in lakes and rivers. This results in serious water contamination in 6 districts- Ba Dinh, Hoan Kiem, Dong Da, Hai Ba Trung, Cau Giay, Tay Ho. Water pollution continuously leads to a variety of consequences related to human health and the development of plants and animals. In addition, it also has a fundamental impact on the economies of numerous different countries. Hence, in order to create a better living environment in Vietnam and the world, we aim to establish a sustainable and long-term method to reduce pollution in water. Three authoritative research papers about treating water contaminated by garbage will be summarized and analysed. This study aims to assess the system's performance in terms of removing BOD₅ and TSS from wastewater. The results show both materials achieved high removal efficiencies. This environmentally friendly approach highlights the potential for effective and eco-friendly domestic wastewater treatment. In the paper by Islamuddin and Imran Ahmad in 2016, "Treatment of domestic wastewater by filtration operation using low-cost natural absorbents", a sand filter model using low-cost natural absorbents is reviewed. The domestic wastewater flows through 3 compartments: grass mulch wheat husk; sugarcane bagasse; and activated carbon. The filter gave good results for removal efficiency. The treated water is used for irrigation, toilet flushing, firefighting. The proposed system integrates low-cost natural adsorbents with a dual-filtration approach, combining corrugated plastic sheets and periphyton biomass filtration. Through this study, we aim to create a sustainable and accessible method for wastewater treatment that addresses both environmental and economic concerns, paving the way for improved water quality and resource conservation. In conclusion, our main target is to compose an effective and new method from 3 reliable research papers to focus on each treatment strength and improve their disadvantages. From this paper, we hope to contribute to the process of saving the environment and creating a better world for the future.

Keywords: polluted water, living environment, contaminated water

Paindesite: Tio2/Andesite Based Paint as A Pollutant Degradation Media

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Jakarta, known as the capital city of Indonesia, has the highest amount of air pollution compared to other cities in the nation. On August 2023, the AQI index indicated that the air quality of Jakarta was taken into consideration as dangerous for its residents to respire. According to the most recent research from 2020, it was shown that Jakarta has generated 72.4% NO_x, 96.36% CO, 57.99% PM₁₀, and 67.03% PM₂ from the transportation sector. This phenomenon might lead to severe consequences if not treated carefully. Therefore, there ought to be an approach to reduce the air pollutants in Jakarta with an eye to creating a healthy environment for the community. After putting a careful thought regarding the issues, there is an idea of innovation in form of TiO₂/Andesite paint as a pollutant degradation media called Paindesite. The effectiveness of TiO₂ based products have been proven for degrading pollutants such as NO_x, SO_x, CO, etc. with its photocatalyst principle. Andesite is mainly known as a material that has the capability to accelerate the TiO₂ photocatalyst process, making Paindesite as more efficient innovation than ordinary TiO₂ application. Combining the two materials with a blender will resulting in a liquid type material that can be applied a paint on numerous infrastructures. Paindesite will have color varieties by adding light tone Styrene Acrylic on the blending process. Styrene Acrylic has the ability to reflect heat, so it won't interfere the photocatalyst process. Paindesite has the potential to reduce air pollution through photocatalyst principal applications. As for that, Paindesite will not only be applied in Jakarta but it is hoped to be the first step for global application. Therefore, a world where the community can live in a healthy environment will be established.

Keywords: Pollutant, TiO₂, Andesite, Paint, Degradation

Rauwolfia Serpentina (Serpentina) and Peperomia Pellucida (Pansit-Pansitan) as Anantiparasitic Spray Against Rhipicephalus Sanguineus Latreille (Common Ticks)

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Rauwolfia Serpentina (Serpentina) and Peperomia Pellucida (Pansit-pansitan) were used as the raw materials for creating different mixtures of both plants to determine which concentration will be faster in exterminating Rhipicephalus Sanguineus Latreille. The leaves were boiled to get the essence, which in turn was used for the creation of the spray mixtures itself. The variants of the concentration in regards to the ratio Serpentina/Pansit-pansitan are: Mixture 1: 50%/50%, Mixture 2: 75%/25% and Mixture 3: 25%/75%. Upon the testing, it was recorded that the Mixture 1 had the results of 1.5 hrs (sprayed once), 1.33 hrs (sprayed twice) and 1.25 hrs (sprayed thrice). Mixture 2 had the results of 3.5 hrs (sprayed once), 3.42 hrs (sprayed twice) and 3.33 hrs (sprayed thrice). Mixture 3 had the results of 1.5 hrs (sprayed once), 1.42 hrs (sprayed twice) and 1.33 hrs (sprayed thrice). Considering these results, it is noted that Mixture 1 and Mixture 3 almost had the same results, if not for the few time differences. Mixture 1 was always minutes faster than Mixture 3, while Mixture 2 was left behind a few hours. Therefore, Mixture 1 is the fastest of all mixtures to exterminate the ticks in a controlled environment

Keywords: mixture, ticks, controlled environment, raw materials

Biomass Waste-Derived Hard Carbon for Energy Storage Materials Application to Protect Against Energy Crises and Global Warming

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Global warming is a serious environmental issue characterized by an increase in the Earth's average surface temperature. This is primarily caused by the accumulation of greenhouse gases in the atmosphere. One of the main contributors to this problem is the combustion of fossil fuels in vehicles and industries, which releases greenhouse gases such as CO₂ and NO_x into the atmosphere. Additionally, conventional biomass burning contributes 18% of CO₂ and 4% of CH₄ emissions, resulting in the deaths of a quarter of a million people each year. One solution to reduce the amount of CO₂ emissions from biomass waste is to convert it into hard carbon, utilizing a process known as pyrolysis in a nitrogen gas environment at temperatures ranging from 800 to 1400 °C. Hard carbon can be employed as an anode material in sodium-ion batteries (SIBs), achieving a specific capacity of 200-350 mAh/g. Hard carbon offers several advantages, including excellent performance as an SIB anode, abundant availability from biomass waste, cost-effectiveness, and environmental friendliness. The utilization of biomass waste to produce hard carbon can enhance the value of waste materials, reduce CO₂ greenhouse gas emissions, and shift away from fossil fuel combustion towards alternative energy sources, such as electricity generation. The conversion of biomass waste into SIB anodes represents an initial step in energy conservation, reducing the primary causes of global warming, contributing to technological advancement through energy storage, and playing a role in environmental preservation through waste biomass processing.

Keywords: global warming, biomass conversion, hard carbon, energy storage, sodium-ion batteries

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APPLIED STUDIES

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BANDUNG CREATIVE SOCIETY

Microbit Irrigation Solar System

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Irrigation or watering systems are very important to maintain the quality and quantity of a crop. This is due to the fact that most crops need a high level of soil moisture for healthy growth. But unfortunately, there are farmers who have time constraints and can't get to the garden, making it difficult for them to water the plants. Because of this, the Microbit Irrigation Solar System (MISS) is used. MISS is an efficient plant watering machine that controls the pump for automatic watering by measuring how dry the soil is so that the plants have enough water. MISS uses solar energy to the fullest, making this product save electricity as much as it does. MISS can be controlled online for this system to function in tandem with Industrial Revolution 4.0 (IR 4.0), which benefits considerable aspects of human life today. Furthermore, MISS is connected to the MISS Website and apps, which can provide information about the environmental conditions of the plants as well as control the pump for watering. Users can monitor and manage crops from a great distance using gadgets that can access the internet as a medium. This product will open up new initiatives and opportunities for all farmers who are working on crops and thus increase crop yields.

Keywords: irrigation, plant, solar system, watering

Comparison of Physical Quality Tests of Body Scrub Bar from Red Dragon Fruit (*Hylocereus polyrhizus*) Peel and Orange Fruit (*Citrus sinensis*) Peel Extracts

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Indonesia is a rich country in natural resources, including a wide variety of fruits. Generally, only the fruit flesh is consumed, while the peel is considered as waste. However, these peels contain beneficial substances for the skin. Therefore, this research focuses on using fruit peels as the main ingredient in making Body Scrub. Red dragon fruit and orange peels were selected for the study due to their skin-benefiting substances like vitamin C, flavonoids, antioxidants, natural dyes, and calcium. The choice of a scrub bar form was based on its solid texture, also it easy to use and carry. The research methodology conducted using a comparative analysis, including organoleptic, pH, irritation, spreading ability, adhesion, homogeneity, and stability tests on Body Scrub Bars containing extracts of Red Dragon Fruit Peel and Orange Peel. While the organoleptic test revealed a notable change on the 4th day, with the Red Dragon Fruit Peel Bar showing significant color transformation from red to light brown, the other tests showing similar results for both extracts. This research proves that red dragon fruit and orange peels can be effectively used in the production of Body Scrub Bars. Body scrub bar with orange peel extract has better durability than the one containing red dragon fruit peel extract. Furthermore, this research is expected to contribute positively to the utilization of household waste in producing natural skincare products.

Keywords: Body Scrub Bar, Orange peel and Dragon fruit peel extracts, Physical quality test, house hold waste

Protein Decomposition in School Cafeteria Waste by Enzyme Protease Used for Application in Agriculture

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Food waste in landfills causes issues like odor, vermin attraction, harmful gas emissions, groundwater contamination, and landfill capacity waste, leading to global warming due to methane and carbon dioxide release. In order to help slow down global warming, my group has suggested using protease enzymes to break down protein in leftover food into amino acids for application in agriculture. The ratio of enzymes to a specified mass of campus food waste is considered. In addition, we also investigated the decomposition time of different waste products using protease enzymes. The hydrolysate which is collected after using enzyme protease is used as fertilizer for school gardens and can be further developed as nutritious food for livestock. The amount of enzyme required for decomposing corresponds to 1% of the waste mass. Different foods have different decomposing times.

Keyword: protein decomposition, enzyme protease, food waste, global warming, agriculture

VendoWaste: Goa Science High School's Arduino-based Waste Segregation Vending Machine

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Pollution remains a significant challenge in Goa Science High School, and the struggle for garbage dealers to collect and segregate waste at Goa, Camarines Sur, Philippines has surged. To address this issue, the researchers developed a waste segregation vending machine called "VendoWaste". VendoWaste represents a paradigm shift in waste disposal. Equipped with cutting-edge sensor technology and user-friendly interfaces, it empowers students and staff alike to deposit their waste in a convenient and eco-conscious manner. This study uses a design-based research approach by identifying the problem and designing a device that gives a solution to the given problem. The machine is a solar-powered Arduino-based waste segregation machine to sort plastics, papers, and metals. Your waste in exchange for coins using programmed sensors connected to its primary construction. Number of tests were done to make sure that the tool was completely functional and usable. The major goal is to assess the capability, accuracy, reliability, and sustainability in performing its function as an innovative waste segregation vending machine. The result of the study states that the integrated sensors consistently demonstrated high accuracy, with a sensor reliability rating of 87.5%, ensuring dependable waste separation. The project's automation significantly benefited local garbage dealers in terms of reducing manual labor. The automation process resulted in 33.4% faster than the manual in collecting 5 kilos of garbage. This study also led to a 63.8% reduction in the environmental impact of waste disposal, as evidenced by the decrease in contamination and improved waste management rates. The implementation of the VendoWaste Arduino-powered waste segregation vending machine at Goa Science High School (GSHS) achieved notable success in addressing the school's waste management challenges; however, the researchers recommended adding a self-composting feature to the machine for further research.

Keywords: waste, pollution, arduino, solar powered

Styrofoam Biodegradation by Superworm (*Zophobas* sp.) with a Diet of Cabbage (*Brassica oleracea* var. *capitata* L.) and Pok Choi (*Brassica rapa* L. Ssp. *chinensis* (L.))

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Styrofoam is one of the forms of plastic that is commonly found in Daerah Istimewa Yogyakarta, Indonesia. The daily production of plastic reached 293.60 tons by 2022 that includes styrofoam. Styrofoam disposal is also banned in Yogyakarta. Styrofoam brings harm to nature and living things. Based on Yang. Y. et al (2020), superworm or *Zophobas* sp. larvae has the potential of styrofoam biodegradation since its gut system contains *Pseudomonas* sp. bacteria that secretes poliuterenase-lipase enzymes that have a potential on degrading plastic polymers. Cabbage (*Brassica oleracea* var. *capitata* L.) and pok choi (*Brassica rapa* L. Ssp. *chinensis* (L.)) that are proven in containing Ca and Mg, were given since both have a potential on increasing superworm's gut styrofoam degrading capability. Hence, this research is conducted to find out the effectiveness of the cabbage and pok choi diet in addition to superworm on increasing its styrofoam degrading ability based on superworms faeces, through quantitative methods including superworm acclimatisation for 2 days, faeces collecting for 14 days, temperature and acidity level observation, microplastic observation found in faeces using counting chamber, and data analysis using graphs, T-tests, and NOAA (2015) applied formula. Based on the result, cabbage consumption effectiveness on superworm increases superworms' capability on degrading styrofoam for 66.24%-100%, meanwhile pok choi is 76.25%-100% compared to superworm consuming styrofoam as a sole diet. In conclusion, cabbage and pok choi consumption increases superworms capability in degrading styrofoam, although pok choi has higher effectiveness.

Keywords: biodegradation, styrofoam, superworm, cabbage, lettuce

Micro Hydro Power Plant Related to Global Warming

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As we know electricity plays an important role in our life, everything we do needs electricity in this era. This is resulting additional problem to global warming which is caused by sources of greenhouse gas emissions that were released during the electricity production, such as coal, oil, and natural gas. This will create massive amount of pollution, let's take an example, The Capital City of Indonesia, Jakarta as the top 10 most polluted cities in the world. That is one of the global issues that must be solved. However, there is an opportunity to overcome this problem. Especially by changing the source to produce electricity from not environmentally friendly similarly to gas, fossil, oil, and coal into environmentally friendly such as sun, wind, and water. In this project we will implement the power plant using the water source called MicroHydro power plant. "Microhydro power plant (PLTMH/MPH) is a technology to take advantage of the falling force of water." Reference: Hanggara, Ikrar. (2017). The use of PLTMH plays a very meaningful role in energy savings. It also contributes to improving the quality of the environment because we reduce on using fossil fuels, by doing this, it will decrease the impact such as air pollution, acid rains, and the greenhouse effect. Rahmat Kartono, conducted research on "Analysis of Micro Hydro Power Plants Using a Water Distribution System at P.T. Astra Honda Motor Plant 5 Karawang". He said that the Micro Hydro Power Plant (PLTMH) is an alternative electrical energy that has several advantages, including eco-friendly and energy sources obtained for free.

Keywords: electricity, power plant, gas emissions, global issues, environmentally

Seashell-Derived Filters for Sustainable Air Purification: Efficacy of Seashell Filters and Solar Panel Technology in Removing Airborne Pollutants

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Air pollution is a global crisis with bad health and environmental problems, caused primarily by emissions of carbon and sulfur compounds. Jakarta has a current AQI score of 133, exceeding the safe limit of 100. Thus, air filters are needed to filter the harmful gases. Conventional air filters, often non-biodegradable due to polypropylene or fiberglass composition, contrast with the alternative eco-friendly filter, composing of seashells and zeolite. Seashells, rich in CaCO_3 , can diffuse carbon dioxide. To ensure sustainability, solar panels are used over coal-dependent power sources in Indonesia for their affordability and environmental friendliness. The method conducted was a comparison of multiple air filter materials, followed by research into the effectiveness of air filters. This study is focused on identifying the most efficient air filter material and assess how altering filter material influenced filtration performance. This research method involved data collection and analysis, contributing valuable insights into optimizing air filtration systems to improve the air quality. According to the research conducted, the air purifier (using seashell air filter) in its best performance can reduce from 4380 ppm to 442 ppm (89,9%) of carbon dioxide from the air in 80 seconds. This air purifier production cost is lower than the price of most air purifiers found in the market, which makes it more cost-effective than buying from shops. As for the solar panel energy unit, it can generate about 20 watts and assuming that the air purifier is used for 20 hours/day, the cost-savings obtained are around 72.426 IDR every year, when compared to using PLN electricity. In conclusion, seashells are an effective material at filtering CO_2 , while also being an eco-friendly air filter component compared to other regular filter materials. Using solar panels makes the seashell-based air purifier independent, semi-portable, and eco-friendly.

Keywords: Air Purifier, Seashell, Pollution

Analyze the Correlation of AI to The Teachers Productivity

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The emergence of ChatGPT at the end of 2022 boosted the emergence of other AI, even though AI has existed since 1965. The disruption of AI also brings impact to education. There are some pros and cons to the use of AI in education. In September 2023, UNESCO launched the guidance for generative AI in teaching and research. The future generation of children will compete with other children and AI. So, the school should prepare them to face the coming challenge. Teachers, as one of the main parts of education, should know AI as it is one of the agents of change in students' lives. Researchers believe that AI will never replace teachers. However, teachers without AI will be replaced by teachers who use AI to support their tasks and duties as teachers. The purpose of this research is to know whether teachers, as agents of change, also use AI and how it impacts teacher productivity. Researchers shared the survey to all teachers. There were 100 respondents. The data was gathered using SPSS to check the validity, reliability, normality, and correlation between the use of AI and teacher's productivity. The r value of this research is 0.2, while the r table for 100 respondents means that the survey is valid. The Cronbach Alpha value is 0.7, meaning the survey is reliable. The significant value of the data is 0.02, which is below 0.05, meaning that there is a correlation between the use of AI and teacher's productivity. The correlation coefficient Pearson is 0.03, meaning there is a correlation between the use of AI and the teachers' productivity. The Pearson correlation coefficient is 0.75, meaning that the correlation is strong.

Keywords: AI for Teacher, Productivity, education

Seed Sowing Robot Based on ROV (Remotely Operated Vehicle) to Increase Reforestation Rates Following Forest Fires

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Forest fires have a tremendous impact on the lives of living creatures. Forest fires have an impact on the unavailability of clean air, absorption of ground water, and preventing erosion. The main impact that is felt most directly from forest and land fires is air pollution. As a result of forest fires, the ecosystem of flora, fauna and abiotic life will experience disruption. From the description above, we, students of SMP Muhammadiyah 7 Surakarta, developed an innovation entitled ROV (Remotely Operated Vehicle) based seed sowing robot to increase the rate of reforestation after forest fires. This research aims to develop and apply an ROV (Remotely Operated Vehicle)-based seed sowing robot to increase the rate of reforestation after forest fires. The research method used is the development method by Borg and Gall. This robot works with a remote-control system to monitor fire-scarred land. This robot is equipped with a fire sensor and heat sensor to find out fire areas that are safe for dropping seeds. The robot will then drop the seeds automatically into the container box and carry out treatment with fertilizer or soil fertilizer. With this robot, it is hoped that the process of reforesting fire-scarred land can run optimally.

Keywords: fire, seeds, reforestation, ROV

SAGANA: Sustainable Agricultural Gadget for Achieving Natural pest control and Abundant harvest

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Due to the impact of climate change, plant pests that ravage important crops are becoming more destructive, posing an increasing threat to food security and the environment. Annually, about 40% of the global crop production is lost to pests and 30% of the total greenhouse gas emissions comes from agriculture. Moreover, soil and water quality is continuously deteriorating due to excessive use of chemical pesticides. With the aforementioned quandary, the team developed project SAGANA. A Sustainable Agricultural Gadget for Achieving Natural pest control and Abundant harvest which aims to minimize pest destruction while reducing the usage of pesticides. Using carbon nanotubes (CNTs) and various chemical enzymes, SAGANA is a game-changer that precisely detects pesticide residue by triggering an electrochemical activation of acetylcholinesterase (AChE) upon contact with the chemical residue. These nanotubes are an efficient and safer alternative compared to pre-existing pesticide residue detection tests. The chemical sensitivity of these CNTs is highly precise displaying a 96% accuracy rate. Moreover, the pest detection system uses several sensors, such as passive infrared motion sensors and sound sensors, to locate pests and record their concentration. It is also equipped with a camera for easy manoeuvring of the device through a corn maze. The prototype demonstrates high accuracy in terms of pest detection, reporting around 94% accuracy. The project also comes with a mobile application for data and data interpretation display which is programmed through Python. Through SAGANA, farmers can have an integrated pest and pesticide residue management system, consumers can monitor their crops, as well as their surroundings, and the government and private sectors can invest in efficient and sustainable agriculture. SAGANA is a cutting-edge technology that is crucial for creating the balance between supplying the rapidly growing demand for food and ensuring the preservation of the world by reducing pollution.

Keywords: climate change, gas emissions, pesticide, sensors, SAGANA

Research On Manufacturing Fruit Preservative from Pectin Extracted from Dragon Fruit's Peel

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Plastic waste is a major issue we're facing as it took lots of time to recycle and release greenhouse gasses during the process of breaking down. Additionally, plastic is commonly used in fruit preservation. In order to reduce plastic waste, our project focuses on finding a replacement for plastic preservatives. Accordingly, we used pectin from dragon fruit peel to create preservatives by utilizing the use of wasted fruit's peel. Dragon fruit is a widely grown fruit in Vietnam, thus, by choosing it, we can utilize its peel, known for its high amount of pectin, to reduce organic waste. As pectin is a soluble fiber, it can be used to create film-forming coagulant solutions on fruit and preserve it, making use of the peel with its high pectin content. The research was conducted through 7 main steps. First, dried dragon fruit peel was ground into powder. Then mixed with water and Hydrochloric acid 15% to reach 2.5 pH level and stirred on Heating Magnetic Stirrers at 80-degree Celsius for 60 minutes. Next, the mixture was evaporated, precipitated with 90-degree ethanol, and centrifugal. The extracted pectin was added with 20 mL Glycerol to create preservatives and tested it on mango. Mango was chosen because it is a specialty fruit, has export value but is difficult to preserve and easily damaged. The selected mangoes all have comparable weights and ripeness, which was determined by the duration it took for each one to ripen. The ripe mangoes are preserved in four different conditions, including no membrane, 5g; 10g; and 15g pectin membrane. The experiment was conducted three times for each condition, then calculated the average results. Mangoes with 5g pectin membrane had the lowest average weight loss percentage of 7.32%, indicating that it was the most efficient in forming the film and causing the least weight loss. Research has proven the effective usage of pectin in manufacturing fruit preservatives, reducing plastic waste to the environment.

Keywords: Dragon fruit peel; Pectin; Fruit preservation; Plastic

Investigating the Antioxidant and Antibacterial Properties of the Leaf extract from the Chameleon plant (*Houttuynia cordata*)

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Due to the lingering effects of COVID-19 and an increased awareness of hygiene, the hand sanitizer and soap market has experienced significant growth. However, the rising demand for hygiene products raises a question: How can manufacturers sustainably produce more consistently effective soaps? This is the inquiry that our research aims to address. To create an efficacious and environmentally friendly soap, we turned to nature and discovered the Chameleon plant (*Houttuynia cordata*). This versatile plant is widely acknowledged as a beneficial and familiar vegetable to human life. Proven by multiple research papers, it is one of the few resources from nature with high antibacterial and antioxidant properties, which are the two highly sought-after characteristics of hygiene products. Therefore, our research focused on assessing the Chameleon plant's antibacterial and antioxidant properties to develop a new type of soap that excels in both categories. To conduct this scientific investigation, we employed a range of research methods, including the extraction method, the oxidative property assay, the antibacterial property assay against the ESKAPE (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter*) group of bacteria (Kirby Bauer method), and multiple observation methods. Our research revealed that the IC₅₀ value of the Chameleon plant's aqueous extract is 231.91 mg/mL, which is 1.9 times higher than the IC₅₀ value of its ethanol extract (124.82 mg/mL). As for the positive control solution, the Chameleon plant's aqueous extract has an IC₅₀ value of approximately 22.9 times higher than that of ascorbic acid. Building upon these findings, we successfully produced soap using the Chameleon plant's aqueous extract, ethanol extract, and leaf powder. In particular, the soaps derived from the ethanol extract and the leaf powder have moderate foaming and a light, herbal scent. When applied directly to the skin, the soaps provide a comfortable experience without causing irritation. Our research proves the feasibility of producing potent and effective soaps through a clean and eco-friendly approach.

Keywords: covid-19, hygiene, soap, chameleon plant's

Antimicrobial Activity of Microwave Assisted Extraction of Perepat (*Sonneratia alba* sm.) Toward Injury Causing Bacteria

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Based on the results of research can be concluded that the microbial solution to extract the fruit perepat (*Sonneratia alba* Sm.) with extraction using microwave assisted extraction proved to have microbial activity based on the measurement of the diameter of the zone inhibit bacteria obtained wide inhibit zone was 19.6 mm in inhibits the bacteria *Staphylococcus aureus* and on *Escherichia coli* bacteria have inhibit zone of 20.8 mm through the Disc Diffusion method. Meanwhile for the test Concentrations Inhibit (Minimum) KHM through methods of electrolyte deficits showed that the solution to extract the fruit perepat have microbial activity that is marked with the lack of growth of the bacteria *Staphylococcus aureus* and the bacteria *Escherichia coli* on the concentration of 25%. From the testing of the level of ashes, fruit extract solution perepat (*Sonneratia alba* Sm.) passed based on the standard quality of Standard National Indonesia (SNI) with gray levels of 0.87%. Meanwhile, fruit extract solution perepat (*Sonneratia alba* Sm.) has a lower water level compared with the level of water with the level of commercial antiseptic water of 97,26%. Now the pH contained microbial solution to extract the fruit perepat still in a range of pH skin man with the level of pH of 4.5. The test result organoleptik against microbial solution to extract the fruit perepat (*Sonneratia alba* Sm.) shows that the panelists prefer microbial solution to extract the fruit perepat (*Sonneratia alba* Sm.) compared with commercial antiseptics in colors and flavors. Meanwhile, from the test result homogenates that has been done shows that the microbial solution to extract the fruit perepat have a heterogeneous nature.

Keywords: Microbial, Extraction, Perepat, Infection Wound

HYDROMOTECH: An IoT-based Automated Monitoring System for Water Pollution, Acidity, and Temperature

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The development of river water monitoring systems plays an essential role in the evaluation, restoration, and preservation of river water quality. It enables the identification and assessment of dangerous compounds that may be compared to acceptable standards for a specific area. However, without data, environmental problems cannot be identified. This study addresses this issue by introducing "HYDROMOTECH: An IoT-based Automated Monitoring System for Water Pollution, Acidity, and Temperature," which enables users to automatically monitor water pollution based on temperature, acidity, and contaminants. The researchers developed a water monitoring device that includes an app that easily monitors water quality. Through monitoring, the study provides objective information for making successful water quality management decisions now and in the future. This tool would aid in identifying current, ongoing, and emerging difficulties as well as assessing water regulation compliance. It enhances water quality analyses, resulting in more sustainable water resources. The study employs a descriptive and developmental methodology that includes the planning, designing, and development of the HYDROMOTECH device and application. The researchers methodically completed each procedure to ensure the device's perfect operation and verification of numerical quantity by its TDS value, pH level, and water pollutants. After conducting a series of tests and gathering the responses from the respondents through questionnaires, it was computed that the overall functionality has an average of 3.6, the application's reliability with an overall average of 3.40, and data accuracy with an overall of 2.88. The study revealed that the HYDROMOTECH device and application are effective in terms of functionality after executing a series of tests, however, the accuracy and dependability need to be enhanced further. To summarize, this study shows a viable path for better environmental management, sustainable water quality, and a brighter future for our planet's most important resource, water.

Keywords: water river, water quality, environmental, water regulation, water pollutants

FSDS ALERT: A Community-based Flood Severity Detector System through Ultrasonic Sensor and SMS Alert

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The escalation of global warming had propagated the onset of flooding, an inevitable and harmful phenomenon, prevalently affecting Southeast Asia, particularly the Bicol Peninsula, within the Philippines. In addressment to this, a resilient disaster recovery system is necessary for reducing offset effects. The conducted assessment regarding flood susceptible areas in Goa, gave an impetus to develop the study "FSDS ALERT: A Community-based Flood Severity Detector System through Ultrasonic Sensor and SMS Alert" to address underlying issues that concern promptly alerting individuals in the midst of flooding. Additionally, this system functions by using an ultrasonic sensor to constantly monitor river conditions, together with an SMS application that serves as early warning mechanism, allowing essential flood level data to be disseminated to local authorities. The research process involved descriptive and developmental methodologies, which involved planning, design, and the actual development of the FSDS ALERT device. Researchers meticulously conducted each phase to ensure the functionality of the device, precision and responsiveness in terms of SMS notifications delivery time interval, and the correspondence with an ultrasonic sensor. The research tested the device within artificial pools, measuring water levels in feet, wherein inputs encompassed various sub - parameters, including safe, moderate, and critical, to acquire accurate data. It was concluded that the FSDS ALERT device is effective in terms of functionality as the ultrasonic sensor transmitted data through SMS messages. In terms of accuracy, and responsiveness of the device, the SMS notification delivery time interval garnered an average of 5 seconds transmission, thus this proves the immediate response of the device. This research offers a convenient one-way communication method for residents that works independently of a network connection, primarily during calamitous events, network connectivity is often unavailable. Generally, FSDS ALERT is significant in disaster preparedness, prevention of casualties and damages, and in informing local authorities.

Keywords: Floods, Monitoring System, Ultrasonic Sensor, SMS Alert, FSDS Alert

The Pomegranate (*Punica granatum*) Peel Waste to Worth: Producing Skin Lotion for UV Radiation Shielding

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Indonesia *Punica granatum*, commonly referred to pomegranate, contains high concentrations of polyphenols and anthocyanins within its peels. These substances serve the pivotal role as a skin protection shield from UV radiation exposure. The aim of this research is to produce a sunscreen lotion from the by-product of pomegranate peels, with the research question: "To what extent can pomegranate peel extract function as an effective shield against UV radiation?" This research hypothesizes that the pomegranate peel extract exhibits the UV radiation shielding ability. The experiment procedure was conducted as follows: (1) Produce the pomegranate biomass by drying the peel at about 60°C until it reaches the constant weight, followed by grinding it to fine powder form, (2) Implementation of the maceration extraction to homogenize the pomegranate biomass by employing 70% ethanol, (3) Application of rotary vaporization to refine and purify the extracted materials, and (4) Formulation of the sunscreen lotion, by mixing pomegranate extract with coconut oil, shea butter, beeswax, and distilled water until achieving emulsification. The efficacy of the sunscreen was assessed through the utilization of UV-responsive paper. The experimental procedure entailed the exposure of two distinct UV-responsive papers to ultraviolet radiation, one of which was coated with sunscreen lotion. This exposure was conducted in two distinct manners: firstly, via the emission of an artificial 400-nm UV flashlight, and secondly, through natural exposure to sunlight. The outcomes of both experiments revealed that the UV-responsive paper lacking sunscreen lotion has indicated the absorption of UV with alteration in coloration, transitioning a shade of purple. Conversely, the UV-responsive paper coated with sunscreen lotion remained consistently unaltered color, which signified the successful protective barrier against UV radiation. In conclusion, the initial hypothesis of this study was acceptable.

Keywords: pomegranate, anthocyanin, polyphenol, UV, maceration extraction, rotary vaporization

Natural Preservatives from Eco-enzymes and their Effects on Foodstuffs

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As the human population grows, the food industry will follow and so will the need for food preservatives. Current preservatives used in the sector are chemical-based; These could lead to customers experiencing adverse effects such as headaches, palpitations, allergies, and cancer. A possible solution to this would be using eco-enzymes, as shown in different research. They've hypothesised that eco-enzymes could make great preservatives for fruits as their preserving abilities managed to keep up with Propionate Acid. Through a few observations done by the research team, the team decided to use an eco-enzyme solution mixed with water in a ratio of 1:3. They found that the solution has a PH of 4.3, a Total Dissolved Solid (TDS) of 849 parts per million (ppm) and an Electrical Conductivity (EC) of 1757 micro-Siemens per centimetre ($\mu\text{S}/\text{cm}$). They also decided to use 10 grams of Potassium Sorbate as their chemical preservative, which is mixed with water to get a solution of 100 millilitres. They found that the solution has a PH of 7.7, similar to water with a neutral acidity. The TDS and EC count were unobtainable due to unknown reasons. Using rice as a population subject, they sprayed both solutions on different populations while one was left as it was, as a negative control subject. After a few days, the team inspected the physical properties of each sample and checked them. Physical results show that the control sample went dry, the Potassium Sorbate sample left a powder of possibly Potassium Sorbate as it's stuck together firmly, while the eco-enzyme sample has a yellowish-brown colour that comes from the eco-enzyme colour itself due to colour fading from the solution to the sample. For the time being, this topic is being researched further and is subject to be changed.

Keywords: Preservatives, Eco-enzyme

Effectiveness of Sunflower Seed Oil as The Basic Ingredient of Sustainable Vehicle Fuel

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Fuel is a complementary object, meaning it can be useful when used in collaboration with other objects, such as internal combustion vehicles. Many people use diesel motor vehicles daily which require diesel fuel to run them. The high usage of biodiesel fuel (B30) in Indonesia brings a lot of negative impacts, such as environmental damage, significant climate change phenomena in recent years, the emergence of various kinds of epidemics and infectious respiratory diseases, as well as the decline in the welfare of the poor due to fossil fuel scarcity, which oppresses the middle to lower economic community. The use of internal combustion vehicles has caused various air pollution problems which have now become a major catastrophe that we are all facing. For example, Jakarta's air pollution has recently reached a PM2.5 figure of 75.4 $\mu\text{g}/\text{m}^3$ which is classified as hazardous air quality. Responding to these problems, researchers argue that an effective and environmentally friendly alternative fuel is needed in Indonesia. Researchers raised the use of sunflower seed oil as a base material for manufacturing Sustainable Vehicle Fuel (SVF) namely SF100, which is an environmentally friendly biodiesel made of pure sunflower seed oil. Researchers observed three important aspects, which are the efficiency of fuel consumption, the speed of the combustion process, and the emissions produced. The results of the analysis show that SF100 has a more efficient fuel consumption efficiency of 0.013 liters/hour when compared to B30 which has an efficiency of 0.024 liters/hour. B30 has a better combustion rate than SF100, since SVF doesn't contain fossil fuels. SF100 produces less carbon emission residue compared to B30. Emissions from B30 leave thick clumps of black carbon, whereas SF100 emissions leave a small amount of carbon residue on the screen.

Keywords: fuel, environment, biodiesel fuel, Sustainable Vehicle Fuel (SVF)

Beepernia Bio Seed Paper Made from water hyacinth (*Eichhornia crassipes*) As A Material for Making Eco-Friendly Paper

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Paper is a material that comes from pulp that undergoes a milling process. In general, the fibers used to make paper are natural fibers containing cellulose and hemicellulose. During this time, paper was made from cellulose found in wood. However, without realizing it, this can have a negative impact on the environment if done excessively. Because, the more paper you need, the more wood you need. Water hyacinth (*Eichhornia crassipes*) has a high cellulose content, so it has the potential to be used as an ingredient in making BEEPERNIA. The aim of this research is to determine the effectiveness of water hyacinth fiber (*Eichhornia crassipes*) as an ingredient in making BEEPERNIA. Sample preparation with different variations, namely sample A with a water hyacinth content of 100% and sample B with a water hyacinth content of 50%. The manufacturing process begins with the drying stage of raw materials, the pulping process, rinsing, bleaching and finally the drying process. This research data was taken based on the results of tensile strength, tear resistance and biodegradability tests of the samples. The tensile strength and tear resistance tests showed that the best sample was sample A with values of 9,073 MPa and 8493 mN respectively. Both samples were proven to decompose in the soil for 2 weeks and could produce new plants. The conclusion of this research is that BEEPERNIA can be used as an eco-friendly paper as an alternative to conventional paper.

Keywords: BEEPERNIA, *Eichhornia crassipes*, Eco-friendly paper

Utilizing Indonesia's Abundant Pleurotus Mushroom Resources to Fulfil the Average Human Nutritional Intake in The Form of Plant-Based Meat

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Plant-based meat is one of the innovations to reduce animal meat consumption, derived from the vegetarian community as a contribution to environmental sustainability. While Indonesia had been known as an agrarian country, where about 88% of the working individuals are farmers, Indonesia is rich of its diverse natural plant-based resources. This research aims to utilize plant-based resources by turning them into plant-based meat ingredients. One of the various natural resources that are widely used as animal meat substitutes is the fungi, which a lot of its species can be used as animal meat substitutes, due to its taste, texture, and nutritional components dominated by carbohydrates and proteins. During the research, it was found that fungi from the Pleurotus genus are the most cultivated genus of mushrooms in Indonesia. The average nutritional value of the Pleurotus fungi per 100 grams consists of 24.274 grams of protein and 46.067 grams of carbohydrates. The fungi are processed into plant-based meat by getting combined with raw tofu, wheat flour, and other minerals. As a result, it fulfils the average nutritional intake by providing 62.4375 grams of protein and 314.6875 grams of carbohydrates.

Keywords: plant-based meat, Pleurotus mushrooms from Indonesia, meat analogue, alternative proteins

Ph Reducer Product of Detergent Waste with Eggshell Activated Carbon as Utilization of Food Waste

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Surfactant LAS (Linear Alkyl Sulfonate) which produces foam as the main constituent of detergents causes the pH of the water to be high, around 10-12. High pH values in waters can cause disruption of the metabolic process of aquatic biota, increase ammonia content, damage food webs in waters for marine biota, and many more. Various negative impacts of high pH detergents can be reduced by utilizing natural materials, namely lime. Lime coagulant can be in the form of calcite compound $\text{Ca}(\text{CO}_3)_2$ which can be found in food waste or organic waste commodities which are eggshells. The carbon and oxygen content, the presence of protein fibers, and the porous nature of eggshells have the potential to become adsorbents with physical and chemical activation processes. Egg shell activated carbon is able to reduce the pH of detergent waste from 10 to 8, the pH value is within the pH threshold that can be accepted by water. Therefore, there is a need for products that can be used in households and laundry businesses in order to reduce the negative impact of pH increase on waters. "HODENAS" can be a solution by providing eggshell activated carbon in reusable gauze bags as a form of food waste utilization into pH reducer products in detergent waste.

Keywords: eggshell, detergent waste, pH

Integrating Thermoelectric Generator from High and Low Temperatures on a Thermos

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Electricity is one of the most common aspects in our day-to-day life. In addition, almost everything in our life is correlated with electricity, whether on a small, medium, or large scale. However, electricity sources especially in Indonesia aren't able to cover those electricity needs on a small scale. Therefore, this research aims to integrate a thermoelectric generator (TEG) on a device to generate small-scale electricity through a disparity of heat. The idea emerged by practicing the use of TEG SP1848-27145 SA, then extracting two data samples of two different thermal readings, one with high and one with very low temperatures. The TEG function is based on a theory known as the seebeck effect. The process is defined when the two sides of the TEG module receive different conditions in temperature. By doing so, electrons inside the TEG module will start to move around, creating electron flow, thus generating electricity. In an experiment conducted on a thermos, we utilize the seebeck effect by using hot water (66°C) and cold water (10°C), in this case having a 56°C difference in temperature. By doing so, 0,7 volt of electricity is generated. As a result of this data above, we're able to determine that the generator has a thermoelectric efficiency of 0,673889%. This indicates that a difference in temperature is able to produce a slight amount of electricity. Despite the amount of electricity generated is relatively small, it can be stored and applied for practical purposes, such as recharging batteries and the like.

Keywords: Thermoelectric generator, heat disparity, seebeck effect

Synthesis of TiO₂ Nanoparticles for Wastewater Treatment in Van Phuc Silk Village

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Van Phuc is a village traditionally associated with silk weaving in Ha Dong, 8 km southwest of Ha Noi. In the past, this craft was just family-based and a family was just able to produce 1 piece of silk per year which all went to the royalty for clothing. Royal clothes were known for their bright yellow coloring, so in order to dye the silk, the villagers used natural materials like turmeric. After extracting the yellow liquid from the plant, the leftover was thrown into the soil, it then decomposed and turned into a natural fertilizer, which was very eco-friendly. Nowadays, silk in Van Phuc village is manufactured on an industrial scale and the villagers no longer use the traditional method of dyeing anymore. The modern dyeing method requires the use of chemicals and silk is soaked for half a month to come out with the desired color. After taking the pieces of silk out, the remaining liquid is poured into the Nhue River. As a result, the river is seriously contaminated: the pitch-black water contains such federal chemicals that intoxicate underwater creatures. The air around the area is filled with an overpowering stench and the fact that this river is located in a densely populated region makes the situation much more unbearable. This concerning problem has led our group to the idea of using the TiO₂ nanoparticle for pollution treatment so that people can use this water resource in their daily lives. In the next part, we will further discuss this experiment to clarify our idea.

Keywords: Titanium Dioxide, photocatalyst, nanotechnology, water treatment.

Characterization and Evaluation of Cobalt Ferrite Nanoparticles Synthesized for Drug Delivery Applications

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Nanotechnology has the potential to revolutionize the field of drug delivery, including chemotherapy. Nanoparticles have a large surface area relative to their volume, which makes them more permeable and allows them to carry more drugs. Magnetic nanoparticles (MNPs) can be guided to specific sites in the body using an external magnetic field, which can improve the accuracy and efficacy of drug delivery. Among all MNPs, cobalt ferrite (CoFe₂O₄) nanoparticles are particularly promising due to their unique properties such as high magnetocrystalline anisotropy, large coercivity, moderate saturation magnetization, high hardness, and thermal and chemical stability. This research paper investigates the fabrication of CoFe₂O₄ MNPs for drug delivery applications in chemotherapy. The CoFe₂O₄ MNPs are synthesized using the Sol-Gel method, which produces homogeneous and crystalline nanoparticles with high stability and purity under mild reaction conditions. The research aims to shed light on the relationship between nanoparticle characteristics and drug delivery efficiency by examining the synthesis methods, their advantages and limitations, and the resulting nanoparticle properties. The research findings have the potential to lead to the development of more effective and safer cancer treatments. By using CoFe₂O₄ MNPs to deliver drugs directly to cancer cells, researchers can reduce the side effects of chemotherapy and improve the overall treatment outcomes.

Keywords: Magnetic nanoparticles, drug delivery, sol-gel method, CoFe₂O₄

BYE TB!: A Prototype Website as A Potential Elimination Tuberculosis Accelerator in Manado, Indonesia

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Tuberculosis (TB) remains a health problem in several countries, including Indonesia. Indonesia is ranked second as the country with the highest number of TB cases in the world, with an estimated 969,000 cases. For that reason, the government has made programs, such as the Sustainable Development Goals (SDGs), and taken actions to eliminate TB. Technology is also involved to maximize the government's targets, especially in the medicine field, known as telemedicine. Several telemedicine platforms have been developed in relation to TB, including SOBAT TB and EMPATI clients. However, a product needs to be developed to target the community, particularly the people of Manado City. This is because the case detection rate is still low, and TB itself ranks as the 10th highest disease there. Additionally, special attention is given to individuals with low educational backgrounds, as they are one of the contributing factors to TB incidence. As a result, we have created the website "BYE TB". This website provides information about TB disease, the correct collection of sputum specimens, and contact information for health centers in Manado. The website includes a translation in the Manado language on each page so the local community in Manado, especially those with low educational backgrounds, can easily understand the content. The "BYE TB" has benefits for education about TB and facilitates communication between the public and the health centers. The health centers also experience benefits as identifying TB cases becomes easier and they are assisted in carrying out health promotion activities. Even though "BYE TB" is still a prototype website, it has a potential impact on the elimination of TB, especially in Manado and also in Indonesia in the future.

Keywords: website, tuberculosis, Manado

Automation Electrocoagulation System

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Rapid industrial growth and technological advances have provided great benefits to society. However, one of the negative impacts of this development is Hazardous and Toxic Waste (Bahan Berbahaya dan Beraacun B3). The waste is a serious threat to the environment originating from the industrial, pharmaceutical, electronic and manufacturing sectors. Therefore, the management of B3 waste is a priority to protect the surrounding environment. So, a tool is needed which can neutralize liquid waste to make it safe for the environment before disposal. In this electrocoagulation method, designed to work automatically in order to provide waste treatment results that meet the threshold limit values as turbidity and dissolved solids quality standard requirements with the best efficiency and accuracy, therefore, this tool is expected to be a comprehensive protection of the environment and human health in the future.

Keywords: Hazardous waste, electrocoagulation, automation, environment and human health.

Utilization Of Wood Waste as Building Insulation Material for Energy Conservation and Carbon Dioxide Gas Emission Reduction

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Building energy consumption has become one of the major contributors to global energy consumption and one of the causes of carbon dioxide emissions from building cooling systems. In other sectors, conventional biomass burning also contributes 18% of CO₂ and 4% of CH₄, which play a significant role in increasing Earth's surface temperature or global warming. The effective way to solve the problem mentioned above is by installing thermal insulation in building walls using biomass-based materials. The thermal insulation material is prepared by utilizing wood waste or sawdust, which is transformed into biochar to enhance its insulation properties. In this study, the composite is made from natural materials, making it an environmentally friendly material that can be used for long-term applications since it can be recycled. Sawdust is converted into hard carbon, known as biochar, through a manual pyrolysis process in a low oxygen environment. Biochar is then combined with cornstarch binder to produce insulation material with optimal physical properties, mechanical strength, fire resistance, smoke suppression, carbon capture capability, and thermal insulation performance. The material is characterized using Scanning Electron Microscopy (SEM), durometer hardness tester, and a thermal conductivity instrument. Observations from secondary electron images (SEI) reveal that the composite material has high porosity as shown in Fig 1(b), which results in low thermal conductivity but reduces the material's mechanical strength. This is confirmed by the hardness test results, which show a value of 85.3 Shore-C with a specific addition of biochar. The thermal conductivity of the insulation material varies with temperature and ranges from 0.045 to 0.2 W/m·K. This indicates that the thermal insulation material developed in this study can be a viable alternative for thermal insulation.

Keywords: Global warming, insulation material, composite, biochar

Exploration of Natural Anticancer Compounds from *Opuntia cochenillifera* in Inhibiting Cell Proliferation Breast Cancer MDA-MB 231 Targeted Metastatic Pathway Apoptotic and Cell Cycle Arrest to Support National Drug Independence

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Breast cancer is the second highest cause of death in the world, causing up to 9.5 million deaths in 2022. *Opuntia cochenillifera* is an ornamental plant known as centong cactus containing bioactive compounds that have the potential to be anticancer. Until now, the exploration of the anticancer potential of centong cactus extract is still unclear. This study aimed to identify the molecular activity of anticancer active compounds in cactus extract. Analysis of active compounds of centong cactus extract using FTIR, cytotoxicity test on MDA-MB-231 breast cancer cells with MTT assay. Flow cytometry analysis is used to analyse the molecular activity of apoptosis induction and cell cycle arrest of cactus extract. FTIR spectroscopic analysis succeeded in identifying functional groups in centong cactus extract, with absorption peaks observed at 3358 cm⁻¹, indicating the presence of carboxyl groups (-COOH) and O-H groups, indicating phenolic compounds, especially flavonoid groups. MDA-MB-231 breast cancer cell culture was used to evaluate the cytotoxicity of centong cactus extract with an IC₅₀ value of 270.63 µg/mL. Analysis of flow cytometry-based apoptosis showed that the active compound of centong cactus extract induced apoptosis and inhibited the cell cycle in the G₀/G₁ phase. Based on the results of this study, centong cactus extract contains active flavonoid compounds with anticancer potential, showing efficacy in inhibiting proliferation, inducing apoptosis, and inhibiting the cell cycle in MDA-MB-231 breast cancer cells.

Keywords: *Opuntia cochenillifera*, anticancer, cytotoxic, proliferation, apoptotic

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Global Warming

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Global warming is the rise of temperatures due to greenhouse gasses and the sun's energy getting trapped inside the Earth's atmosphere, making the environment warmer. The burning of fossil fuels releases lots of greenhouse and methane gasses and these gasses get trapped in the atmosphere that we live in. Natural disasters like droughts, floods, heat waves, and cyclones are being irritated by rising temperatures. In the US, droughts can result in scarce clean water, unmanageable wildfires, and harsh weather conditions like dust storms, heat waves, and flash floods. Insufficient water supply is a primary cause of fatalities and severe illnesses, and it also contributes to crop failures. Vietnam's temperature has increased greatly over the past few decades, with the highest increase seen in the last decade at an average of 0.2°C per decade for the past 40 years. Rainfall has also increased slightly by 5.5% on average within the same period, but there are varying trends in different regions. Additionally, the sea level has been rising at an average rate of 3.6 mm per year from 1993 to 2018. This might seem difficult to solve. However, we can still do things to make it less severe and stop it from getting worse. Raising awareness and teaching younger generations is one way, as is using public transportation to reduce our carbon footprints. Going with clean and sustainable energy sources, going vegan, or adding more plant-based foods to our diet are all good choices. These choices are good for our health and the environment. No matter what we do, any effort to protect the planet is a good thing. A survey was made among 29 sixth-grade students from LSTS to decide the most useful way to donate to save the planet. The survey showed that 16 students had some knowledge about global warming, while 10 students had conducted in-depth research on the topic. Only 3 students expressed a lack of knowledge about it. In terms of the best ways to stop global warming, 11 students felt that planting trees could be a solution, while 9 students suggested using green energy. 3 students advised spending money only on necessities, and 2 students recommended using public transport. When asked about what they or their families had done to prevent global warming, 11 students reported using green energy, 6 students consumed more greens, 5 students only spent money on needs, 4 students grew trees, 2 students used public transport, and only 1 student raised awareness. These findings mean that there are various ways people can contribute to weakening global warming. To sum up, we all need to protect the planet, no matter who we are or where we live. Let's be mindful of our actions and reduce our carbon footprint to preserve the environment for future generations.

Keywords: global warming, temperature, planting, trees

Preventing Financial Disaster: Building Financial Literacy among Students Through Improving Financial Understanding of Teachers and Educators

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Preventing Financial Disaster: Building Financial Literacy among Students Through Improving Financial Understanding of Teachers is a crucial humanities study that delves into the perplexing phenomenon of financially educated individuals, specifically teachers and prospective educators, falling prey to online loans despite their presumed financial acumen. The overarching objective is to formulate strategies for nurturing financial literacy and awareness within Indonesia's primary and high school environments. This research benefits teachers, students, and parents and focuses on teachers and prospective teachers, including students from universities and teacher colleges. The critical issue at hand revolves around the substantial deficiency in financial literacy among academic professionals in Indonesian primary and high schools, hindering their capacity to convey financial knowledge to adolescents effectively. Examining the incongruity within Indonesia's international financial literacy rankings, where the nation excels in financial consciousness but concurrently reports a startling 42% of teachers in West Java ensnared by illegal debt providers, this study explores the hypothesis that teachers may exhibit low financial literacy, potentially contributing to the documented low financial literacy rates among millennials. The research methodology involves administering questionnaires to 100 teachers and prospective teachers across Indonesia, employing quantitative data collection methods, maintaining a 95% confidence interval for hypothesis test, and utilizing descriptive statistics to find and explore the relationship between financial literacy levels and susceptibility to online loans. Despite Indonesia's commendable international financial literacy score, surpassing even some developed countries, the alarming prevalence of teachers grappling with shark-loan providers in West Java underscores the urgency of this research from a humanities perspective. Key terminologies such as "survey," "data spread," "95% confidence interval," "descriptive statistics," and "hypothesis test" underscore the research's scientific rigour within the humanities domain. Ultimately, this research seeks to shed light on the enigmatic financial vulnerability of teachers and educators in Indonesia and pave the way for a more financially resilient educational system, benefiting current and future generations.

Keywords: financial literacy, loan trapped, teacher, financial disaster, Humanities Research

Social Acceptability, Economic Impacts, and Environmental Advantages of the Solar-Powered Deep Wells in the Areas of Goa Camarines Sur

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Solar-powered deep well is a system that uses solar energy, harnessed by photovoltaic panels to power a well pump that extracts water from deep underground (Ramos, et al., 2009). This system is particularly useful in areas with level 1 water source where grid electricity is unavailable and water-source is expensive to access. In fact, one of the primary issues plaguing the many Barangays in the Municipality of Goa, Camarines Sur is the dearth of access to clean and safe water. In order to address the needs of the locals in this area, the Local Government Unit, in cooperation with Department of Energy, Department of Interior and Local Government and Ako Bicol Partylist, initiated a project in 2019 that provides water to many waterless areas in the community by installing forty (40) solar-powered deep well. Two (2) solar deep wells were installed in Urban Housing, ten (10) were placed within the vicinity of elementary and secondary schools, (1) for community sharing used for domestic and livelihood purposes, two (2) for government offices use, others were staggeringly to twenty-three (23) different Barangays. This directly contribute to the reduction in percentage of household without access to water from 20.46% to 6% as reported by Community Based Monitoring system in 2018 and Environmental Sanitation Report in 2022. This research study aims to assess socio-economic impacts and environmental advantages of introducing solar-powered deep well. Because of its dependability to sunlight, the acceptability level in terms of reliability is 60%, this is conversely different to 100% acceptability level in terms of accessibility, affordability and sustainability. Applying the socio-economic impact, the study found out that the project has an average of 581.97% return on investment with payback time of 1.47years.

Keywords: deep well, water resources, sunlight, solar power

Future Education: The Impact of ChatGPT Integration on Scholars Comprehension

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ChatGPT is a free AI tool that scholars use to complete various tasks, producing well-written papers with summaries of the material they want to learn. However, it is also referred to as "monster technology" due to its potential to stifle creativity and promote laziness. This research aims to determine the impact of ChatGPT integration on Cita Hati School students' comprehension. This research aims to provide parents and educators with the best advice on the impact of AI developments on education. The research question is what is the impact of ChatGPT integration on scholars' comprehension. is using a quantitative method by distributing questionnaires in order to obtain how ChatGPT impacts scholars' comprehension, after getting the data we analyse it using reliability test (Cronbach alpha), validity test, normality test, Pearson correlation test, and determination test. For the validity test, all thirteen questions have r values above 0.355 according to SPSS analysis, meaning they are all valid. According to the Cronbach's Alpha reliability test, the results are reliable with a score of 0.885. The distribution was normal according to the Shapiro wilk test, which yielded a p -value of 0.464. The Pearson correlation shows an R -value of 0.541, which denotes a moderate correlation between the integration of ChatGPT and students' comprehension. According to the results of the determination test, the R square value of 0.292 indicates a 29.2% influence of the independent variable on the dependent variable. Other factors have an impact on the remaining 70.8%. In conclusion, ChatGPT integration has a positive impact on scholars' comprehension. The future research is repeating the research with a larger group of people, equal participants in gender grouping, and conducting experimental research by integrated school project.

Keywords: ChatGPT, education, and comprehension.

The Impacts of T.U.C.A.D (Trekking to Unlock Community Ailments and Difficulties) Program: A Case Study Review

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Trekking to Unlock Community Ailments and Difficulties (abbreviated as TUCAD) is a bikol term which means "to Trek" or "to go Up". The term "TUCAD" is emblematically used to depict the bringing of the government services to highland areas and set foot on distant sitios identified with high poverty incidence, poor road conditions, high incidence of school dropouts and malnutrition, and residents suffering from inadequate health care services. (Pan M, 2023). Despite challenges like the COVID-19 pandemic, TUCAD has persisted, bringing hope and development to marginalised communities through various interventions and projects. This study aims to explore how this project influenced community engagement, participation and empowerment among the government's leaders and volunteers, to account and document the intervention this project has made and identify the overall impact of this project to the community. This study found out that the TUCAD Program brought inspiration and encouragement to the government servant leaders and this serves as a tool to further strengthen the delivery of services and ensures that such services are reaching even the remotest sitios of this idyllic town. It has inspired and recorded 2,950 volunteers from all walks of life. Likewise, the program rekindles the compassion and empathy among government and non-government employees, national government agencies, civil society organisations, private citizens and other volunteers in helping each other especially the underprivileged sector of the community. After 73 TUCADs done in the past two (2) years and nine (9) months, the interventions made include the initiatives done on housing, hanging bridge, solar lights, solar-operated water supply, health sustaining programs, tree planting and other environment sustaining activities, livelihood and infrastructure projects and scholarship grants.

Keywords: TUCAD program, covid-19, community engagement

Analyzing the Concentration of Fecal Bacteria Along Waller Creek (at the University of Texas Austin Campus, USA)

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Fecal Indication Bacteria (FIB) is used to measure the presence of fecal bacteria and pathogens such as E. Coli and Coliform. E. Coli is mainly found in the intestines of warm-blooded animals, such as humans and dogs. However, E. Coli can also be found in lakes, rivers, and creeks, which can contaminate drinking water. This presence in common waterways indicates sewage or animal waste containment. If the fecal bacteria are ingested, it can cause significant harm to internal human organs. Therefore, it is important to monitor FIB levels in any recreational waterways to ensure E.Coli does not exceed 406 E.Coli/100ml, which is the limit by the USA government. For this experiment, I collected data samples from four different locations around the University of Texas campus in the USA. I utilized several research equipment such as incubator, petri films, and pipettes to process, incubate, and grow the fecal bacteria for examination. The data collected indicate that despite the city of Austin named as a top livable city in the USA, the UT-Austin campus does not meet the criteria for being safe due to the high levels of E. coli which greatly exceed the recommended 406 E.coli/100 mL. These high levels may have been caused by the fecal disposals from an abundance of small critters such as raccoons or squirrels that live around the campus. This research demonstrated the need for properly maintaining local bodies of water. I discovered that one of the sites, the Texas Alumni center, had high concentrations of fecal bacteria averaging 8380 CFU/100 mL or 20 times the acceptable level. As a result, the concentration of fecal bacteria along the campus, which can host up to 50,000 student population, might be highly dangerous for human activities as it greatly exceeded the recommended E.Coli/100ml (406 E.Coli/100ml). This becomes an active issue that alerted the University administrators and urged them to undertake control measures to reduce E.coli levels and maintain public community safety for its citizens.

Keywords: fecal, E.Coli, bacteria

Assesing The Impact of Climate Change on Horticultural Crop Production in Enrekang District, South Sulawesi

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Climate change is a global phenomenon that has a significant impact on various sectors, including horticultural production. This study aims to analyse the relationship between climate change and horticultural production in Enrekang Regency as a center for horticultural production in South Sulawesi. This study uses primary data obtained from interviews with agricultural service staff or extension workers. Secondary data in the form of rainfall data and horticultural production in the period 2011 to 2021 were obtained from the Meteorology, Climatology and Geophysics Agency of South Sulawesi Province and the Agriculture Office of Enrekang Regency. The data was processed using a quantitative method using the IBM Statistical SPSS (Statistical Product and Service Solution) 22 data processing tool by applying the linear regression method to analyse the relationship between climate variables, namely annual rainfall and the main horticultural crop production in the area. The results of this study indicate that the impact of climate change has had an impact on the production of several horticultural crops, both significantly and not significantly. Increased rainfall has a significant effect on the increase in shallot production by 48.9%, but increased rainfall has an insignificant effect on potato production by 1.2% and cabbage by 10.5%. The findings of this study will be implemented by policymakers and agricultural practitioners to develop adaption strategies that appropriate for local context.

Keywords: Climate change, horticultural, rainfall,

Surabaya Water Legacy: Investigating The Water Quality by Differentiating the Economic Regions

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Tap water is an essential need for humans. There were concerns raised regarding the inferior water quality in economically disadvantaged regions and a few from the privileged economic regions in Surabaya. The aim of this study is to compare the tap water quality between disadvantaged and privileged regions in Surabaya, with the research question: "To what extent does the tap water quality differ from the disadvantaged and privileged economic regions in Surabaya?" This study hypothesises that there is a significant difference between the tap water quality of privileged and disadvantaged economic regions in Surabaya. The quality of water was measured by several parameters, such as dissolved oxygen, pH levels, and turbidity. The research hinged upon twenty-four tap water specimens, from a total of thirty-one subdistricts. The Slovin formula: $(N=n/(1+ne2))$, was used to determine the sample size. The acquisition of data pertaining to dissolved oxygen and turbidity was executed with the aid of data loggers, whereas the pH levels data was assessed using a pH meter. The findings of this research for both economic regions were: (1) The pH levels exhibited a similar level between 6.5-7, which is within the safety threshold of 7, (2) Comparable Dissolved Oxygen levels of 6.2-6.5, meeting the safety threshold of 5 mg/l. (3) Elevated turbidity levels in both regions (12.6-27 ntu), exceeding the 5 ntu safety limit. The findings indicated elevated turbidity levels in all of Surabaya's tap water and there was no significant difference between privileged and disadvantaged economic regions. Therefore, the hypothesis was rejected.

Keywords: tap water, turbidity, dissolved oxygen, pH

The Effects of Social Proof towards Canisius College Jakarta's 12th Graders Opinion about Gamelan's Melodic Resonance

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This research is based on the concern of the researcher regarding the decline of Gamelan culture among young people. The researcher discovered that social proof or the majority group's thoughts can influence the opinions of individuals within that group. An idea emerged to influence the opinions of 12th-grade students at Canisius College Jakarta regarding the melodic resonance of Gamelan through social proof. The researcher conducted two surveys. The first survey consisted of Gamelan audio and a question about the respondents' interest in Gamelan. The second survey also included both components and added the element of social proof, stating, "The majority of your friends answered that they are interested." A total of 171 respondents participated in the first survey, and all of them also completed the second survey. The researcher analysed these data by comparing the percentage of those who expressed interest in the first and second surveys and sought the correlation between social proof and 12th grade students' opinions using the Pearson coefficient. It was found that the increase in percentage and the value of the Pearson coefficient was only 1.8% and 0.020, respectively. This indicates that the influence of social proof was relatively small. One reason for this is that the opinion did not come from individuals with more experience in Gamelan. An interesting idea for future research is exploring how to utilize social proof from experienced individuals to shape public opinion for the common good.

Keywords: gamelan, influence, gamelan audio, experience individual

The Impact of Sleep Deprivation on Attention Span of SMA Cita Hati Students

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Senior high school students frequently experience sleep deprivation, associated with physical and academic impairment. The aim of this study is to investigate the effects of a night's sleep deprivation on students' attention span. We hypothesized that since learning demands a large amount of cognitive work such as attention, we expect that students who get 8-9 hours of sleep per night will be able to have better results in learning because they have more attention span. Students who have experienced sleep deprivation will have worse results in learning because less attention span. Sleep deprivation will be operationalized into three groups: students with 4-5 hours, 6-7 hours and 8-9 hours of sleep. The learning result will be operationalized by the correct words recalled from 50 two-syllable words in 5 minutes. Our study involves a quasi-experimental in which we enlist students from SMA Cita Hati Christian School East Campus. We would give them a questionnaire regarding their sleeping habits and patterns for the past 3 months. Participants would then be assembled in one room and placed into three different sleeping pattern groups. Participants will have five minutes to memorize 50 two syllable words, which they must then recall the wordlist. As for the results, we will analyse the average words each group is able to recall and compare across the different groups. Through a careful analysis of the research literature and statistical results, the research question will be "to what extent does sleep deprivation impair senior high students' attention span capacity on a task?" These results will highlight the critical importance of addressing effects of sleep deprivation among senior high students to their concentration capabilities and attention span, which will affect their academic achievement in the future.

Keywords: sleep, deprivation, quasi-experimental, students



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