EDISI 2025

POLITEKNIK TUN SYED NASIR SYED ISMAIL

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Technology Engineering Education Science and Research

TEKNOLOGI DAN KEJURUTERAAN

Kalkulator Santan

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Wireless Helmet's Tail Lights and Engine Loc

TEKNOLOGI HIJAU DAN KEJURUTERAAN

Pocket d'klaz

Solid Waste Management System

Dual Axis Solar Tracker With Iot Monitoring

TEKNOLOGI KIMIA DAN MAKANAN

Turkey Berry Latte

Plant-Based Sweet Potato Waffle Cone

REVOLUSI INDUSTRI 4.0

Centdóne Smart System

Smart Command Line Interface Tool for Cisco Packet Tracer (sCLIt)

PENULISAN KREATIF

Diet Keto & Diabetes: Solusi Terkini atau Sekadar Trend?

Menghidupkan Warisan melalui Teknologi: Pameran Virtual

MENJANA ILMU, MENGGERAK INOVASI

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Nota Editor

Berteraskan sains dan teknologi, edisi ini mengajak pembaca meneroka kedua-duanya dengan pendekatan yang kreatif tanpa mengubah inti maksudnya.

Bersyukur ke hadrat Ilahi, dengan limpah kurnia-Nya E-Digest TEESRec kembali diterbitkan dengan mutu penyampaian yang terus terjaga. Setulus penghargaan ditujukan kepada Jawatankuasa Penerbitan PTSN atas dedikasi dan sentuhan profesional mereka dalam menggilap setiap artikel. Sekalung terima kasih juga kepada para penyumbang Program i-Sinergy 2025, yang hadir dengan idea segar dan komitmen tinggi, memaknakan lagi edisi kali ini dengan kandungan yang hidup dan bertenaga.

Dalam era yang kian dipacu digital, artikel ini menyorot perubahan yang membentuk semula hidup kita. Kesan teknologinya dihuraikan secara kreatif agar pembaca kekal peka.

Dr.Rahizana binti Mohd Ibrahim

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Program I-SINERGIE 2025

"Empowering a Sustainable Future Through Innovation"

Dengan penuh rasa penghargaan, kami merakamkan ucapan terima kasih kepada Program I-SINERGIE 2025 yang telah menjadi pemangkin kepada penerbitan E-Digest PTSN edisi tahun ini. Melalui semangat "*Empowering a Sustainable Future Through Innovation*", program ini bukan sahaja mengumpulkan para peserta berbakat dari pelbagai negara, malah turut membuka ruang kepada idea berimpak tinggi yang kini didokumentasikan dalam bentuk 40 artikel yang menyumbang kepada E-Digest kali ini. Usaha dan kolaborasi yang ditunjukkan sepanjang program ini membuktikan bahawa inovasi dan kelestarian mampu digerakkan bersama apabila minda kreatif disatukan. Semoga kerjasama ini terus diperkukuh dan menjadi inspirasi kepada lebih banyak penciptaan masa hadapan.

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DIGES TEESRec PTSN

TEKNOLOGI DAN KEJURUTERAAN

Teknologi Berkembang, Kejuruteraan Maju

TERUSKAN MEMBACA

FLEXI PFD-X

Khairul Aswad Ishak, Nurhani Syufaiza Arishad,
Siti Khairun Naemah Malik
Bahagian Peperiksaan dan Penilaian, JPPKK

>>> PENGENALAN

Produk inovasi Flexi PFD-X dihasilkan sebagai inisiatif bagi memenuhi keperluan pelajar dan pensyarah semasa melaksanakan aktiviti air bagi Kursus Rekreasi Pelancongan. *Personal Flotation Device* (PFD) sedia ada bersaiz standard dan hanya sesuai untuk individu dengan saiz badan dari *Small* (S) hingga *Large* (L) sahaja. Ini menyebabkan mereka yang mempunyai ukuran saiz badan melebihi saiz L hanya dapat menjalankan aktiviti yang terhad dan seterusnya menjejaskan kelancaran pelaksanaan latih amali dan sesi pengajaran dan pembelajaran (PdP) di institusi. Penghasilan produk inovasi PFD-X ini bertujuan untuk menyediakan PFD yang bersaiz fleksibel untuk semua ukuran saiz badan, dilengkapi dengan padding mudah alih, water bag, ciri keselamatan tambahan serta mudah dipakai dan disimpan setiap kali penggunaan agar pelaksanaan aktiviti amali di air dapat dijalankan dengan lancar dan menyeluruh.

Flexi PFD-X turut dihasilkan menggunakan bahan kalis air, ringan, tahan lasak dan cepat kering menjadikan produk lebih selesa, tahan lama dan sesuai digunakan dalam pelbagai keadaan cuaca dan persekitaran. No Pendaftaran MyIPO : LY2025C08526

Produk Inovasi Flexi PFD-x

Personal Flotation Device Standard

>>> PENYATAAN MASALAH

1.PFD sedia ada mempunyai saiz yang terhad
2.Tidak dapat memenuhi keperluan individu ukuran saiz badan melebihi saiz L
3. Latih amali dan sesi PdP tidak dapat dilaksanakan secara insklusif

METODOLOGI

OBJEKTIF

1. Untuk mereka bentuk PFD fleksibel (Flexi PFD-X) yang boleh disesuaikan dengan pelbagai saiz badan pengguna
2. Untuk menambah ciri keselamatan ke dalam reka bentuk PFD sedia ada.
3. Untuk meningkatkan keselesaan, kebolehgunaan dan kemudahan penyimpanan
4. Untuk menyokong proses PdP yang lebih selamat dan inklusif

>>> PENYELESAIAN

Menghasilkan PFD dengan Reka Bentuk Saiz Fleksibel (Universal Fit)

Penyelesaian utama ialah menghasilkan PFD yang flexibel dan boleh dilaras sesuai untuk kegunaan pelbagai ukuran saiz badan pengguna – dari saiz kecil (S) hingga ke saiz ekstra besar (XXXL).

Integrasi Ciri Keselamatan Tambahan pada PFD

Selain mempunyai wisel kecemasan dan jalur reflektif pada PFD, produk ini turut dilengkapi dengan ciri keselamatan tambahan iaitu QR Code - yang mempunyai borang penggunaan dan boleh mengesan lokasi penggunaan serta *GPS tracker* yang dapat mengesan lokasi aktiviti pengguna pada setiap masa.

Penambahan Water Bag untuk Kegunaan Jangka Panjang

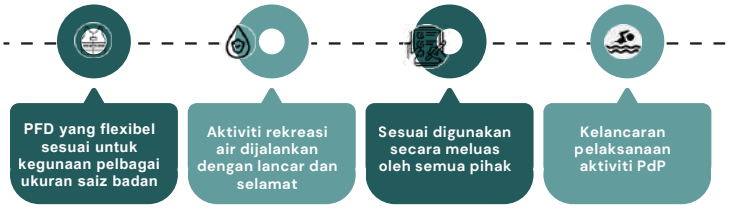
Flexi PFD-X turut direka dengan water bag untuk membantu pengguna untuk pengambilan air tanpa perlu menanggalkan PFD semasa melaksanakan aktiviti serta dapat memastikan pengguna kekal terhidrat ketika menjalankan aktiviti dalam tempoh yang lama.

Penggunaan Bahan Berkualiti dan Ergonomik dalam penghasilan produk

Penghasilan Flexi PFD-X dari material *nylon*, *foam*, *non – slip grip rubberized* yang kalis air, tahan lasak, ringan dan selesa untuk digunakan untuk semua aktiviti air.

>>> KESIMPULAN

Kelebihan Flexi PFD-X



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>>> IMPAK

1. **Menyokong Pengajaran & Pembelajaran yang Inklusif -** Reka bentuk PFD-X yang fleksibel dan boleh laras membolehkan pelajar dan pensyarah terlibat secara aktif dalam melaksanakan aktiviti Air dengan selesa.
2. **Meningkatkan Keselamatan Aktiviti Air** - Flexi PFD-X dilengkapi dengan ciri keselamatan seperti wisel kecemasan, jalur reflektif, QR Code penggunaan dan lokasi serta GPS Tracker yang membantu meningkatkan tahap keselamatan pengguna semasa aktiviti air, terutamanya dalam situasi kecemasan.
3. **Meningkatkan Kualiti Kursus Rekreasi Pelancongan** - Penghasilan Flexi PFD-X yang lebih selesa, sesuai dan selamat menjadikan proses PdP lebih berkesan sekaligus meningkatkan minat pelajar terhadap kursus rekreasi pelancongan.
4. **Menyumbang kepada Inovasi Pendidikan TVET** - Flexi PFD-X merupakan hasil inovasi untuk menyelesaikan isu pelajar dan pensyarah berasaskan keperluan sebenar. Ia menunjukkan keupayaan institusi pendidikan TVET dalam menghasilkan produk inovasi yang praktikal yang boleh diguna pakai dalam setiap aktiviti air.
5. **Potensi Pengkomersialan** - Reka bentuk yang serbaguna, material yang berkualiti, dilengkapi ciri keselamatan dan ciri tambahan lain menjadikan produk ini berpotensi untuk dikomersialkan kepada pengusaha aktiviti rekreasi, pengusaha resort dan institusi pengajian tinggi yang memerlukan.

KALKULATOR SANTAN

Noor Azam Azmi, Nor Aishah Ismail, Norehan Abd Aziz, Noor Suhaina Ajis, Halimah Ab Rahim,
Politeknik Sultan Haji Ahmad Shah

>>> PERKENALAN

Inovasi “KALKULATOR SANTAN” adalah suatu aplikasi android untuk mengira kuantiti bahan mentah bagi formulasi santan mengikut perolehan santan kelapa yang diperolehi di dalam sesuatu *batch* pengeluaran. Inovasi ini dilaksanakan atas keperluan industri pemprosesan santan yang menggunakan resipi dengan berat tetap (Kg). Masalah utama semasa pemprosesan santan adalah kuantiti santan yang dihasilkan berbeza-beza mengikut pengeluaran, jadi ini menimbulkan masalah sama ada santan yang diperolehi tidak mencukupi mengikut keperluan resipi atau kerugian kerana perolehan yang berlebihan. Tujuan inovasi ini adalah menghasilkan aplikasi bagi mengira kuantiti bahan mentah berasaskan kuantiti santan yang diperolehi berdasarkan formulasi santan.

IPenciptaan inovasi ini melalui kaedah Plan, Do, Check and Action (PDCA) sehingga mencapai objektif dan memenuhi keperluan pengguna. mpak aplikasi “KALKULATOR SANTAN” adalah dapat mengira kuantiti bahan mentah secara automatik serta tepat, pengeluaran santan yang fleksibel, kualiti produk yang konsisten, penjimatan bahan serta kos dan mesra penggguna. Cadangan terhadap inovasi ini adalah dengan menambahbaik versi aplikasi “KALKULATOR SANTAN” yang boleh mengubah peratus bahan mentah yang digunakan untuk diperluaskan kepada banyak lagi industri pemprosesan santan.

Secara keseluruhan, Kalkulator Santan merupakan inovasi praktikal dan bernilai tinggi yang bukan sahaja memudahkan pengguna, malah memberi kelebihan kompetitif kepada industri pemprosesan santan serta menyumbang kepada pembangunan modal insan berasaskan teknologi.

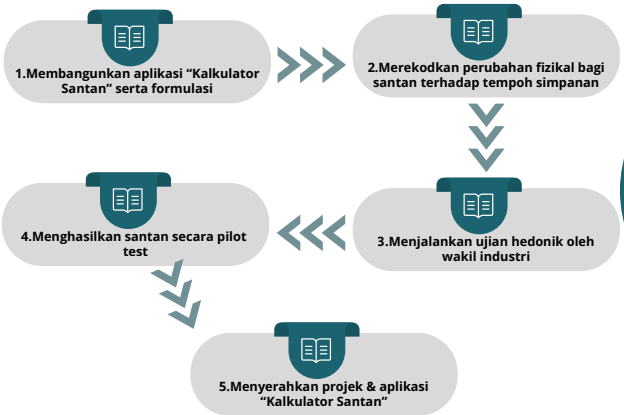
>>> PENYATAAN MASALAH

1.Perolehan santan tidak tetap
2.Jangka hayat yang pendek
3.Bahan tambah tidak mencukupi
4.Santan kurang likat

OBJEKTIF

1. Menentukan formulasi bagi pembinaan aplikasi “Kalkulator Santan”
2.Menentukan tahap penerimaan oleh wakil industri
3.Menentukan perubahan fizikal santan terhadap tempoh simpanan santan

METODOLOGI



>>> PENYELESAIAN

Formulasi Kalkulator Santan

Formulasi fleksibel bagi berat bahan dikira berdasarkan keapda berat SANTAN KELAPA.

Kualiti santan adalah konsisten apabila menggunakan "KALKULATOR SANTAN" kerana bahan mentah berkadar terus dengan hasil santan

Tahap penerimaan wakil syarikat

Wakil industri suka terhadap warna, aroma, tekstur, rasa dan penerimaan keseluruhan bagi santan kelapa. Maklumbalas ini menunjukkan bahawa santan kelapa yang dihasilkan sesuai untuk dipasarkan oleh industri (Wattanapahu et al.,2012)

Tempoh simpanan santan

Hari	Ciri-ciri Fizikal						Kesimpulan
	Warna	Bau	Tekstur	Lendir	Pemisahan fasa	Buih	
1-10	Putih pekat	Segar	Licin pekat	Tiada	Tiada	Tiada	Optimum
11-19	Putih pekat	Segar	Berketul sedikit	Tiada	Sedikit	Tiada	Kualiti menurun
20	Putih pekat	Kemasaman	Berketul sedikit	Tiada	Sedikit	Tiada	Kerosakan santan

>>> KESIMPULAN

Kelebihan Kalkulator Santan

>>> RUJUKAN

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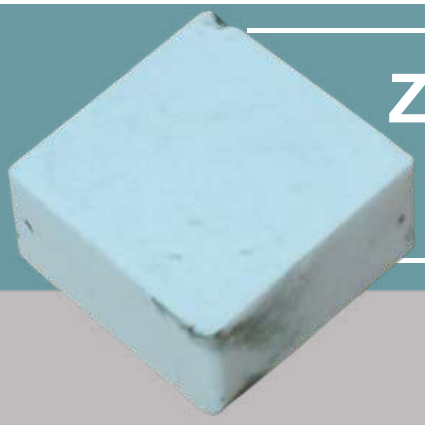
>>> IMPAK

1. **Pengiraan bahan mentah secara automatik**- Hasilan santan yang tidak tetap memerlukan aplikasi Kalkulator Santan untuk mengira berat bahan yang tepat
2. **Pengeluaran santan yang fleksibel-** Perolehan santan yang tidaktetap bagi setiap pengeluaran dapat dimanfaatkan 100% melalui formulasi berasaskan peratus yang fleksibel. Masalah lebihan santan juga dapatdiatasi.
3. **Pengeluaran santan yang meningkat-** Pengeluaran santan syarikat meningkat daripada 848Kg santan kepada 1272Kg santan. Peningkatan pengeluaran santan adalah sebanyak 424Kg. Pengeluaran santan meningkat sebanyak 50%.
4. **Pendapatan santan yang meningkat-** Pendapatan syarikat meningkat daripada RM6,360 kepada RM11,448.00. Peningkatan pendapatan syarikat adalah sebanyak RM5,088. Pendapatan syarikat meningkat 80%).
5. **Jangka hayat santan yang meningkat-** Jangka hayat santan dapat ditingkatkan daripada 3 hari kepada 10 hari. Peningkatan jangka hayat adalah sebanyak 7 hari. Jangka hayat santan meningkat 3.3 kali ganda (Sanjana, 2024)
6. **Janaan pendapatan kepada CFoST-** Pendapatan CFoST (POLISAS) melalui pembangunan formulasi santan, sesi lawatan, khidmat konsultansi dan penyelidikan bagi projek santan ini adalah sebanyak RM6,500.00



ZTA-CeO_2-MgO INSERTS

Nik Akmar bin Rejab,Nurul Khairunnisa binti Su[2], Mohd Nazri bin Idris, Hasmaliza binti Mohamad[4] and Zainal Arifin bin Ahmad[5]
[1]Universiti Sains Malaysia
[2]Politeknik Tuanku Syed Sirajuddin

>>> INTRODUCTION

This innovation extends our previously published research on zirconia-toughened alumina (ZTA) reinforced with CeO_2 and MgO nanoparticles [1]. While the earlier study focused on scientific mechanisms, the present work demonstrates their application as cutting tool inserts for surface finishing operations. Surface finishing requires inserts with very high hardness and wear resistance to maintain a sharp and stable edge, ensuring excellent surface quality. Table 1 shows the material properties between finishing and roughing operation in metal cut machining as the reference. Zirconia-toughened alumina is particularly attractive due to its high hardness, wear resistance, and potential for high-speed machining. By incorporating CeO_2 and MgO nanoparticles, this study explores how microstructural refinement can further improve hardness, toughness, and wear resistance, addressing the key challenge of brittleness in ceramic cutting inserts.

Zirconia-toughened alumina (ZTA) is widely studied for ceramic cutting inserts because of its high hardness and wear resistance, but its poor fracture toughness still causes premature chipping and tool failure. Previous strategies such as microstructural control and oxide reinforcement have improved properties, but the balance between hardness, toughness, and wear resistance remains a challenge. While CeO_2 improves phase stability and MgO nanoparticles refine grain size and inhibit growth, each alone is not sufficient [1,3]. Therefore, combining CeO_2 and MgO nanoparticles offers a promising route to overcome these limitations and develop ZTA cutting inserts optimized for surface finishing applications.

Operation	Hardness	Toughness	Wear Resistanc
Finishing	Very high (≥1428 – 1835 HV)	Moderate (resists micro-	Excellent (abrasive & crater
Roughing	Still high, but secondary	Higher (to survive impact/int	Robust (adequate for heavy

Comparison between finishing and roughing operation in metal cut machining [2]

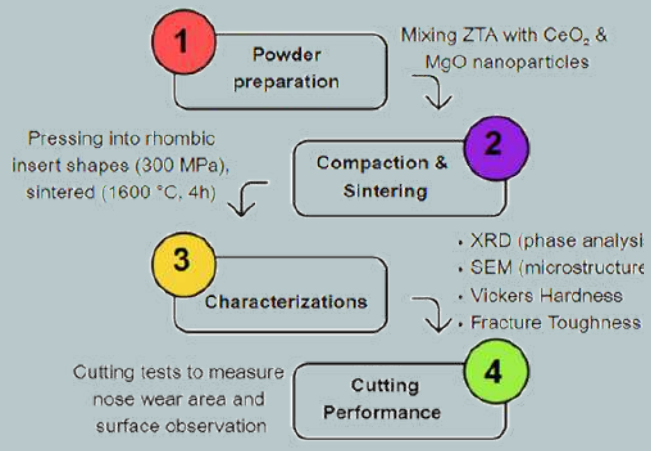
>>> PROBLEM STATEMENTS

1. ZTA is hard and wear-resistant but brittle, leading to chipping and tool failure.
2. Single reinforcements (CeO_2 or MgO) provide partial improvement but cannot balance hardness, toughness, and wear resistance.
3. A combined reinforcement approach is required to overcome brittleness and enhance tool performance.

>>> OBJECTIVES

1. To introduce ZTA-CeO_2-MgO ceramic inserts as an innovative material for surface finishing in turning operations.
2. To demonstrate the efficiency of CeO_2 and MgO additions in enhancing hardness, wear resistance, and overall performance of ZTA composites compared to commercial WC-Co tool inserts.

>>> METHODOLOGY

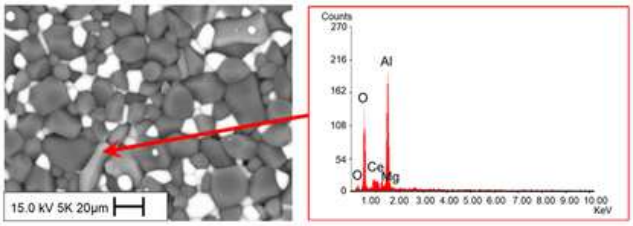


Methodology for fabricated ZTA-CeO_2-MgO inserts

>>> RESULTS AND DISCUSSION

Phase and Microstructural Analysis

- Dominant phases: α-Al_2O_3 + Y-ZrO_2.
- New phase: $MgAl_{11}CeO_{19}$ (redistribution of Mg & Ce).
- Grain refinement → better stability.



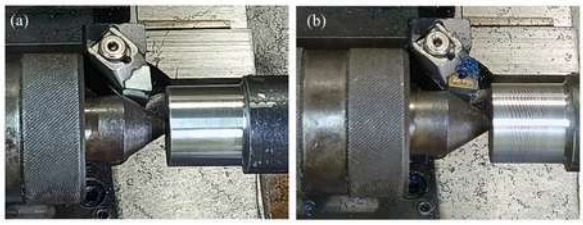
Phase and microstructural analysis for ZTA-CeO_2-MgO inserts

Mechanical Properties

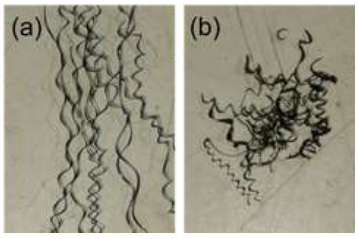
- Hardness: 1618 HV (↑ than WC-Co 1581 HV).
- Toughness: 8.84 MPa·m¹/² (slightly↓vs WC-Co 9.12 MPa·m¹/²).
- Nose wear: 0.0578 mm² (↓41% vs WC-Co 0.0979 mm²).

Cutting Performance

- Stable at high speed (800 RPM).
- Smooth spiral chips (better cutting stability).
- Superior surface finish (cleaner edges, less wear).



Phase and microstructural analysis for ZTA-CeO_2-MgO inserts



Chip formation of (a) ZTA-CeO_2-MgO and (b) commercial WC-Co tool inserts

ZTA-CeO_2-MgO inserts Vs WC-Co inserts properties

Properties	ZTA-CeO_2-MgO Inserts	Commercial WC-Co Inserts
Hardness (HV)	1618±7.18 HV	1581±5.03 HV
Fracture Toughness	8.84±0.58 MPa·m1/2	9.12±0.46 MPa·m1/2
Nose Wear Area (mm²)	0.0578±0.02 mm2	0.0979±0.03 mm2

ZTA-CeO_2-MgO inserts Vs WC-Co inserts properties

>>> CONCLUSION

1. The ZTA-CeO_2-MgO cutting inserts represent an innovative advancement in ceramic tool technology by offering a practical balance of hardness, toughness, and wear resistance.
2. These improvements make them strong candidates for industrial applications requiring, high wear resistance, and resistance to catastrophic fracture, particularly in semi-finishing and finishing operations.

>>> IMPACT

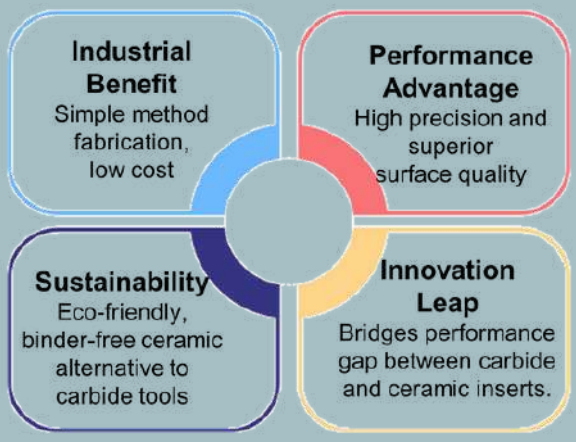


Figure 5: Potential impacts

Sustainability Development Goals (SDGs)

Figure 6: Sustainability Development Goals (SDGs) for ZTA-CeO_2-MgO inserts

>>> REFERENCES

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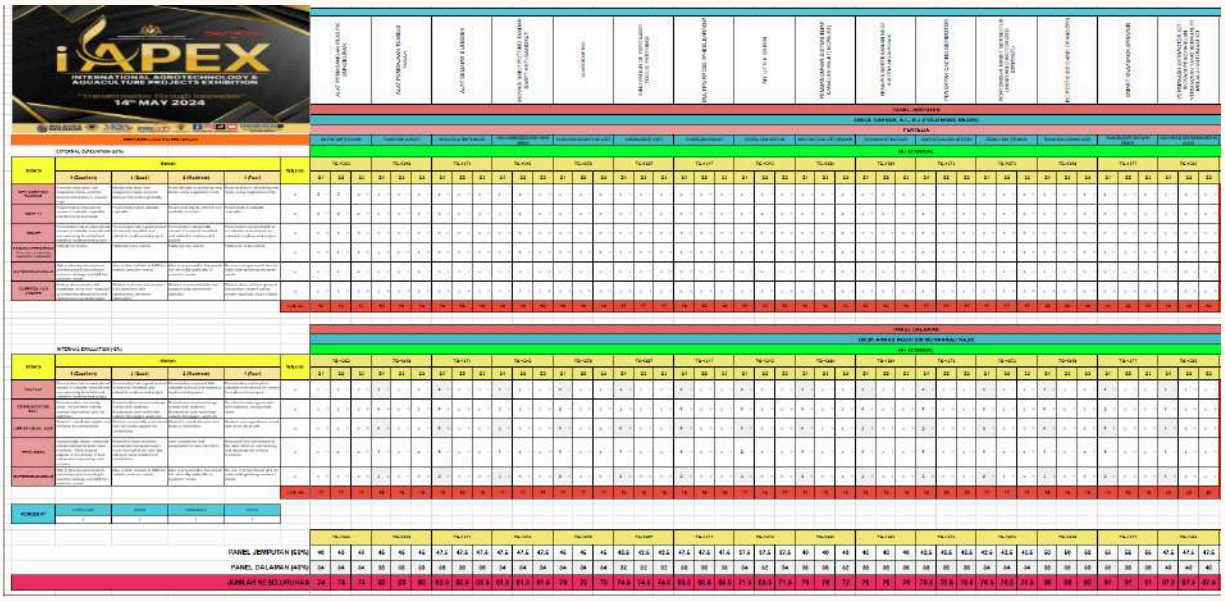
SMART SCORING SHEET (S3)



Interface of S3 contain rubric for External & Internal Jury. Access to this rubric is only given to Jury's assigned at specific category.

Muhammad Adam Teo Koon Sing, Zati Hazirah binti Salleh
Politeknik Jeli Kelantan

Academic exhibitions face persistent challenges in project assessment due to reliance on manual scoring systems. The Smart Scoring Sheet (S3) emerges as an innovative solution—an Excel-based platform automating real-time judging.

Implemented during final-year project exhibitions at Politeknik Jeli Kelantan, S3 replaces paper-based methods with a digital framework that accelerates results while ensuring fairness and transparency. S3 targets three transformative goals: eliminating delays in result processing, automating medal allocation (Gold/Silver/Bronze) through dynamic thresholds, and enabling instant identification of category winners like "Best Category." Designed for accessibility, it leverages ubiquitous Excel software to democratize advanced judging capabilities without proprietary tools.

Traditional manual judging struggles with critical inefficiencies. Paper-based systems consume times for score aggregation, delaying award announcements. Human calculation errors and subjective medal allocation compromise fairness. These bottlenecks disrupt event flow and diminish participant engagement. Developed using Excel's native functionalities, S3 integrates formulas, conditional formatting, and data validation. Judges input scores via real-time collaborative spreadsheets. Core automations include SUMIFS formulas compute weighted team totals, threshold-driven IF statements assign medals (e.g., Gold ≥80%) and Best Category winner is identified through the highest marks achieved by groups within their category. S3 has proved its functionality in exhibition with high groups participants involving 12 judges evaluating 50+ projects across multiple categories.

Judges (Internal & External) key in marks in real time for each students based on rubric criteria.

	TG-1323		
PANEL JEMPUTAN (60%)	40	40	40
PANEL DALAMAN (40%)	34	34	34
JUMLAH KESELURUHAN	74	74	74

Final marks automatically calculated based on percent weightage

MARKAH				
LUAR	DALAM	JUMLAH	PURATA	PINGAT
40	34	74	74	SILVER
40	34	74		
40	34	74		

Medal (Gold/Silver/Bronze) is assigned immediately

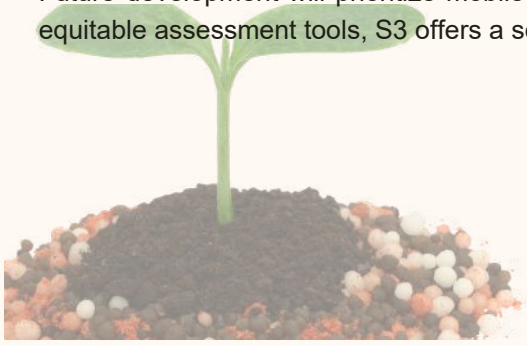
Developed using Excel's native functionalities, S3 integrates formulas, conditional formatting, and data validation. Judges input scores via real-time collaborative spreadsheets. Core automations include SUMIFS formulas compute weighted team totals, threshold-driven IF statements assign medals (e.g., Gold ≥80%) and Best Category winner is identified through the highest marks achieved by groups within their category. S3 has proved its functionality in exhibition with high groups participants involving 12 judges evaluating 50+ projects across multiple categories.

IMPACT!

Evaluation committee checking final results at the end of exhibitions

- Time Savings: Cuts result-processing times, enabling instant winner announcements.
- Error Elimination: 100% accuracy in score calculations.
- Bias Reduction: Transparent, threshold-based medal allocation ensures objective results.
- Data-Driven Decisions: Organizers gain actionable insights (e.g., score distributions, judging trends).
- Scalability: Supports small classrooms to large exhibitions (50+ teams, 10+ judges).
- Cost-Free Solution: No budget required—runs on existing Excel infrastructure.
- Sustainability: Paperless judging reduces waste and administrative clutter.

S3 transforms academic exhibitions by converting manual judging into an efficient digital workflow. Its success lies in delivering real-time results, ensuring objective medal allocation, and requiring zero financial investment. Future development will prioritize mobile integration and AI-assisted discrepancy detection. As institutions seek equitable assessment tools, S3 offers a scalable solution balancing rigor with accessibility.



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MOTORIZED LATHE TOOL SHARPENING JIG

Mohd Hazri Omar, Mohamad Nazri Abdul Halim and Sofian Yusoff
Politeknik Sultan Abdul Halim Mu'adzam Shah,

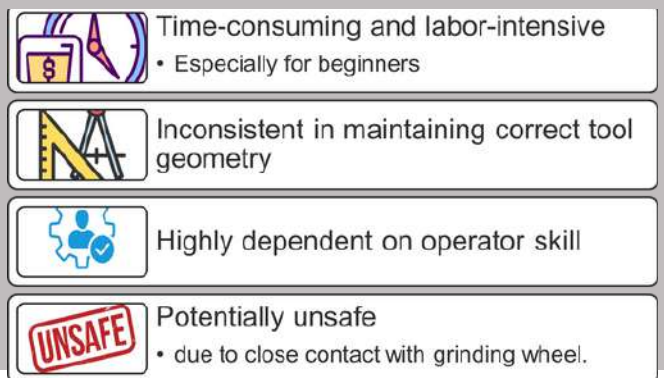
INTRODUCTION

The Motorized Lathe Tool Sharpening Jig is a compact, motor-assisted system designed to simplify and standardize the sharpening of various lathe tool bits. This invention provides a solution to the limitations of manual sharpening by introducing automation, precision control, and enhanced safety features.The jig accommodates a wide range of tool geometries and includes adjustable components that allow precise replication of cutting-edge angles and clearance profiles
Lathe tool bits are critical components in machining operations, directly affecting surface finish, dimensional accuracy, and overall process efficiency. However, these tools are subject to wear and damage over time due to friction, heat, and repeated use.

Conventional sharpening methods are predominantly manual, requiring skill and experience to maintain correct tool geometry. These methods are not only labor-intensive but often lead to inconsistencies in tool angles, resulting in premature tool failure, poor surface finish, and reduced machining accuracy.

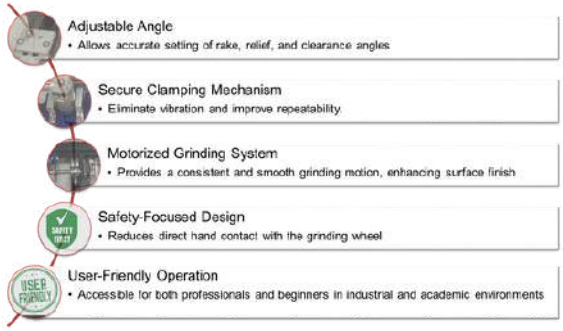
By integrating automation with precision and safety, the Motorized Lathe Tool Sharpening Jig provides a reliable, user-friendly solution to the challenges of traditional tool sharpening. It enhances tool performance, extends tool life, and promotes safe machining practices, making it an invaluable addition to modern machine shops and training facilities.

PROBLEM STATEMENT



Tool bits are subject to frequent wear and damage due to prolonged use, leading to reduced cutting performance, dimensional inaccuracies and potential defects in the workpiece. Traditional sharpening methods are manual, time-consuming and heavily reliant on operator skill.
This often results in inconsistent tool geometry, improper cutting angles, increased tool wear, and decreased productivity. Additionally, manual sharpening poses safety risks due to close contact with abrasive surfaces. There is a need for a more precise, efficient, and safer method to sharpen lathe tool bits, especially one that ensures repeatable results and is accessible to both professionals and beginners

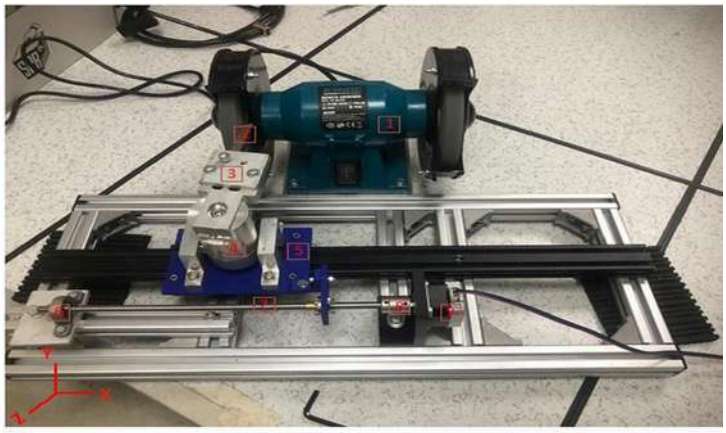
METODHOLOGY



OBJECTIVES

- To design and develop a motorized jig for sharpening lathe tool bits with high precision and repeatability.
- To ensure consistent tool geometry, including accurate rake, relief, and cutting angles for optimal cutting performance.
- To enhance operator safety by minimizing direct contact with the abrasive surface during the sharpening process.
- To create a user-friendly system suitable for both professionals and beginners in industrial and educational settings.

DESIGN

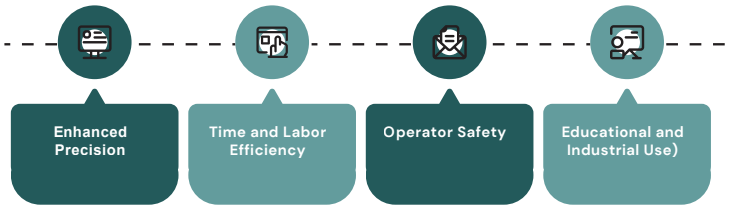


1. Bench Grinder; **2.** Tool Bit; **3.** Tool clamping device; **4.** Rotating Cylinder (X-axis & Y-axis); **5.** Slider (X-axis); **6.** Self-aligning ball bearings; **7.** Lead Screw; **8.** Stepper Motor

1. Bench Grinder –The main grinding unit used to sharpen the lathe tool bits.
2. Tool Bit
3. Tool Clamping Device –Securely holds the tool bit in place during the sharpening process.
4. Rotating Cylinder (X-axis & Y-axis) –Allows the adjustment and rotation of the tool bit along the X and Y axes, enabling accurate angle positioning.
5. Slider (X-axis) – Moves horizontally along the X-axis, enabling precise control of tool positioning relative to the grinding wheel.
6. Self-Aligning Ball Bearings –Reduce friction and allow smooth movement of the slider and rotating components.
7. Lead Screw– converts the motor's rotary motion into linear movement for fine adjustments.
8. Stepper Motor –providing controlled and repeatable positioning

CONCLUSION

Advantages and Applications



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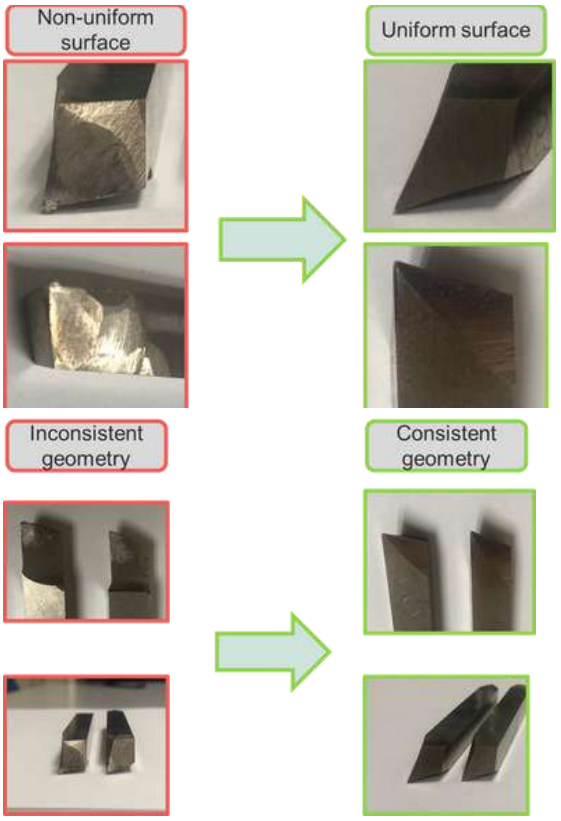
RESULT

Uniform Surface and Consistent Geometry



IMPACT

1. **Ensures consistent tool geometry-** This leads to improved machining accuracy and extends the tool's lifespan by reducing uneven wear, making the sharpening process more reliable and cost-effective.
2. **Provides enhanced operator safety-** By minimizing direct contact with the abrasive surface, the system significantly reduces the risk of accidents and injuries during sharpening.
3. **Highly user-friendly-** It is valuable for technical education and training, and it is adaptable for both industrial and educational environments, making it suitable for a wide range of users, from beginners to professionals.

Overall, this invention combines precision, safety, and usability, making it an effective solution for improving lathe tool sharpening processes

EDUSPHERE: STUDENT INFORMATION HUB

Ts. Hasimahwati binti Abu Yamin, Siti Nurr Hidayah binti Mohd Sanif, Nurul Shuhaila Hasma binti Sharif,
Kolej Komuniti Segamat 2

PENGENALAN

Transformasi digital dalam sektor pendidikan kini menjadi keutamaan bagi memastikan pengurusan institusi lebih cekap, tersusun dan mesra pengguna. Menurut Mohamed et al. (2021), pelaksanaan sistem maklumat berasaskan teknologi di institusi pendidikan dapat mempercepatkan capaian kepada data pelajar, mengurangkan kesilapan manusia dan memudahkan komunikasi antara pelajar dan pentadbiran. Seiring dengan perkembangan ini, Kolej Komuniti juga menyahut seruan pendigitalan dalam pentadbiran akademik bagi meningkatkan kecekapan pengurusan data pelajar.

EduSphere: *Student Information Hub* dibangunkan sebagai sistem inovatif yang menggabungkan penggunaan Kod QR Dinamik untuk memudahkan pengurusan dan capaian maklumat pelajar. Melalui sistem ini, setiap pelajar dibekalkan dengan Kod QR unik yang mengandungi maklumat asas peribadi seperti nama, nombor telefon, alamat dan sebagainya. Keistimewaan Kod QR ini ialah ia turut dilengkapi dengan butang panggilan terus yang membolehkan pihak pentadbiran menghubungi pelajar dengan segera dan lebih cekap.

Tambahan pula, sistem ini bukan sahaja terhad kepada maklumat peribadi, malah Kod QR juga berfungsi sebagai pintu masuk kepada maklumat penting tambahan seperti akses terus ke laman sesawang CCMS untuk menyemak markah peperiksaan akhir, buku panduan pelajar dan borang e-Aduan pelajar. Kajian oleh Aini et al. (2020) menunjukkan bahawa integrasi Kod QR dalam sistem pendidikan meningkatkan kebolehcapaian data dan menyokong komunikasi pantas dalam ekosistem akademik.

Dengan hanya menggunakan telefon pintar atau peranti yang sesuai, pengguna boleh mengimbas Kod QR untuk mengakses data pelajar dengan cepat, tepat dan mudah. Secara tidak langsung, sistem ini bukan sahaja meningkatkan keberkesanan pengurusan data pelajar, malah turut menyokong budaya pendigitalan dalam pentadbiran pendidikan yang sejajar dengan aspirasi Pelan Pembangunan Pendidikan Malaysia (Pendidikan Tinggi) 2015–2025 untuk memperkasakan inovasi teknologi dalam pengurusan akademik (Abdullah & Nor, 2023).

OBJEKTIF INOVASI

Objektif EduSphere: *Student Information Hub* dibangunkan adalah:

1. Memudahkan Akses Data Pelajar
   - Mengintegrasikan semua data pelajar ke dalam satu platform pusat yang mudah diakses seperti no telefon pelajar, alamat pelajar, markah peperiksaan akhir, buku panduan pelajar dan borang e-Aduan pelajar.

2. Memperkenalkan Teknologi QR Code Untuk Akses Cepat
   - Menggunakan kod QR untuk memberikan akses pantas kepada data pelajar, menjadikan proses pengambilan maklumat lebih mudah dan cepat.

PERNYATAAN MASALAH

Dalam sistem pengurusan pelajar sedia ada, terdapat beberapa kekangan yang menjejaskan keberkesanan capaian maklumat dan proses pengesahan identiti pelajar. Pertama, isu kesukaran dalam pengesahan identiti sering berlaku apabila kad pelajar hilang atau tidak bersama pemilik. Kad pelajar hanya memaparkan maklumat asas seperti nama, nombor kad pengenalan dan nombor pendaftaran, tanpa memberikan butiran penting lain seperti nombor telefon, e-mel atau alamat. Keadaan ini menyukarkan pihak pentadbiran untuk menghubungi pelajar tersebut dengan segera sekiranya berlaku kehilangan atau kecemasan.

Sistem sedia ada masih tidak memenuhi ciri-ciri pengurusan data bersepadu yang menekankan keselamatan, kebolehcapaian dan kecekapan seperti yang disarankan oleh Tan & Lee (2021) dalam kajian berkaitan inovasi digital di institusi TVET. Kekangan ini menyebabkan banyak proses pentadbiran masih bergantung kepada kaedah manual yang memakan masa dan berisiko tinggi terhadap kehilangan maklumat.

Selain itu, keterbatasan fungsi Kod QR sedia ada hanya berfungsi untuk memaparkan Buku Panduan Pelajar dalam format PDF tanpa sebarang integrasi dengan data pelajar yang lain. Kajian Shamsudin & Rahman (2022) mendapati teknologi Kod QR boleh berfungsi dengan lebih berkesan jika diintegrasikan dengan sistem pengurusan akademik bagi membolehkan akses kepada pelbagai maklumat seperti keputusan peperiksaan, aduan pelajar dan profil individu. Oleh itu, wujud keperluan untuk membangunkan satu sistem yang mampu menyediakan akses yang lebih komprehensif, cepat dan mudah kepada maklumat pelajar melalui integrasi Kod QR Dinamik yang boleh menyelesaikan kekangan ini.

NOVELTY / KEASLIAN INOVASI

Keaslian pertama EduSphere ialah proses pembangunannya dilaksanakan sepenuhnya oleh kepakaran dalaman Kolej Komuniti Segamat 2 yang berkemahiran dalam bidang teknologi maklumat. Hal ini membuktikan keupayaan dan potensi institusi dalam menghasilkan penyelesaian teknologi yang bersifat kos efektif, dan memenuhi keperluan sebenar pengguna di peringkat kolej komuniti.

Kedua, penghasilan Kod QR yang unik bagi setiap pelajar berfungsi sebagai identiti digital yang boleh diimbas untuk mendapatkan maklumat pelajar dengan cepat dan tepat. Ia menjimatkan masa dan mengurangkan kebergantungan terhadap sistem carian manual yang sering mengambil masa lama. Selain itu, data yang disimpan secara digital juga lebih selamat dan mudah dikemaskini mengikut keperluan institusi.

Tambahan pula, EduSphere turut mengintegrasi pelbagai elemen penting ke dalam Kod QR tersebut yang mengandungi maklumat asas pelajar, serta pautan kepada pelbagai sumber maklumat umum seperti nombor telefon, capaian ke CCMS, buku panduan pelajar, serta borang e-Aduan pelajar. Gabungan maklumat ini menjadikan Kod QR dalam EduSphere sebagai satu *one-stop hub* yang komprehensif dan dinamik.

MANFAAT / IMPAK INOVASI

Manfaat / impak inovasi EduSphere dapat dilihat melalui peningkatan kecekapan, kebolehcapaian dan keberkesanan komunikasi antara pelajar, pensyarah, pemegang taruh institusi dan komuniti setempat:

1. Manfaat / impak inovasi kepada Pelajar:
   - Pelajar mempunyai akses mudah dan pantas kepada website CCMS bagi semakan markah peperiksaan akhir, buku panduan pelajar dan borang e-Aduan pelajar.

2. Manfaat / impak kepada Pensyarah:
   - Pensyarah dapat mengakses maklumat pelajar dengan mudah dan cepat, membuat panggilan terus kepada pelajar, mengakses dan memverifikasi data pelajar seperti salinan kad pelajar melalui sistem. Hal ini sangat membantu jika pelajar terlibat dalam kegiatan kurikulum atau ko-kurikulum yang memerlukan bukti identiti, seperti program pelajar, seminar atau program lainnya.

METODOLOGI / RESULTS INOVASI

Metodologi inovasi EduSphere: *Student Information Hub* adalah:
Proses EduSphere dimulakan dengan mendaftarkan maklumat pelajar seperti pada Rajah 1.

Rajah 1: Borang Daftar Pelajar

Rajah 2: Senarai Pelajar

Selepas data pelajar didaftarkan seperti pada Rajah 1, maklumat pelajar tersebut akan dipaparkan pada Senarai Pelajar seperti di Rajah 2. Maklumat asas pelajar yang dipaparkan adalah: (1) Gambar Pelajar; (2) Nama Penuh Pelajar; (3) Nombor Telefon Pelajar; (4) Sesi Pengajian Semasa; (5) Program Pengajian; (6) Kod QR yang mengandungi maklumat lengkap pelajar; (7) Salinan Kad Pelajar dan (8) Maklumat Penting Pelajar.

Salinan Kad Pelajar boleh diakses dengan mengetik ikon Kad Pelajar seperti di Rajah 3.

Rajah 3: Salinan Kad Pelajar

Maklumat Penting Pelajar boleh diakses dengan mengetik ikon Maklumat Pelajar seperti di Rajah 4. Paparan ini menyediakan akses pantas kepada LIMA(5) fungsi utama iaitu (1) Panggilan Terus; (2) Mesej di aplikasi sosial WhatsApp; (3) Buku Panduan Pelajar Kolej Komuniti; (4) Laman Web CCMS dan (5) Borang e-Aduan Pelajar.

Selain itu, pengguna juga boleh menggunakan fungsi-fungsi berikut dengan mengimbas kod QR di belakang Kad Pelajar fizikal.

Rajah 4: Maklumat Penting Pelajar

KESIMPULAN

EduSphere telah membuktikan keberkesanannya sebagai alternatif penyelesaian kepada cabaran pengurusan maklumat pelajar di Kolej Komuniti Segamat 2. Pelaksanaan sistem ini membuktikan pendigitalan proses pengurusan pelajar melalui penggunaan Kod QR bukan sahaja mempercepatkan capaian data, tetapi juga mewujudkan budaya kerja yang lebih sistematik dan berasaskan konsep *big data*. Selaras dengan penemuan Mohamed et al. (2021), sistem pengurusan maklumat pelajar berasaskan web boleh meningkatkan ketelusan, meminimumkan kesilapan manusia dan mempercepatkan keputusan pentadbiran.

Dari perspektif akademik, kajian oleh Aini et al. (2020) dan Shamsudin & Rahman (2022) menunjukkan bahawa penggunaan Kod QR dalam sistem pendidikan menyumbang kepada pembangunan kampus pintar, manakala Tan & Lee (2021) menekankan kepentingan pengurusan data bersepadu sebagai tonggak utama keberkesanan institusi TVET. Oleh itu, EduSphere bukan sahaja mengoptimumkan akses pelajar kepada maklumat, tetapi juga memupuk amalan pendigitalan menyeluruh dalam ekosistem kolej.

Slain itu, inovasi ini juga selaras dengan aspirasi Pelan Pembangunan Pendidikan Malaysia (Pendidikan Tinggi) 2015–2025, yang menekankan peranan teknologi digital dalam memperkukuh kecekapan dan kualiti pengurusan akademik (Abdullah & Nor, 2023). Oleh itu, sistem EduSphere boleh digunakan sebagai model inovasi yang boleh dikembangkan ke kolej komuniti lain sebagai platform penyeragaman data pelajar yang selamat, cepat dan mudah diakses.

Kesimpulannya, EduSphere: *Student Information Hub* bukan sekadar alat bantu pengurusan pentadbiran institusi, tetapi inisiatif strategik yang mampu mengukuhkan kecekapan pengurusan, meningkatkan keselamatan data dan menyokong transformasi digital Kolej Komuniti Segamat 2 ke arah kampus pintar yang inovatif, mampan dan berdaya saing dalam ekosistem pendidikan abad ke-21.

RUJUKAN

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FOLDABLE HOUSE WITH STEEL FRAMING CONCEPT

Masarizan Binti Mohamed, Nurul Asyikin Binti Osman, Muhamammad Aimanuddin Bin Mohd Razali

INTRODUCTION

'The Foldable House with Steel Framing Concept is designed as a mobile, foldable house that provides a solution to one of the main problems in the construction industry, namely project delays. Delays in construction often lead to negative impacts such as abandoned projects, financial losses, damage to the reputation of the involved parties, and legal issues. By introducing this foldable house concept, these issues can be minimized as the main components of the house are pre-assembled using steel framing in the factory and only require simple assembly on-site.

In addition to its industrial application, the Foldable House with Steel Framing Concept prototype is also developed as a teaching and learning aid in laboratories. This aims to help students better understand the IBS technology and its practical application in modern construction.

OBJECTIVE

- To develop a foldable house with a steel framing concept.
- To utilize the foldable house with a steel framing concept as a teaching aid in the IBS laboratory.

RESEARCH METHODOLOGY

The research innovation briefly explains the innovation of the study that will be used to collect data. For this study, the research design refers to below:
Tools required to produce a foldable house with a steel framing concept

FINDINGS

FINDINGS AND DISCUSSION

Criteria	Beam Square Hollow Section (SHS)		Column	
Size	100 x 100 mm	100 x 200 mm	100 × 100mm	100 × 200mm
Distance	30cm	60cm		
Modulus Elastik(E)	= 27.01 kNm	= 27.01 kNm	210 000MPa	210 000MPa
Bending Moment	4.05 kNm < 27.01 kNm	16.2 kNm < 27.01 kNm		
Shear force	5.4 kN < 457.26 kN	10.8 kN < 457.26 kN		
Deflection	1.507 × 10−3 mm < 15 mm	0.012 mm < 30mm		
Compression			200 kN < 792 kN	200 kN < 792 kN
Slenderness			$\chi = 0.9$	$\chi = 0.95$
Tension			NEd = 200kN < Nb.Rd = 712.8 kN	NEd = 200 kN < Nb.Rd = 1170.4 kN

CONCLUSION

- improving quality, reducing costs and reducing construction time
- Delays in construction issues can be minimized as the main components of the house are pre-assembled using steel framing in the factory and only require simple assembly on-site.

FEATURES AND IMPACT

This technology uses various prefabricated elements that help accelerate the construction period while improving the quality of workmanship,

The Foldable House with Steel Framing Concept is designed as a mobile, foldable house that provides a solution to one of the main problems in the construction industry, namely project delays.

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PROJECT IMAGES

RECOMMENDATIONS

This study opens opportunities for new innovations in future house construction, especially in the development of mobile and cost-effective housing.For the improvement of this project, need to reduce errors in terms of measurements. To achieve this, need to plan more thoroughly and in greater detai

WIRELESS HELMET TAIL LIGHT AND ENGINE LOCK

Hasyireen binti Abdul Halim, Muhammad Aidil Farhan bin Syaruzamri, Muhammad Fahmi Bin Mohamad
Politeknik Tun Syed Nasir Syed Ismail

>>> INTRODUCTION

Motorcycle safety is a significant concern in Malaysia, given the high accident and fatality rates involving motorcyclists. Studies indicate that motorcyclists are at greater risk than other road users such as food riders, students who use motorcycle as main transport, and daily motorcycle users due to their exposure and lack of protective barriers. Motorcycle accidents have remained consistently high in Malaysia, with head injuries being a major cause of fatalities. The study also highlighted concerns about the effectiveness of helmets, as many fatal victims were found to be wearing protective headgear, suggesting issues with counterfeit or improperly used helmets.

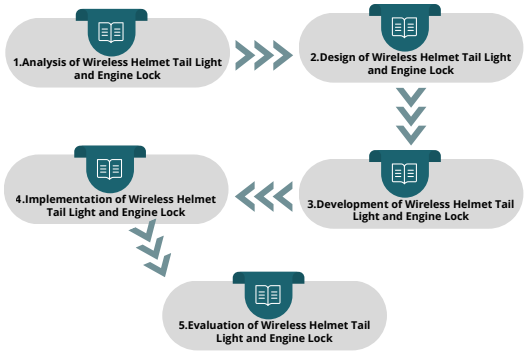
Motorcyclists face multiple challenges on the road, primarily concerning visibility and protective measures. Limited visibility is a key issue, especially when turning or braking, leading to collisions with other vehicles. Reported that passenger cars and trucks are the highest collision partners in motorcycle crashes, with trucks being particularly dangerous due to blind spots. Furthermore, the inability of road users to notice motorcycle tail lights increases the risk of rear-end collisions.

To address these challenges, an innovative wireless helmet system incorporating a tail light and engine lock mechanism has been proposed. The wireless tail light enhances visibility by synchronizing with the motorcycle's braking and turning signals, ensuring that surrounding vehicles can better anticipate the rider's movements. This feature could significantly reduce the risk of rear-end and side collisions. The engine lock system, on the other hand, prevents the motorcycle from starting unless the helmet is securely fastened. Given the concerns about improperly worn or counterfeit helmets, this technology would ensure that motorcyclists comply with safety measures before riding.

>>> PROBLEM STATEMENT

1.Low visibility when turning or braking is a major cause of motorcycle accidents, especially because other drivers (e.g., truck drivers) often fail to notice the motorcycle's tail light.

2.Helmet issues, such as not wearing one or not fastening it properly, significantly increase the risk of severe injuries or fatalities.



METODOLOGI

>>> OBJECTIVES

1. To develop a wireless system that synchronizes the tail light of the helmet with the motorcycle's brake and signal lights, improving visibility to other road users especially heavy vehicles that are as high as 3 meters and above in the distance of 5 meters in order to reducing the risk of accidents caused by insufficient signaling.
2. To design a mechanism that prevents the motorcycle engine from starting unless the helmet is securely fastened, ensuring the rider adheres to safety protocols and reducing the risks associated with improper helmet usage.

>>> PROPOSAL FOR IMPROVEMENTS

1. Enhancing visibility can reduce accidents by making motorcycles more noticeable to other drivers.
2. Proper helmet use can significantly reduce the severity of injuries in accidents.
3. This can ensure helmets are worm and fastened before the engine starts proveneng

>>> CONCLUSIONS

The project successfully achieved its two primary objectives by integrating smart safety mechanisms into motorcycle use. Firstly, the development of a wireless system that synchronizes the helmet's tail light with the motorcycle's brake and signal lights has significantly enhanced visibility, especially for larger vehicles within a 5-meter range and as high 3-meter. This synchronization contributes to reducing the risk of accidents due to poor signaling, making riding safer for all road users.

Secondly, the implementation of a helmet-lock safety mechanism ensures that the motorcycle engine does not start unless the helmet is properly fastened. This system encourages helmet compliance, reinforcing safety practices among riders and helping to prevent injuries related to improper helmet use.

Together, these innovations mark a step forward in the use of embedded systems to improve motorcycle safety, showcasing a practical and effective solution for real-world applications.

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>>> TARGET USER

STUDENT WHO USE MOTORCYCLE AS MAIN TRANSPORT

FOOD RIDERS

DAILY MOTORCYCLE USERS

>>> EFFECTIVENESS OF OUR PRODUCT

Our Wireless Helmet's Tail Light and Engine Lock highly effective in improving riders safety. Its significant in ensuring the rider's braking and turning intentions are clearly visible for drivers especially heavy vehicle like truck or bus which is 3 meters height and above.

Improves reaction time for heavy vehicles behind especially if rider did a sudden lane changes as the drivers could see the indicator in the distance of 5 meters , reducing rear end collisions.

Not only improving road safety, its ensures responsible riding behavior with engine lock features which prevents the motorcycle from starting unless the helmet is fastened, which could result in reducing risk of helmetless accidents.

DESIGN AND DEVELOPMENT OF A 2 IN 1 MAGNETIC WHEEL BROOM FOR EFFICIENT CHIP REMOVAL IN MACHINING WORKSHOPS

Nur Aziah & Nor Aida

This project was developed to address cleanliness issues in the machine workshop after machining activities that produce metal chips and dust. These small yet sharp chips have the potential to cause injuries and disrupt operations. Ordinary brooms often fail to collect these chips effectively, especially when they are stuck due to oil or hidden under machines. Therefore, the 2-in-1 Magnetic Wheel Broom was designed as a solution to this problem.

The cleaning of metal chips in the workshop environment poses several significant challenges that impact overall efficiency, safety, and ergonomics. Metal chips that are mixed with cutting oil tend to harden and adhere strongly to the floor surface, making removal difficult and time-consuming.

Furthermore, chips that accumulate in narrow spaces and beneath machinery are often inaccessible, resulting in incomplete cleaning. The use of conventional brooms has also proven to be ineffective, as they are unable to properly separate fine dust particles from heavier metal chips. Consequently, the cleaning process not only requires an extended amount of time but also forces workers to adopt awkward postures, leading to reduced productivity and potential ergonomic risks.

The main objectives of this project are to design a cleaning tool that is capable of effectively separating dust from metal chips, thereby improving the efficiency of the cleaning process. In addition, the tool aims to reduce both the time and workload involved in post-machining cleaning tasks, allowing for a more efficient maintenance routine. Ultimately, the project seeks to enhance the overall cleanliness and safety levels in the machine workshop, ensuring a more organized and hazard-free working environment.

“The student using the 2-in-1 magnetic wheel broom in the Machine Workshop, Department of Mechanical Engineering, Politeknik Ibrahim Sultan”

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Initial Problem Study → CAD Design → Material Selection → Fabrication Process → Effectiveness Testing

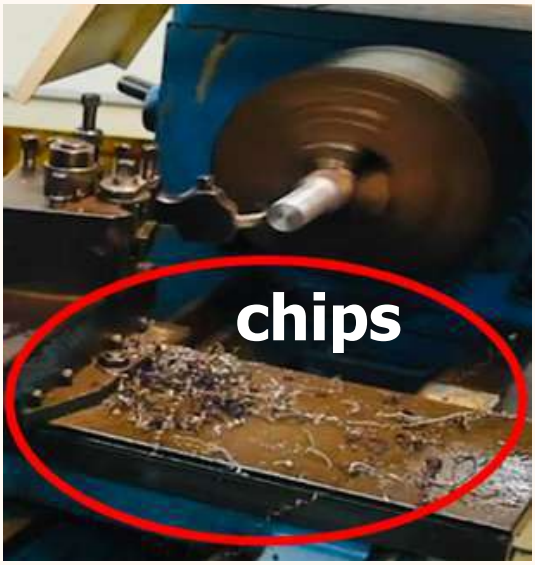
The methodology of this project began with an initial problem study carried out through surveys and direct observation in the machine workshop to identify cleaning challenges faced by users. Based on the findings, a Computer-Aided Design (CAD) process was conducted, which included both 2D sketches and 3D modeling of the proposed cleaning tool. Following the design stage, suitable materials were selected, including a neodymium magnet for effective chip collection, a hard brush for dust removal, and a lightweight PVC structure for ease of handling. The fabrication process was then carried out in the engineering workshop to assemble the tool according to the design specifications. Once completed, effectiveness testing was performed by comparing the cleaning time and results against a regular broom. Finally, improvements were made to enhance the tool's performance, particularly by extending the magnet's range and incorporating a rotating handle to improve ergonomics and usability.

TESTING RESULT

Cleaning Method	Time Taken	Notes
Regular Broom	3 minutes 27 seconds	Longer cleaning duration, metal chips not fully collected
2 in 1 Magnetic Wheel Broom	1 minutes 29 seconds	60% faster, cleaner collection with no remnants, improved posture

The cleaning test results highlight that the 2-in-1 Magnetic Wheel Broom is significantly more efficient compared to a regular broom. In terms of time efficiency, the regular broom required 3 minutes and 27 seconds to complete the task, whereas the magnetic broom only took 1 minute and 29 seconds, reflecting almost a 60% reduction in cleaning time. For cleaning quality, the regular broom often left behind small metal chips that required repeated sweeping, while the magnetic broom was able to collect all chips cleanly and effectively using its magnetic function. From an ergonomic perspective, the magnetic broom also offered better user comfort as it reduced the need for frequent bending, allowing the operator to maintain a healthier posture during cleaning.

In conclusion, the magnetic wheel broom has proven to be an effective innovation that reduces cleaning time, thereby saving labor and work hours. Its high-performance magnets ensure greater efficiency by attracting small metal particles quickly, while also improving user safety by minimizing the risk of cuts and injuries. Furthermore, this tool can serve as a reference model for innovation in TVET workshops across Malaysia, supporting technical education and skill development. With its practicality and effectiveness, the design holds strong potential for commercialization, especially within small and medium industries seeking cost-efficient and reliable cleaning solutions.



The 2-in-1 Magnetic Wheel Broom innovation has proven its effectiveness as a modern workshop cleaning tool. It meets user needs, solves existing problems, and holds broad potential for further development.

DSCMATH: MOBILE APPLICATION TO SUPPORT FLIPPED CLASSROOM IN DISCRETE MATHEMATICS THROUGH GAMIFIED DIGITAL LEARNING

Nur Intan Syazwani Binti Jamaludin, Raja Noorliyana Binti Raja Almanan
Politeknik Tuanku Syed Sirajuddin

INTRODUCTION

Flipped classroom strategies, supported by mobile learning, have proven effective in improving outcomes by allowing students to prepare before class and focus on problem-solving during sessions (Pedraja-Rejas et al., 2024; Valencia-Arias et al., 2024). The integration of gamification elements further increases student motivation and participation, creating an engaging digital learning environment (Firdousi et al., 2024).

OBJECTIVE

The objective of this project is to develop DSCMath, a mobile application that supports flipped classroom strategies through gamified digital learning, with the aim of increasing accessibility, motivation, and academic performance. While traditional lecture-based delivery often limits interactivity and fails to meet the needs of diverse learners, the lack of accessible digital resources further widens the learning gap. To address these challenges, DSCMath provides an engaging, scalable, and sustainable solution that integrates mobile learning and gamification, offering strong potential for adoption across institutions.

PROBLEM STATEMENT

Discrete Mathematics is widely recognized as abstract and challenging, often resulting in low student engagement, limited participation, and weak academic performance. Conventional lecture-based delivery lacks the interactivity needed for deep understanding, while limited digital resources further widen the learning gap, especially for students with diverse needs. Hence, there is a critical need for an innovative, scalable, and sustainable solution. DSCMath addresses this by integrating flipped classroom strategies with gamified mobile learning, offering an engaging platform that motivates students, enhances comprehension, and has strong potential for adoption across institutions.

METHODOLOGY

To systematically address these challenges, the project adopted the Design Thinking framework, a human-centered approach that guided the development of DSCMath from problem identification to solution testing. This process—moving through Empathize, Define, Ideate, Prototype, and Test—ensured that the app was not only pedagogically sound but also directly aligned with students' needs and learning contexts. The process is illustrated in Figure 1 below, providing a clear visual representation of the steps involved in DSCMath's development.

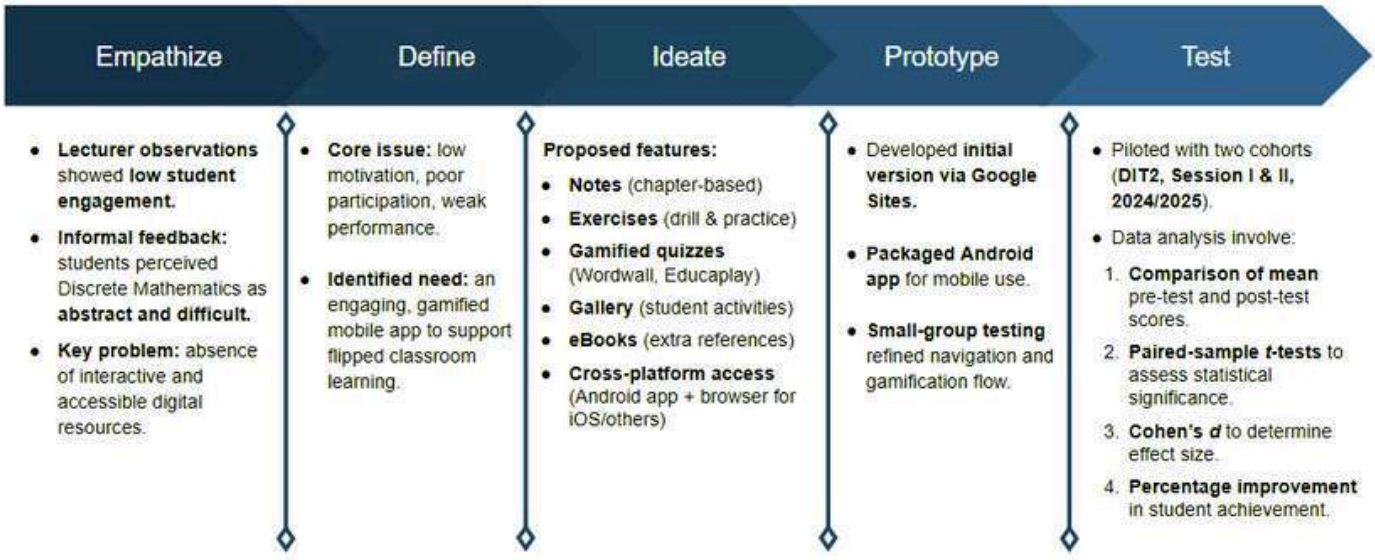


Figure 1 Design Thinking Framework Applied in the Development of DSCMath.

RESULT

The implementation of DSCMath resulted in significant improvements in student learning outcomes. Both Session I and Session II recorded substantial gains in mean scores, with Session I achieving a 79% improvement and Session II a 71% improvement. In both sessions, the differences were statistically significant ($p < 0.001$). The effect sizes (Cohen's $d = 8.40$ for Session I; 4.38 for Session II) indicate very large impacts on student performance. These results are summarized in Table 1.

The bar chart in Figure 2 compares the pre-test and post-test mean scores for both sessions. Overall, the findings confirm the positive influence of DSCMath on student achievement in Discrete Mathematics.

Table 1 Result of the test

Session	n	Mean Pre-Test	Mean Post-Test	% Improvement	t (df)	p-value	Cohen's d
I	13	2.46	15.08	79%	-30.28 (12)	< 0.001	8.40
II	90	2.54	13.96	71%	-41.56 (89)	< 0.001	4.38

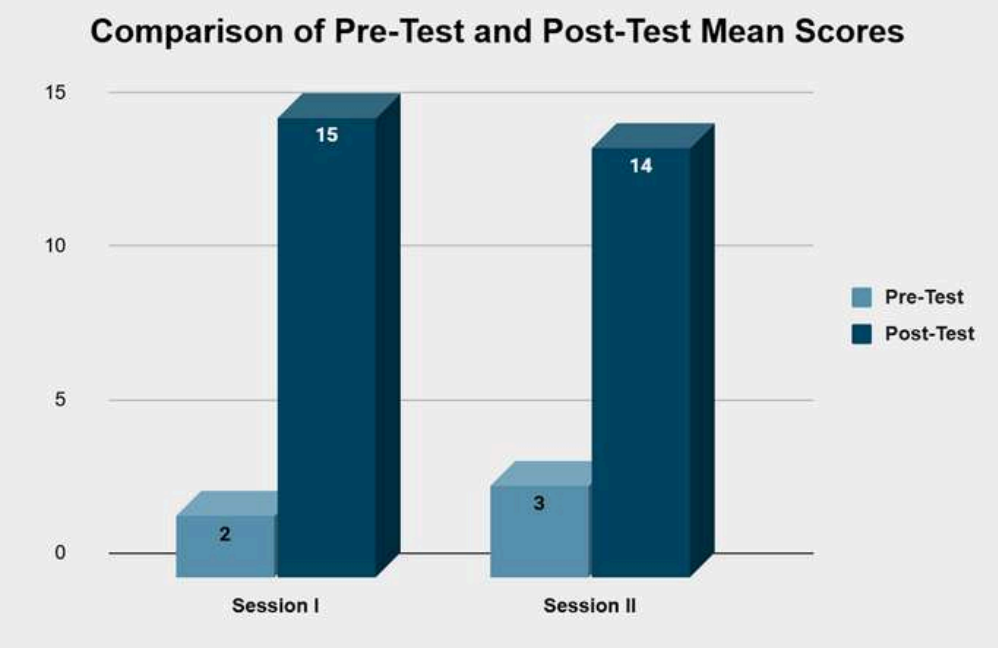


Figure 2 Comparison of Pre-Test and Post-Test Mean Scores

CONCLUSION

The implementation of DSCMath demonstrates that combining flipped classroom strategies with gamified mobile learning can significantly enhance student achievement in Discrete Mathematics. Session I recorded an average gain of 79%, while Session II recorded 71%. Both results were statistically significant ($p < 0.001$) with very large effect sizes. This confirms DSCMath's effectiveness in addressing learning challenges in abstract subjects, reducing inequities in digital resource access, and offering a scalable and sustainable innovation for wider institutional adoption.

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DIGES TEESRec PTSN

TEKNOLOGI KIMIA DAN MAKANAN

Menggabungkan Sains, Rasa dan Teknologi

TERUSKAN MEMBACA

RABBIT PELLET

Muhammad Danish irfan,Amir Fikri,Zarif Iqbal,Muhammad Muidzz
Politeknik Tun Syed Nasir Syed Ismail

INTRODUCTION

The innovation “Rabbit Pellet from Moringa Leaves” is a feed formulation developed to provide rabbits with a more balanced and natural source of nutrition. Moringa oleifera leaves, also known as a “superfood,” are rich in protein, calcium, vitamins, and antioxidants, making them a highly valuable nutrient source for small livestock such as rabbits.

The main issue in rabbit nutrition lies in the use of commercial pellets, which often contain synthetic additives or low fiber content. These can negatively affect digestion, coat quality, and overall immunity. By incorporating moringa leaves into pellet formulation, breeders and pet owners are offered a healthier, natural, and more nutritious alternative.

The purpose of this innovation is to produce rabbit pellets based on moringa leaves that can improve rabbit health, growth, and overall well-being. The development of this product emphasizes scientific formulation, nutritional balance, user convenience, and cost-effectiveness.

Overall, this innovation not only supports a more sustainable rabbit farming industry but also creates new commercial opportunities for natural and eco-friendly animal feed products.

PROBLEM STATEMENT

1. There is insufficient innovation in the rabbit feed market to incorporate locally avalaible,nutrient-dense resource like moringa
2.Moringa leaves are rich in essential nutrients but are not widely used or standardized

METODOLOGY

OBJECTIVE

1. **To provide a natural and sustainable alternative to traditional feed components.**
2. **To reduce reliance on synthetic additives or supplements.**
3. **Contribute to environmentally friendly and organic farming practice**

>>> SOLVING THE PROBLEM

1. DEVELOPING RABBIT PELLETS FROM MORINGA LEAVES (MORINGA OLEIFERA):

MORINGA LEAVES ARE USED AS THE MAIN INGREDIENT SINCE THEY ARE RICH IN PROTEIN, CALCIUM, VITAMINS, AND ANTIOXIDANTS.

THIS PROVIDES A NATURAL AND MORE NUTRITIOUS ALTERNATIVE COMPARED TO COMMERCIAL PELLETS THAT OFTEN CONTAIN SYNTHETIC ADDITIVES.

2. SUSTAINABLE AND ECO-FRIENDLY FORMULATION:

UTILIZES LOCALLY AVAILABLE MORINGA LEAVES, WHICH ARE COST-EFFECTIVE AND EASY TO OBTAIN.

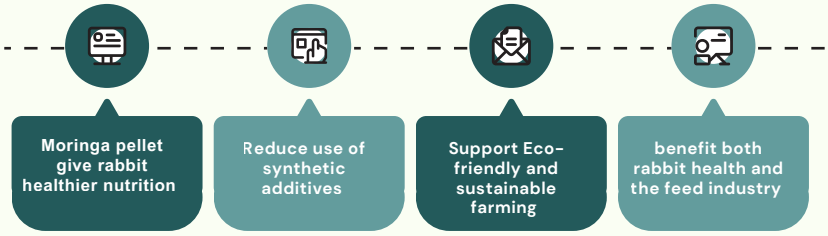
REDUCES DEPENDENCY ON SYNTHETIC SUPPLEMENTS AND CHEMICAL ADDITIVES.

>>> IMPACT OF PRODUCT

1. **Reduce reliance on synthetic supplements or medications**
2. **Increase Digestibility and feed efficiency,leading to better nutrient absorption.**
3. **Enhances immune function due to moringa antioxidant and antimicrobial properties**
4. **Reduces environmental footprint by minimizing the need for industrial feed additives.**

>>> CONCLUSION

ADVANTAGE MORINGA PELLET



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EMULSION PAINT

Aniq , Haziq , Nabil , Iman , Habib
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INTRODUCTION

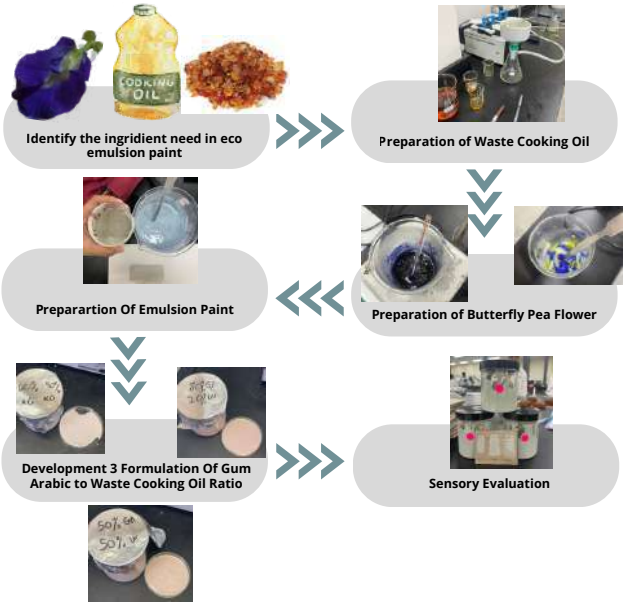
Emulsion paint is a type of water-based paint that is easy to use and dry quickly. It is environmentally friendly because it has fewer harmful chemicals. Emulsion paint provides a smooth finish, good coverage, and is flexible,
making it suitable for walls and ceilings. It is commonly used in homes and buildings because it is safe and easy to clean up with water.

Environmental pollution from improper disposal of used cooking oil has become a major concern. This project focuses on developing an eco-friendly emulsion paint using treated waste cooking oil as a binder, gum arabic as an emulsifier, and butterfly pea flower pigment as a natural colorant. The study aims to produce biodegradable, non-toxic paint based on different gum arabic-to-oil ratios, supporting sustainability and green innovation.

PROBLEM STATEMENT

Waste cooking oil (WCO) is often thrown away improperly, polluting water and clogging drains (Azme, N. A. M., et al. 2023)
The viscosity to hold the emulsion paint in shape. (Hosseini, S. M., et al.2023).
Existence of Volatile Organic Compound (VOC) in water based emulsion paint.
(Xu, Y., et al.2024)

METODOLOGY



OBJECTIVES

1. To identify the ingredients needed in Eco Emulsion Paint.
2. To determine the appropriate formulation in producing Eco Paint.
3. To determine the sensory evaluation based on three different ration of Gum Arabic to Treated Waste Cooking Oil

SOLVING THE PROBLEM

Develop an eco-friendly emulsion paint by utilizing treated waste cooking oil (WCO) as the primary raw material, stabilized with gum arabic and enhanced with butterfly pea flower pigment as a natural colorant. This innovation reduces environmental pollution from improper WCO disposal while replacing harmful chemicals and synthetic pigments in conventional paints.Through optimized formulation, the paint achieves good viscosity, stability, and sensory acceptance, making it safe, cost-effective, low-VOC, and less toxic. Overall, this solution supports sustainable building practices,
promotes healthier indoor environments, and contributes to waste reduction and green innovation.

IMPACT OF PRODUCT

1. Enhanced Environmental Safety and Compliance (SDG 11)
2. Improved Application Properties
3. Cost-Effectiveness and Waste Reduction (SDG 13)
4. Potential for New Applications
5. Contribution to Sustainability

CONCLUSION

The development of eco-friendly emulsion paint using treated waste cooking oil, gum arabic, and natural butterfly pea flower pigment proves to be a sustainable and effective alternative to conventional paints. By transforming waste materials into a valuable product, the innovation reduces environmental pollution while lowering the reliance on harmful chemicals and synthetic pigments. The optimized formulation demonstrates good viscosity, stability, and positive sensory evaluation, making it suitable for safe and practical use. Overall, this eco emulsion paint supports greener construction practices, minimizes VOC emissions, and contributes significantly to waste reduction and sustainable development.

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PUMPKIN SNACK BAR

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Politeknik Tun Syed Nasir Syed Ismail

INTRODUCTION

The innovation of the Pumpkin Snack Bar is a pumpkin-based snack bar specially formulated to be a healthy, portable, and convenient food option suitable for consumption at any time. This product was developed to meet the needs of modern consumers with busy lifestyles who still prioritize nutritious eating. Pumpkin was chosen as the main ingredient due to its high nutritional content, including fiber, vitamins, minerals, and antioxidants, as well as its potential to reduce food waste through the utilization of surplus agricultural produce. This study also evaluates the use of three natural sweeteners honey, glucose syrup, and maple syrup as substitutes for refined sugar in the formulation, to examine their effects on texture, color, moisture, and consumer acceptance. The development of this product not only supports the creation of healthier clean-label snacks but also demonstrates strong potential for commercialization in meeting the growing market demand for more sustainable and innovative plant-based products.

PROBLEM STATEMENT

1.Consumer awareness of healthy food consumption and health problems has amplified the demand for functional food (FF) (Shandilya, et al ., 2019).
2.Snack bar formulations are challenged by the high moisture content and distinctive flavor of pumpkin (Green, et al.,2024).
3.Problem in finding the right balance between flavor, texture for a product to succeed(Johnson, et al ., 2023).
4.The addition of honey to pumpkin snack bars can affect their texture, making them either too sticky or compromising their shelf stability (Smith & Kim, et. al, 2021).

OBJECTIVE

1.To make pumpkin snack bar, using three distinct sugar: honey, glucose syrup, and maple syrup.
2.To determine and compare the texture, color, and moisture content of pumpkin snack bar using three different sugars, such as honey, glucose syrup, and maple syrup.
3. To evaluate the sensory acceptance of pumpkin snack bar, focusing on taste, texture, aroma, and overall consumer preferences.

METHODOLOGY

1. Firstly, seed pumpkin, dried pumpkin, honey, grains (whole meal) and butter are ingredients was weighed based on formulation.
2. Secondly, a pumpkin is cut into squares.
3. Thirdly, the drying process using drying oven until the pumpkin is completely dry for at 70°C for 8 hours 30 minutes.
4. Then, fry without oil the pumpkin seeds in a dry pan for 3 minutes, dry pumpkin for 2 minutes, and grains (whole meal) for 1 minute.
5. After that, mixed all ingredients into the induction cooker with 400°F to 500°F.
6. Lastly, forming the bars with spread mixture evenly in the pan and press down firmly and let bars cool completely.

RESULT

COLOR ANALYSIS

Diagram 1 showed that all pumpkin snack bar formulations had similar L*, a*, b*, H*, ΔE*, C*, and BI* values with no significant differences. This indicates that lightness, saturation, and natural pumpkin pigments remained stable due to controlled drying.

SAMPLE	COLOR ANALYSIS						
	L*	a*	b*	H*	ΔE*	C*	BI*
FORMULATION 1	52.12 ± 0.81^a	3.27 ± 0.37^a	2.63 ± 0.65^a	38.49 ± 6.31^a	52.29 ± 0.18^a	4.22 ± 0.59^a	7.83 ± 3.56^a
FORMULATION 2	51.94 ± 2.17^a	4.06 ± 1.98^a	2.69 ± 2.42^a	25.71 ± 21.76^a	52.22 ± 2.41^a	5.00 ± 2.83^a	10.78 ± 7.18^a
FORMULATION 3	52.41 ± 0.13^a	3.52 ± 0.21^a	3.63 ± 0.50^a	45.71 ± 2.59^a	52.65 ± 0.15^a	5.06 ± 0.50^a	11.90 ± 1.26^a

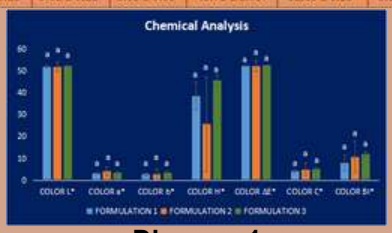

Diagram 1

HEDONIC TEST

The diagram 2 showed that Formulation 3 consistently received the highest scores for appearance, color, taste, texture, and overall acceptance, while aroma showed no significant differences among formulations. These results suggest that Formulation 3 was the most appealing to panelists, likely due to its attractive color, better taste balance, and preferred texture. Overall, Formulation 3 is the most acceptable and has strong potential for commercialization.

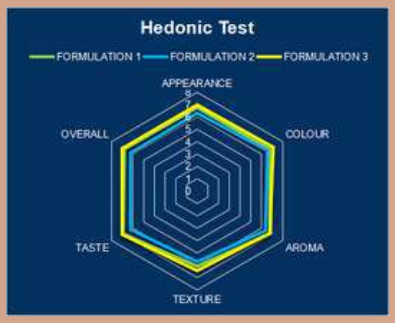

Diagram 2

MOISTURE CONTENT & TEXTURE PROFILE ANALYSIS

Diagram 3, the study found significant differences in moisture content, with Formulation 2 having the highest and Formulation 3 the lowest, suggesting that ingredient composition and drying time influenced water retention. Lower moisture, as in Formulation 3, favors longer shelf life. However, texture profile parameters hardness, cohesiveness, and springiness showed no significant differences among formulations. This indicates that despite varying moisture levels, the use of similar structural ingredients and controlled processing maintained consistent texture quality. Overall, the results highlight the role of natural ingredients and drying methods in producing stable pumpkin snack bars.

SAMPLE	MOISTURE CONTENT %	TEXTURE PROFILE ANALYSIS		
		HARDNESS (g)	COHESIVENESS	SPRINGINESS (mm)
FORMULATION 1	6.75 ± 0.16^b	7408.33 ± 1981.56 ^{a}	0.34 ± 0.1^a	2.06 ± 0.47^a
FORMULATION 2	9.57 ± 0.25^a	7844.33 ± 2755.5^a	0.29 ± 0.09^a	2.1 ± 0.36^a
FORMULATION 3	5.62 ± 0.40^c	9188 ± 268.27^a	0.49 ± 0.18^a	3.46 ± 1.21^a

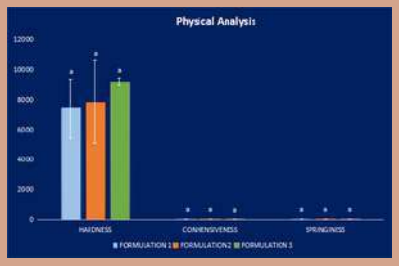

Diagram 3

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CONCLUSION

At the end of this study, the pumpkin snack bar was successfully developed and represents a new innovative pumpkin-based product in the market. All research objectives were successfully achieved. Firstly, pumpkin was optimally utilized in the product formulation, with three variations tested using glucose syrup, honey, and maple syrup as sweeteners. The results showed that pumpkin is suitable as a key ingredient in snack bar development. Based on sensory evaluation, the panelists selected Formulation 3, which used maple syrup, as the best formulation due to its highest scores in appearance, taste, texture, and overall acceptance. The incorporation of maple syrup as a replacement for other sweeteners was well accepted. Finally, the developed pumpkin snack bar exhibited low moisture content, stable color, acceptable texture, and high consumer acceptability, indicating strong potential for commercialization.

TURKEY BERRY LATTE

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INTRODUCTION

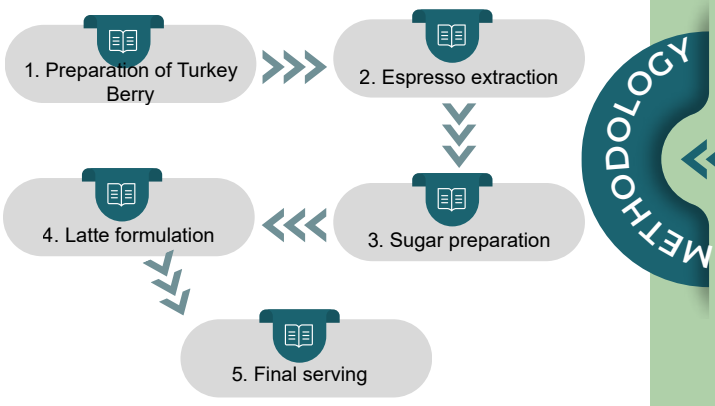
Turkey Berry Latte is a new drink that doesn't use coffee, mainly for people who want to reduce or avoid caffeine. The main ingredients we used are turkey berry powder, full cream milk, and sugar. This combination was chosen because it's simple, easy to get, and gives the drink a balance of flavour and nutrition. Most of lattes in the market are coffee-based, so we wanted to try something different that's still enjoyable.

The taste of the latte is a bit earthy and slightly bitter due to the turkey berry, but the creaminess of the milk and a little sweetness make it pleasant to drink. It's suitable for people who are sensitive to caffeine, like pregnant women or those who want a healthier daily option. This drink doesn't only replace coffee, but also introduces new benefits from the turkey berry, which is known to be good for health.

Throughout this process, we tried a few versions of the recipe to get the right flavour and consistency. In the end, we were able to create a latte that's both unique and functional. This shows that natural ingredients like turkey berry can be used creatively in modern beverages.

PROBLEM STATEMENTS

- More consumers are now seeking caffeine-free drink alternatives for health and wellness reasons (Chen et al., 2022)
- Turkey berry (Solanum torvum) has potential health benefits but is not commonly used in beverages (Kugbei et al., 2021)
- Creating a caffeine-free latte using turkey berry needs the right formulation to make sure it tastes good and is accepted by consumers (Singh et al., 2021)



METHODOLOGY

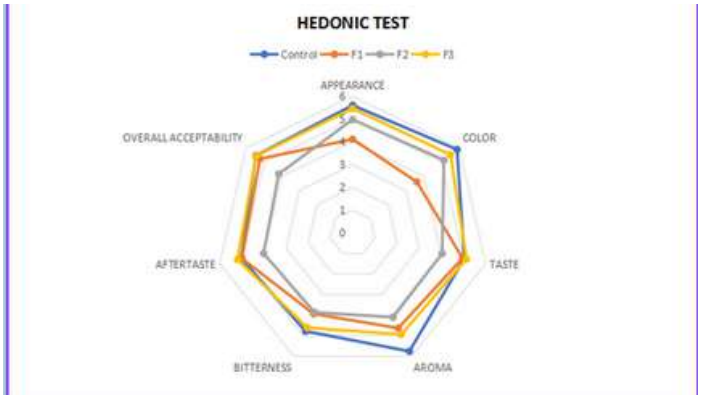
OBJECTIVES

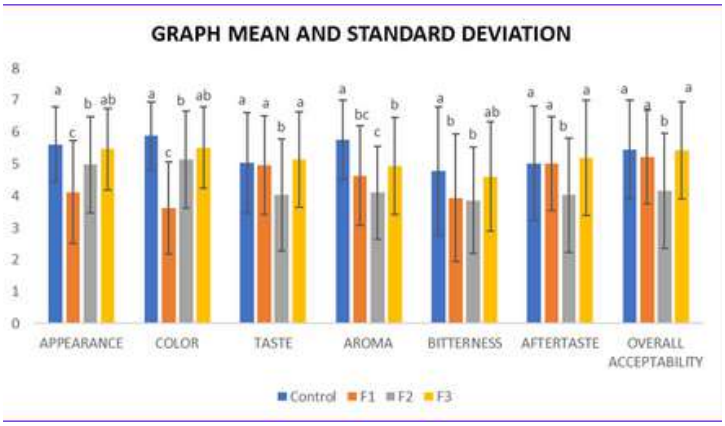
1. To produce a caffeine-free latte using turkey berry to avoid health concerns related to caffeine consumption.
2. To evaluate the health benefits and functional properties of turkey berry when used as an ingredient in a beverage.
3. To determine the best formulations of the caffeine-free latte from turkey berry.

RESULTS

Sensory Result

	APPEARANCE	COLOR	TASTE	AROMA	BITTERNESS	AFTERTASTE	OVERALL ACCEPTABILITY
Control	5.61 ± 1.17^{a}	5.88 ± 1.07^{a}	5.04 ± 1.58^{a}	5.76 ± 1.23^{a}	4.78 ± 2.02^{a}	5.02 ± 1.80^{a}	5.45 ± 1.56^{a}
F1	4.12 ± 1.60^{c}	3.61 ± 1.44^{c}	4.96 ± 1.54^{a}	4.63 ± 1.56^{bc}	3.94 ± 2.00^{b}	5.00 ± 1.47^{a}	5.22 ± 1.46^{a}
F2	4.98 ± 1.51^{b}	5.14 ± 1.53^{b}	4.04 ± 1.76^{b}	4.10 ± 1.46^{c}	3.86 ± 1.67^{b}	4.02 ± 1.79^{b}	4.16 ± 1.81^{b}
F3	5.47 ± 1.28^{ab}	5.51 ± 1.23^{ab}	5.14 ± 1.50^{a}	4.94 ± 1.52^{b}	4.61 ± 1.71^{ab}	5.20 ± 1.80^{a}	5.43 ± 1.53^{a}





CONCLUSION

Turkey Berry Latte is an innovative functional beverage that combines the familiar taste of a latte with the health benefits of turkey berry (Solanum torvum). Based on the analysis, this drink not only offers a unique and appealing flavor but also provides several health benefits, including antioxidant and anti-inflammatory properties, as well as potential support for immune function and blood sugar regulation.

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IMPACT

1. The inclusion of turkey berry powder in formulations F1, F2, and F3 affected the sensory characteristics when compared to the control sample.
2. While the control sample received the highest overall acceptance, formulation F3 achieved a close score, showing good acceptance even with increased turkey berry content.
3. The levels of bitterness and aftertaste were lowered in the turkey berry versions, resulting in a smoother and more pleasant latte.
4. Although aroma and taste ratings for the formulations were slightly less than the control, they remained acceptable to consumers.
5. These results indicate that turkey berry can be added to create a caffeine-free latte that promotes health benefits without greatly affecting the flavor.
6. The study encourages further refinement of the recipe to achieve the best balance between nutrition and taste.

FLEXI TAUHU FINGERS

Flexi Tauhu©

Flexi Tauhu Fingers

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Flexi Tauhu Fingers merupakan produk adaptasi daripada Flexi Tauhu© yang diubahsuai dari segi formulasi dan bentuk tanpa menjejaskan kualiti pemakanan.

Produk ini berbentuk jejari bersalut *breadcrumbs* yang lebih mudah disusun di dalam bekas, lebih menarik dari segi persembahan, dan mempunyai potensi pasaran yang lebih luas dalam industri makanan sejuk beku. Produk Flexi Tauhu dalam bentuk asal (bulat) didapati membazir ruang dalam bahan pembungkus. Ia juga sering kali tidak menepati kehendak pengguna yang menginginkan makanan ringan berbentuk snek lebih kontemporari dan mudah dipegang seperti (*grab and go*). Ia juga perlu mempunyai bentuk yang mudah disusun dan menjimatkan ruang penyimpanan.

Di samping itu, pengguna kini lebih cenderung untuk memilih produk yang bersifat mudah dan cepat disediakan, namun tetap sihat. Produk yang lebih menarik secara visual berpotensi untuk dipasarkan ataupun disediakan dalam pelbagai majlis. Dengan adanya produk Flexi Tauhu Fingers ini, ia dapat mengimbangkan keaslian budaya lama dan moden.

METODOLOGI

Penambahbaikan dilakukan dengan mengubah bentuk produk daripada bulat kepada jejari, seterusnya memudahkan pengguna untuk menikmatinya. Resepi baharu dicipta melibatkan percampuran bahan asas iaitu tauhu telur, tauhu keras, telur dan isi ayam. Sayur lobak, bawang Holland dan daun sup juga ditambah bagi membekalkan nutrisi tambahan selain protein. Campuran serbuk roti dalam adunan menambahkan tekstur dan peningkatan visual yang lebih menarik. Stok ayam dan perasa juga ditambah bagi menaikkan rasa dan aroma. Produk dimasukkan ke acuan berbentuk jejari, dikukus untuk memastikan keselamatan produk dan kemudian disalut dengan serbuk roti *(breadcrumbs).* Produk boleh digoreng untuk dimakan terus atau boleh disejukbekukan. Ujian penerimaan pengguna dijalankan ke atas 14 orang responden terdiri daripada pembeli produk Flexi Tauhu yang asal untuk menilai aspek rasa, tekstur, rupa dan penerimaan keseluruhan. Data yang diperoleh kemudian dianalisis menggunakan perisian Microsoft Excel bagi mendapatkan frekuensi.

PENGHASILAN FLEXI TAUHU FINGERS

Hasil Ujian Penerimaan Pengguna menunjukkan bahawa 100% responden menyukai rupa jejari yang lebih praktikal dan menarik serta mudah disusun dalam pembungkus. Dari segi tekstur, 100% responden menyatakan bahawa mereka suka akan teksturnya. Tambahan serbuk roti didapati menjadikan produk lebih rangup dan memuaskan. Bagi atribut rasa, 100% memberi maklum balas sangat suka. Bagi potensi pasaran pula, semua responden memilih skala sangat suka. Keseluruhannya, 100% responden berpendapat bahawa mereka sangat suka produk baharu ini.

Produk ini dijangka dapat memberikan beberapa impak dari segi pasaran dan sosial. Ia dapat menawarkan pilihan baharu kepada pengguna yang lebih mudah dan sentiasa tersedia di pasaran (frozen). Ia juga merupakan makanan mesra Halal yang boleh diterima oleh semua lapisan masyarakat dan budaya. Selain dijadikan makanan pembekal protein harian, ia juga boleh dipelbagaikan lagi dengan menambah perisa atau perasa mengikut sasaran pengguna tempatan mahupun luar negara. Bentuk produk ini juga berpotensi dijadikan lebih seragam dengan penggunaan mesin pengacuan automatik dengan sistem kawalan suhu pembekuan yang lebih efisien.

Sebagai kesimpulan, produk transformasi tauhu berlauk kepada bentuk jejari bersalut rangup berpotensi luar biasa ke arah penjenamaan yang lebih praktikal dan global. Dengan mengekalkan identiti tauhu sebagai sumber protein utama, ia mampu memenuhi citarasa pengguna.

Produk ini bukan sahaja boleh diterima di pasaran tempatan tapi mampu berdaya saing ke pasaran antarabangsa hasil gabungan elemen inovasi serta kepatuhan terhadap prinsip Halal. Flexi Tauhu Fingers bukan sekadar inovasi produk makanan malah boleh mengangkat seni kulinari negara ke peringat global.

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EDAMAME VEGGIE CUTLETS

"HEALTHY FOR YOU, SUSTAINABLE FOR THE WORLD"

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Nurul Izzah binti Abdullah, Ummu Athirah binti Raja Mohamad Jaafar
Politeknik Tun Syed Nasir Syed Ismail

INTRODUCTION

What is edamame? Edamame is the word edamame (枝豆) is Japanese and translates to "stem beans," a nod to the traditional way of selling the pods still attached to the stem. These are immature soybeans harvested before they fully harden and turn yellow. Typically, edamame is served boiled or steamed in its pod, lightly salted, and eaten by squeezing the beans directly into the mouth.One cup of cooked edamame (about 155g) contains approximately about 18.5g of protein. Edamame is a valuable protein source, especially for vegetarians and vegans. It can help support muscle repair, immune function, and overall cellular health.In today's fast-paced world, consumers are becoming increasingly conscious of their health, diet, and the impact of their food choices on the environment.

Among the many plant-based options available, edamame veggie cutlets stand out as a nutritious, delicious, and sustainable alternative to traditional meat-based products. Combining the wholesome goodness of edamame with a variety of vegetables, these cutlets are not only flavorful but also packed with numerous benefits.

The demand for plant-based food products is increasing due to growing health awareness and shifting dietary preferences around the world. Because of the valuable protein of edamame, we use it to make edamame veggie cutlets. Edamame veggie cutlets are vegetarian patties made primarily from edamame (young, green soybeans) and other vegetables. They are typically shaped into small cutlets or patties, pan-fried or baked, and served as a healthy appetizer, snack, or part of a main course.The demand for plant-based food products is increasing due to growing health awareness and shifting dietary preferences around the world.

Process Methodology for Edamame Veggie Cutlets

The production of edamame veggie cutlets involves a series of carefully controlled steps to ensure the product is nutritious, safe, and high quality. The process integrates ingredient preparation, pre-processing, mixing, freezing, packaging, and cooking, following Good Manufacturing Practices (GMP) and food safety guidelines.

Step 1: Preparation of Ingredients

The process begins with selecting and preparing high-quality ingredients to ensure consistency and flavor. The main ingredients include:

Edamame (young soybeans), Texture Vegetable Protein (TVP), Almond flour, rice flour, corn flour, and potato starch, Black pepper, garlic powder, and mushroom seasoning.

All ingredients are weighed and measured according to the selected formulation to achieve the desired nutritional profile and taste.

Step 2: Pre-processing

In this step, the key protein components—TVP and edamame—are prepared for blending:

1. Soaking TVP: The TVP is soaked in hot water for 10 minutes to soften, then drained.
2. Steaming Edamame: Fresh edamame beans are steamed until soft and tender, then cooled to maintain their natural color and nutrients.
3. Grinding: The softened TVP and steamed edamame are ground together until a smooth, uniform texture is achieved.

This step is crucial to ensure the cutlets have the desired texture and mouthfeel.

Step 3: Mixing and Forming

Next, the prepared TVP-edamame mixture is blended with all the dry ingredients—flours, starches, and seasonings—until well combined. The dough-like mixture is then formed into round cutlets, each weighing approximately 21 grams.

To optimize nutritional balance and taste, three formulations can be used:

F1: 35% edamame, 13% TVP
F2: 43% edamame, 25% TVP
F3: 33% edamame, 37% TVP

Step 4: Freezing and Steaming

To maintain product quality and enhance texture:

The shaped cutlets are placed in a blast freezer at −35°C to −40°C for about 2 hours.

After freezing, the cutlets are steamed for 20 minutes.

This two-step process ensures the cutlets achieve the ideal firmness and consistency, making them easier to handle during packaging and cooking.

Step 5: Packaging

Once cooled, the unfried cutlets are vacuum-sealed in food-grade plastic packaging to maintain freshness and extend shelf life. The packaged cutlets are then stored in a chest freezer for long-term storage.

Vacuum packaging helps protect the product from microbial contamination, freezer burn, and quality degradation.

Step 6: Cooking Method (Before Serving)

Before consumption, the frozen cutlets can be cooked using several methods:

Pan-frying, Baking, Air-frying

Cooking is typically done at 170°C to 180°C for 3 to 5 minutes until the cutlets achieve a crispy outer layer while remaining tender inside.

Once cooked, the edamame veggie cutlets are ready to serve as a healthy snack or a nutritious meal component.

KEDONDONG FRUIT \ LEATHER ROLL

Nur Nisa , Nuralifah & Shivangey
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The primary objective of this innovative product was to evaluate consumer preferences and expectations towards kedondong-based snacks. Secondly, the goal is to promote sustainable food innovation by transforming fruit waste into health-enhancing and marketable snacks. Thirdly, we aim to develop an acceptable formulation of kedondong fruit leather. This innovation emphasizes the importance of sustainability in food production while aiming to produce delicious and healthy snacks that retain the natural goodness of kedondong and can be enjoyed by various generations.

Figure 1: Ambarella fruit (*spondias dulcis sp.*)

There are several problems that arise when trying to make new food products using tropical fruits that aren't used very often. To begin with, consumers' opinions and preferences about kedondong-based products are still not clear, which makes it harder to sell and get people to buy them. If you don't know what consumers want in terms of taste, texture, and health benefits, these kinds of products might not do well in the market (Fauziyah, 2017).

Due to its rich nutritional value and tangy flavour, ambarella (Spondias dulcis), a tropical fruit that is widely available in Southeast Asia, has long been used in sauces, pickles, and juices. Nevertheless, the fruit's peel and pulp, which are frequently thrown away during processing, contain important bioactive substances,

Figure 2: kedondong fruit leather roll with secondary packaging

like dietary fibre and antioxidants, that can be used to create new food products (Koubala et al., 2011). Second, a lot of fruit processing by-products, like ambarella peels, are thrown away as waste.However, they have useful bioactive compounds, like fibres and antioxidants, that can be used to make functional foods (Koubala et al., 2011).

It is hard to make the best ambarella fruit leather because you have to balance texture, flavour, and nutrition retention, especially when you use fruit byproducts like kedondong pulp and skin to meet health and sustainability needs (Simao et al., 2020).

Figure 3: Process of making Kedondong Fruit Leather Roll

The methodology begins with the selection of ripe kedondong and thoroughly washed under clean, running water to remove any dirt, dust or contaminants. Second, blend the fruit and water with a ratio of 1:1 to form a thick mixture containing both juice and puree. Third, strain the blended mixture to separate the fibers and obtain smoother purée and juice. Following this, cook 10 g of strained puree over low heat while slowly adding 270 g of juice and stirring continuously. During this process, honey, pectin, citric acid, castor sugar and potassium sorbate were added, ensuring the mixture reached the desired consistency. Then, the mixture was poured onto dehydrator trays lined with non stick sheets and spread evenly to a thickness. Next, the drying process occurred in a dehydrator at 60°C for 6 hours to ensure the fruit leather is ready and easily peelable. Last, once dried, the fruit leather was removed from the trays and allowed to cool at room temperature before proceeding to the packaging process.

RESULT

SPSS RESULT IN SPIDER WEB DIAGRAM

- Formulation 1 achieved the highest score for most of the sensory attributes. It provides a balanced sensory profile compared to other formulations.

SPSS RESULTS IN TABLE FORM

- According to table 1, formulation 1 has the highest value of consumer acceptability with 7.38 compared to the control with 7.06, formulation 2 with 6.32 and formulation 3 with 6.52.

Graph 1: Spider web

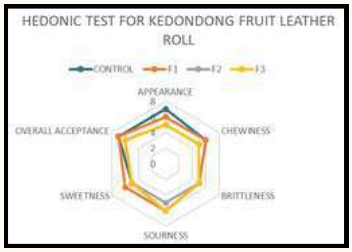

Table 1: SPSS sensory table

ATTRIBUTES	Control	Formulation 1 (F1)	Formulation 2 (F2)	Formulation 3 (F3)
Appearance	7.00 ± 1.471a	6.64 ± 1.439ab	5.72 ± 1.830c	5.92 ± 1.589bc
Chewiness	6.02 ± 1.824ab	6.22 ± 1.314a	5.30 ± 1.681a	5.60 ± 1.604ab
Brittleness	5.62 ± 1.926 a	5.94 ±1.754a	5.20 ±1.565 a	5.48 ±1.887 a
Sourness	6.98 ± 1.421a	6.76 ±1.318 ab	5.94 ±1.845 b	6.32 ±1.731 ab
Sweetness	5.88 ± 1.547a	6.10 ±1.418 a	5.66 ±1.955 a	5.92 ±1.688 a
Overall acceptance	7.06 ± 1.058ab	7.38 ± 1.105a	6.32 ±1.477 c	6.52 ± 1.488ab

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CONCLUSION

- The Kedondong Fruit Leather Roll project met its main goals by turning unused kedondong fruit by-products into a healthy, long-lasting, and tasty snack. Formulation 1 was the best formulation among the others to produce this product.

DRAGON FRUIT PEEL SERUNDING: A SUSTAINABLE AND HEALTHIER ALTERNATIVE TO MEAT SERUNDING

Nur Hidayah binti Rashit
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Figure 1:Dragon fruit's peel for Nexus

Dragon fruit peel is often discarded as waste, even though it contains valuable nutrients such as fiber, antioxidants, and minerals (Shinta et al., 2018). To reduce food waste and promote sustainability, this peel can be transformed into innovative food products. One example is developing dragon fruit peel floss as a healthier alternative to traditional meat floss. This approach not only supports waste reduction but also creates a nutritious, eco-friendly product with added value.

Figure 3: Serondeng dragon fruit's peel fresh out of oven

Figure 2:Dragon fruit (Hylocereus polyrhizus)

Beef floss is a traditional food that is high in protein but limited in nutrition, as it contains about 35.57-40.85% fat and lacks dietary fiber (Bulkaini et al,. 2020) Its relatively high moisture content (11.95-13.56%) also accelerates fat oxidation and microbial growth (Shahrai et al,. 2021), which shortens shelf life and reduces overall quality. To overcome these issues, dragon fruit peel is introduced as a sustainable alternative ingredient. By utilizing this often-discarded by-product, the project aims to create a healthier floss with added fiber and antioxidants, while also extending its shelf life and supporting food waste reduction.

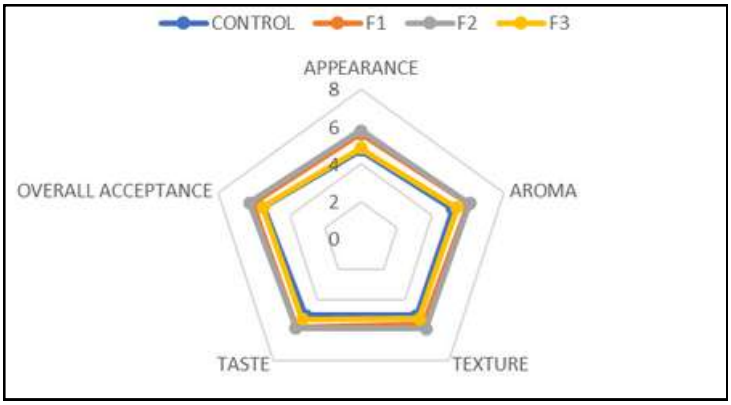
The primary objective of this innovative product is to utilize dragon fruit peel, which is often discarded as waste, in developing a value-added food product. Secondly, this project aims to improve the nutritional quality of floss by incorporating the fiber and antioxidants naturally present in dragon fruit peel. Thirdly, the goal is to extend the shelf life of floss while maintaining its desirable taste, texture, and overall quality. This innovation highlights the importance of sustainability in food production while creating a healthier and eco-friendly alternative that can be enjoyed by consumers across different generations.

PRODUCT INNOVATION

METHOD SUMMARY

Figure 4: Process of making serondeng dragon fruit's peels

The methodology starts with weighing and blended all ingredient except dragon fruit's peels. The dragon fruit's skin must be soaked in salt water and continue to dehydrate for 6 hours. Next step is stir fry blended ingredients in a pan until the oil is released. Then add the semi dehydrated dragon fruit peels and continue to stir fry until it's crumbling (approximate around 30 minutes). Last step before packaging is to bake the serondeng in oven at 120C for 10 minutes, this helps the serondeng more flaky just like how consumers wants.



As we can see here, control product is quite similar to our serondeng this means the consumer can't find the very contra difference of our serondeng.

The difference between F1, F2 and F3 is the spiciness level. F1 is the least spicy, F2 is intermediate and F3 is the most spicy. As shown in the spider web, F2 is preferable because of it's stable taste

All the formulation is included for hedonic test analysis. This result shown that F2 which is using chili paste (30.71%) and chili flakes (1.28%) has the highest consumer acceptability (6.27%) compared to those using too high amount of chili paste (F3=5.51) and the lowest amount of chili paste (F1=6.09).

Formulation	CONTROL	F1	F2	F3
Appearance	4.73±1.726b	5.60±1.706ab	5.78±2.166a	4.84±1.596b
Aroma	5.15±1.682b	6.05±1.649a	6.13±2.064a	5.38±1.683ab
Taste	5.05±1.568b	5.87±1.689a	5.91±1.692a	5.31±1.477ab
Texture	5.04±1.795b	5.65±1.713ab	5.93±1.824a	5.27±1.592ab
Overall Acceptance	5.49±1.665b	6.09±1.590ab	6.27±1.545a	5.51±1.386ab

TURKEY BERRY SAVOURY CRACKERS

Nurin Ahza Binti Salim, Ain Sal Sabila Binti Osman,
Umi Khadijah Umairah Binti Azman and See Hui Yong.
Politeknik Tun Syed Nasir Syed Ismail

>>> INTRODUCTION

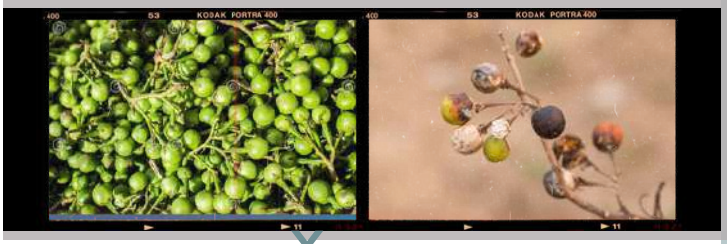
Turkey Berry Savoury Crackers are an innovative functional snack developed to harness the nutritional and health potential of turkey berry (Solanum torvum), a tropical fruit rich in essential minerals such as iron (Fe), magnesium (Mg), and zinc (Zn), as well as natural antioxidants. Although turkey berry has long been used in traditional medicine and local diets, it remains an underutilized crop in the commercial food industry due to factors like limited awareness and its short post-harvest shelf life.

By turning the turkey berry into powder and incorporating it into cracker formulations, the product not only boosts the nutritional value with higher mineral and antioxidant content but also reduces dependence on nutrient-poor refined wheat flour.

This development responds to growing consumer demand for snacks that are both flavourful and health-enhancing while simultaneously addressing global priorities such as sustainable food production, waste reduction, and improved dietary health. The crackers therefore represent a unique balance of taste, nutrition, and sustainability, making them an appealing choice for modern, health-conscious consumers.

>>> PROBLEM STATEMENTS

1. *Solanum torvum* Swartz is an underutilized species commonly known as Turkey Berry (Mashine *et al*., 2023).
2. Commercial crackers are almost free of minerals and antioxidants (Olajide *et al*., 2023).
3. The turkey berry will decay within a couple of days after harvesting (Rajendran *et al*., 2023).



METHODOLOGY

Step 1: Preparation of Turkey Berry Powder

- Fresh turkey berries were cleaned by removing stems and rinsing under running water.
- Berries were chopped into uniform pieces and boiled for 20 minutes.
- Excess water was drained, and the berries were dried at 60°C for 7 hours using a dehydrator.
- Dried berries were ground into fine powder and stored in airtight containers in a cool, dry place.

>>> OBJECTIVES

1.To develop an innovative food product by incorporating Turkey Berry to enhance its utilization and promote its nutritional benefits.

2.To improve the mineral and antioxidant content of crackers by incorporating nutrient-dense ingredient (Turkey Berry) into formulations traditionally made with refined wheat flour.

3.To extend the shelf life of Turkey Berries by developing a shelf-stable product, ensuring their availability and utilization in a convenient and long-lasting form.

4. To determine the consumer preferences on Turkey Berry Savoury Crackers.

Step 2: Formulation of Cracker Dough

- All ingredients were weighed accurately.
- Turkey berry powder, wheat flour, and corn flour were sifted and combined.
- Baking powder, salt, and sugar were added to the dry mixture.
- The dough was seasoned with black pepper and dried herbs, then rested for 15 minutes.

Step 3: Dough Processing and Shaping

- Melted butter was kneaded into the dough, followed by gradual addition of water.
- Dough was flattened thinly and sprinkled with Parmesan cheese.
- Crackers were shaped using molds and placed on a greased tray.

Step 4: Baking and Packaging

- Crackers were baked in a oven at 150°C for 15 minutes.
- After cooling, the final product was packed for storage and analysis.

>>> COMMERCIAL VALUE

💪 **Nutritional Functionality**
- Turkey berry is rich in iron, antioxidants, and anti-inflammatory compounds. Turning it into a cracker makes it a healthy, functional snack—ideal for women, children, and vegetarians.

🏡 **Local Sourcing**
- Using turkey berry supports local agriculture. It promotes traditional crops and aligns with national efforts to reduce reliance on imports.

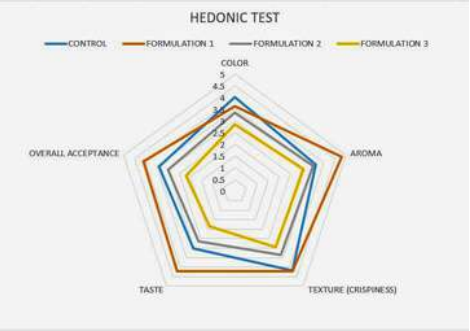
🌱**Sustainability**
- This product helps reduce food waste and supports sustainable farming.

🛍️**Consumer Appeal**
- Fits modern demand for healthy and plant-based options.

>>> CONCLUSION

Turkey Berry Savoury Crackers were developed to introduce a healthier and more innovative snack using a local underutilized ingredient. Turkey berry was chosen for its rich antioxidant and fiber content, which supports health. Beyond offering a nutritious and tasty option for consumers, this product also encourages sustainable food use and strengthens the livelihoods of farming communities. Thus, the crackers stand as a symbol of how innovation can combine nutrition, sustainability, and local heritage in the food industry.

>>> RESULT



Spider web using mean data from hedonic test

CONTROL/ ATTRIBUTES	TASTE	TEXTURE(CRISPINESS)	AROMA	COLOR	OVERALL ACCEPTANC
CONTROL	3.00 ± 1.13^{b}	4.18 ± 0.93^{a}	3.65 ± 1.03^{a}	4.03 ± 0.97^{a}	3.40 ± 0.96^{b}
1	4.20 ± 0.76^{a}	4.20 ± 0.94^{a}	3.80 ± 0.85^{a}	3.63 ± 0.93^{ab}	4.10 ± 0.74^{a}
2	2.63 ± 1.06^{b}	3.35 ± 1.15^{b}	3.53 ± 1.06^{ab}	3.35 ± 0.95^{b}	3.00 ± 0.93^{b}
3	1.85 ± 1.00^{c}	2.95 ± 1.24^{b}	3.10 ± 0.98^{b}	2.85 ± 1.23^{c}	2.20 ± 1.07^{c}

Homogeneous subsets

hedonic sensory test

Overall, adding turkey berry at a moderate level (Formulation 1) produced the best balance of crispiness, aroma, and flavour, making it the most suitable formulation for consumer acceptance and potential commercialization.

>>> UNIQUENESS

- Converts a quickly decaying berry into a stable, ready-to-eat product with longer usability.
- Utilizes an underutilized, nutrient-dense crop, contributing to food system sustainability and reducing waste.
- Enriched with natural minerals (Fe, Mg, Zn) and antioxidants from turkey berry, offering superior health benefits compared to refined flour-based snacks.

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PLANT- BASED SWEET POTATO WAFFLE CONE

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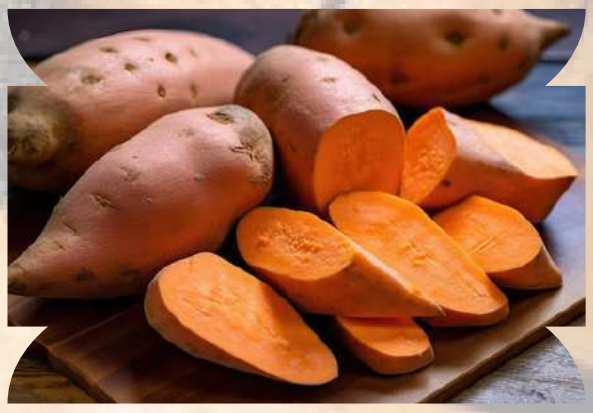
Introduction

The sweet potato waffle cone is a gluten-free, sustainable plant-based substitute for ice cream cones, produced from upcycled sweet potato peel flour and puree. It is high in dietary fiber, antioxidants, and vitamin A and is suitable for health-conscious and gluten-intolerant children and adults. The cone is crispy in texture, with a natural color and nutritional value that promotes healthy consumption and the circular economy by eliminating food waste, thus it is a ready-to-market product in the context of current food trends.



Objectives

1. To make sweet potato peel flour and sweet potato puree before production.

2. To create sweet potato waffle cone with three varying formulations (27.49%, 35.90%, 44.32%).

3. To identify the consumer acceptance of sweet potato waffle cone with 3 various formulations (27.49%, 35.90%, 44.32%).

Problem Statement

- Most adults consume less than the recommended 25g of dietary fiber daily, increasing the risk of constipation (Ibrahim, 2022)

- Despite being biodegradable food waste, 80% of Malaysia's 16,688 tonnes of daily food waste ends up in landfill (A.A.Hashim, 2021)

- Gluten free consumers struggle with limited food choices due to lack of awareness, convenience and variety in plant based products (Sarina Mohamad Nor, 2020)

Methodology

Ingredients:

- Wet: Sweet potato puree, coconut milk, melted butter aquafaba, vanilla essence.
- Dry: Sweet potato peel flour, gluten-free flour, baking powder, salt, xanthan gum, sugar.

Ingredient Preparation:

- Aquafaba: Whisk chickpea water until fluffy.
- Sweet Potato Puree: Steam and blend sweet potato until smooth.
- Peel Flour: Blanch peels, dry, grind, and sieve.

Preparation Steps:

- Mix dry and wet ingredients separately, then combine.
- Add aquafaba and blend until smooth.
- Preheat waffle cone maker.
- Pour 2 tbsp batter, cook at 170°C for 5 mins.
- Cool and store cones in airtight container.

Result

DATA ANALYSIS

SAMPLE	COLOUR	SWEETNESS	CRISPINESS	HARDNESS	AROMA	TASTE	OVERALL ACCEPTANCE
CONTROL	5.42 ± 1.59	5.84 ± 1.27	4.71 ± 1.78	4.81 ± 1.69	5.63 ± 1.51	5.51 ± 1.59	5.51 ± 1.62
F1	5.21 ± 1.32	4.77 ± 1.66	5.70 ± 1.50	5.44 ± 1.42	5.58 ± 1.48	5.33 ± 1.66	5.41 ± 1.43
F2	5.14 ± 1.75	4.91 ± 1.78	5.47 ± 1.59	4.81 ± 1.69	5.19 ± 1.78	5.12 ± 1.66	5.23 ± 1.77
F3	5.26 ± 1.71	4.30 ± 1.96	5.23 ± 1.82	4.37 ± 2.12	6.12 ± 9.68	4.70 ± 2.05	4.74 ± 1.95

SAMPLE	COLOUR	SWEETNESS	CRISPINESS	HARDNESS	AROMA	TASTE	OVERALL ACCEPTANCE
CONTROL	5.42	5.84	4.71	4.81	5.63	5.51	5.51
F1	5.21	4.77	5.70	5.44	5.58	5.33	5.41
F2	5.14	4.91	5.47	4.81	5.19	5.12	5.23
F3	5.26	4.30	5.23	4.37	6.12	4.70	4.74

The best formulation chose by panelists is formulation 1 which has 27.49% of sweet potato and 25.25% of gluten free flour.

Conclusion

The sensory evaluation results indicate that the plant-based sweet potato waffle cone formulation using 27.49% sweet potato and 25.25% gluten-free flour (Formulation 1) achieved the highest overall acceptance among panelists. This formulation balanced desirable sensory attributes such as colour, crispiness, aroma, and taste, while maintaining acceptable sweetness and hardness. The use of sweet potato not only contributed to natural sweetness and appealing colour but also increased the nutritional value by adding dietary fiber, vitamins, and antioxidants. Furthermore, the gluten-free formulation makes the product suitable for consumers with gluten intolerance or those seeking healthier, plant-based dessert options. Overall, the product demonstrates strong potential for market acceptance as a nutritious, allergen-friendly, and environmentally sustainable alternative to conventional waffle cones.

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AKASHEEP+: HERBAL IMMUNOMODULATOR FOR SHEEP

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IPB University

INTRODUCTION

Foot and Mouth Disease (FMD) is a highly contagious viral disease affecting cloven-hoofed animals such as cattle, goats, and sheep. The 2022 outbreak in Indonesia resulted in almost 100% morbidity in sheep, reduced milk production by up to 25% annually, delayed growth, and economic losses worth trillions of rupiah. FMD virus (FMDV), belonging to the *Picornaviridae family* and *Aphthovirus genus*, spreads rapidly via direct contact or aerosols across kilometers. Conventional measures such as vaccination and disinfectants remain limited in effectiveness, creating a need for complementary strategies through **herbal immunomodulators.**

Turkey closes livestock markets amid foot-and-mouth disease outbreak: What to know

Jember Reports Over 60 Cattle Deaths from Suspected Foot and Mouth Disease

Figure 1. News related to foot and mouth disease in livestock

PROBLEM STATEMENT

1. FMD spreads rapidly with no specific cure;
2. Vaccines and antibiotics have limited effectiveness;
3. Local herbs show potential but remain underused.

AkaSheep+ was developed as a liquid herbal immunomodulator formulated from acacia bark (*Acacia mangium Willd*) and clove leaves (*Syzygium aromaticum*). Acacia contains up to 48% condensed tannins and flavonoids with antioxidant, antibacterial, and immunostimulant activities, while clove leaves are rich in eugenol, flavonoids, and alkaloids with antimicrobial and anti-inflammatory properties. Their combination was not only designed to strengthen sheep's immunity against FMD infection but also to provide an innovative formulation that integrates immunostimulant, antioxidant, antibacterial, and anti-inflammatory effects in a single product.

"HEALTHY HERDS, THRIVING FARMERS"

The novelty of AkaSheep+ lies in its utilization of agricultural by-products and local herbal plants, an approach still rarely explored in Indonesia, along with the application of the Ultrasound Assisted Extraction (UAE) method, which is environmentally friendly, time-efficient, and capable of yielding higher levels of bioactive compounds compared to conventional extraction. Thus, AkaSheep+ represents a locally based innovative solution with strong potential to be developed as a sustainable livestock health supplement.

OBJECTIVE

1. Develop AkaSheep+ as a liquid herbal immunomodulator from acacia bark and clove leaves;
2. Evaluate the bioactive content, antioxidant, and antibacterial activities of the product;
3. Assess the effectiveness of AkaSheep+ in enhancing sheep immunity through in vivo testing.

METHODOLOGY

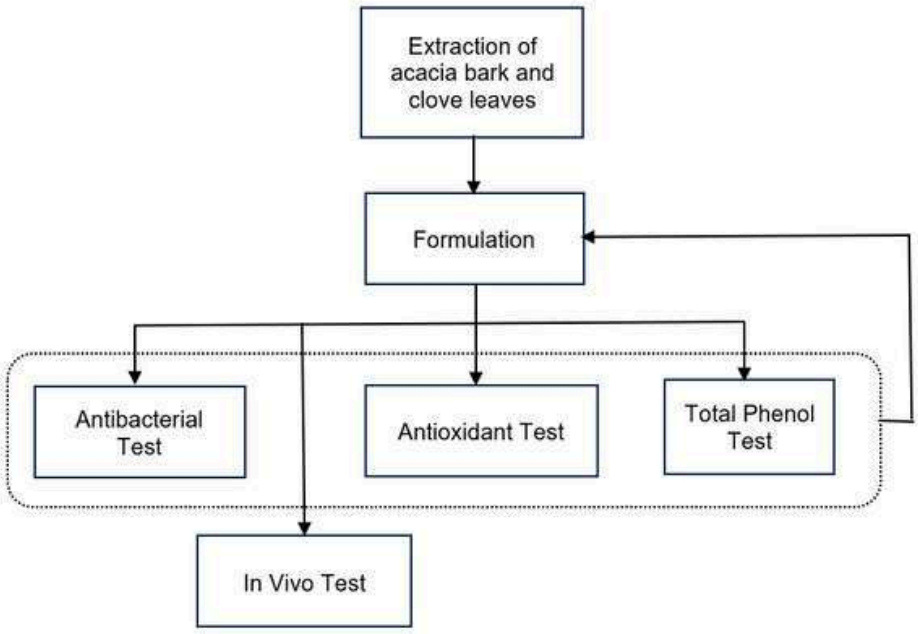
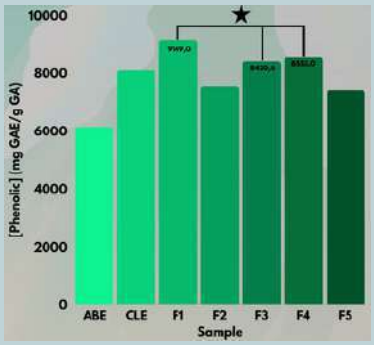
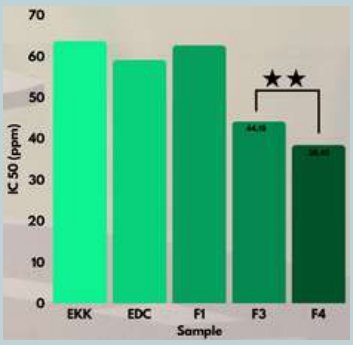


Figure 2. Research Mechanism

RESULT



(a)



(b)

Test Material	Average of baking area (mm)	
	E. Coli	S. Aureus
Control +	7,7	3,5
Control -	0,0	0,0
Clove leaf extract	2,5	2,0
Acacia bark extract	5,0	4,0
F3	1,0	1,0
F4	3,7	2,3

Information: Control (+) = chloramfenikol, control (-) = purified water

(c)

Figure 3. Phenol Total Test Result (a), Antioxidant Test Result (b), and Antibacterial Test Result (c)

The best formulation was found in the 1:2 acacia:clove ratio (F4), showing phenolic content of 8553 mg GAE/g CE and very strong antioxidant activity (IC50 = 38.45 ppm). Antibacterial assays showed inhibition of *Escherecia coli* and *Staphylococcus aureus*, while in vivo tests demonstrated increased leukocyte counts and enhanced sheep immunity.

CONCLUSION

AkaSheep+ showed high phenolic content, strong antioxidant activity, and antibacterial effects, while in vivo tests confirmed enhanced sheep immunity. These findings establish AkaSheep+ as an effective herbal immunomodulator with great potential to serve as an eco-friendly and sustainable livestock health solution for Indonesia and beyond.

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CASSAVA-BASED ANALOG RICE WITH PUMPKIN SEED FLOUR

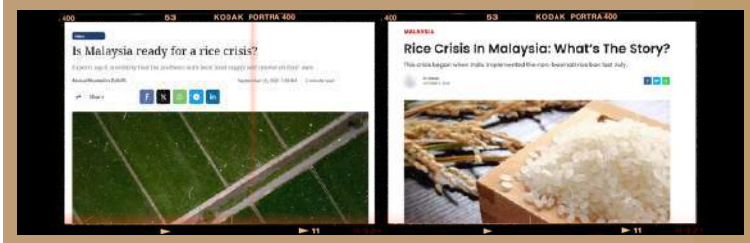
"DEVELOPMENT OF HIGH-PROTEIN CASSAVA-BASED ANALOG RICE THROUGH PUMPKIN SEED FLOUR FORTIFICATION AS A STRATEGY FOR FOOD SECURITY AND ZERO FOOD WASTE IN MALAYSIA"

Bayu Praditya, Najma Najiha, Nuraeni Latifathul Khasanah, Naila Nazhifa Dhia, & Anandita Syahputri
IPB University Vocational School

INTRODUCTION

The rice crisis that recently occurred in Malaysia shows the urgent need for alternative staple foods to reduce reliance on imported rice. Cassava has been promoted as one of the potential substitutes because it is cheap, abundant, and adaptable to local agriculture. However, cassava-based analog rice has two major weaknesses: its protein content is much lower compared to conventional rice, and its darker color makes it less appealing for consumers. These factors limit its acceptance as a sustainable food option.

One strategy to overcome these problems is fortification with pumpkin seed flour. Pumpkin seeds are rich in protein and essential nutrients, making them an ideal ingredient to improve the nutritional profile of cassava analog rice. In addition, pumpkin seeds are often wasted in agro-industrial processing, so their use supports the concept of zero food waste. This innovation not only improves the protein content and sensory quality of cassava-based analog rice, but also contributes to food security and environmental sustainability in Malaysia.



PROBLEM STATEMENT

1. Malaysia faces a rice crisis and high dependency on imported rice, creating vulnerability in food security.
2. Low protein content in cassava-based analog rice.
3. Dark color appearance reduces consumer preference.
4. Pumpkin seeds, as agro-industrial by-products, are underutilized.

METHODOLOGY

Soaking cassava in citric acid solution to improve color.

Fortification of cassava flour with different levels of pumpkin seed flour.

Proximate analysis, physical characteristics, and sensory evaluation of analog rice

OBJECTIVE

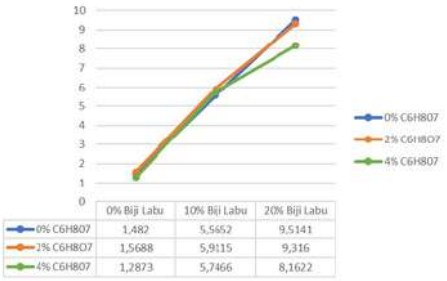
1. Develop cassava-based analog rice with higher protein content through pumpkin seed flour fortification.
2. Improve nutritional quality and sensory acceptance of cassava-based analog rice.
3. Support food security and zero food waste strategies in Malaysia.

RESULT

Color Improvement

Soaking cassava in citric acid solution produces a whiter analog rice, making it more visually appealing and closer to consumer preference.

Nutritional Enhancement



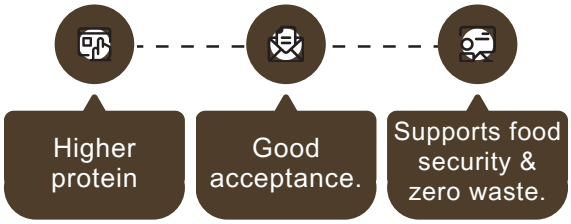
	0% Biji Labu	10% Biji Labu	20% Biji Labu
0% C6H8O7	1,482	5,5652	9,5141
2% C6H8O7	1,5688	5,9115	9,316
4% C6H8O7	1,2873	5,7466	8,1622

Fortification with pumpkin seed flour significantly increases the protein content of cassava-based analog rice, improving its nutritional quality.

Consumer Acceptance

Sensory evaluation shows that taste, texture, color, and overall preference remain acceptable to consumers, even with pumpkin seed flour addition.

CONCLUSION



IMPACT

1. Alternative staple food – Cassava-based analog rice offers a sustainable option to reduce Malaysia's dependency on imported rice. This helps strengthen national food security in the face of recurring rice supply crises.
2. Nutritional improvement – Fortification with pumpkin seed flour significantly increases protein content in cassava-based analog rice. The product becomes more nutritious and suitable as a healthier staple food alternative.
3. Consumer acceptance – Soaking cassava in citric acid improves the whiteness of the rice, making it more visually appealing. Fortification maintains good taste and texture, resulting in better consumer acceptance.
4. Zero food waste – Pumpkin seeds, which are often discarded as agro-industrial by-products, are utilized in this innovation. Their use supports sustainability by reducing waste and creating added value.
5. Socio-economic value – This innovation provides a locally available and affordable rice substitute for Malaysian consumers. At the same time, it creates new opportunities for the agro-industry and contributes to economic resilience.

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CLIMAPACK: ZIPLAST – SMART BIOPLASTIC BASED ON AGRO-INDUSTRIAL WASTE FOR CLIMACTERIC FRUITS

Aqila Ulinnuha Assyafaqi ,Grace Putri John,
Fadila Tul Rahmi, Melkhior Felix Sitompul
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INTRODUCTION

Climacteric fruits such as bananas, papayas, and mangoes ripen rapidly due to ethylene release, causing postharvest losses of over 30% in Indonesia. Limited packaging technology exacerbates this issue, while conventional plastics contribute to severe environmental pollution because of their non-biodegradability. Innovative solutions are needed to reduce waste and preserve fruit quality.

ClimaPack: Ziplast is a smart bioplastic made from cassava bagasse starch and corn cob cellulose, enriched with lemongrass essential oil. It combines two functions: physical protection and freshness monitoring through a pH-based color label. This innovation valorizes agro-industrial waste and offers an eco-friendly alternative to conventional plastics while supporting food security.

PROBLEM STATEMENTS

1. Fruit packaging relies on non-biodegradable plastics.
2. Climacteric fruits spoil quickly from ethylene buildup.
3. Freshness monitoring is limited and destructive.
4. Agro-industrial residues remain underutilized.

OBJECTIVES

1. Formulate bioplastic films from cassava starch and corn cob cellulose.
2. Apply lemongrass essential oil as a natural antioxidant and antimicrobial.
3. Develop a pH-based indicator for non-destructive freshness detection.
4. Evaluate physical, biodegradability, and antibacterial properties of the films.

METHODOLOGY

1. Lemongrass oil extracted by steam distillation
2. Corn cob cellulose purified through delignification and bleaching.
3. Formulate bioplastic films from cassava starch and corn cob cellulose.
4. Bioplastic formulated from starch, cellulose, and oil.
5. Indicator labels made using methyl red and bromophenol blue.
6. Properties tested: water resistance, moisture, thickness, biodegradation, FTIR, and antibacterial activity against E. coli.

RESULTS AND DISCUSSION

Table 1. Physical, biodegradation and antibacterial properties of ClimaPack: Ziplast

Bioplastic	Water resistance	Moisture content	Thickness	Biodegradation	Antibacterial inhibition zone
ClimaPack: Ziplast	91%	11,8%	0,4 mm	76%	0,5 cm

The film showed 91% water resistance, 11.8% moisture, 0.4 mm thickness, and 76% biodegradation in 14 days **(Table 1)**. FTIR spectra confirmed OH, C=O, and C–O groups, indicating stable polymer networks **(Figure 1)**. Antibacterial assays revealed inhibition zones against E. coli, proving lemongrass oil effectiveness.

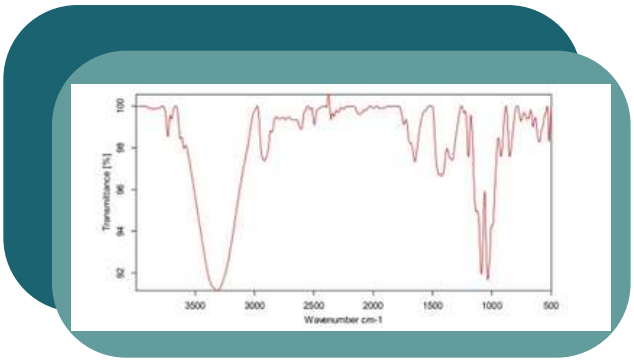

Figure 1. FTIR spectrum of bioplastic ClimaPack: Ziplast

Figure 2. Changes in the color of the pH indicator during fruit storage.

The freshness indicator displayed a color shift from blue to purple as ethylene levels increased, enabling real-time, non-destructive fruit monitoring. These results demonstrate that Ziplast effectively replaces conventional plastics while maintaining postharvest quality and reducing waste.

POTENTIAL IMPACT

- **Environmental:** Less plastic waste and use of agro-residues.
- **Economic:** Added value for by-products and new industrial prospects.
- **Social:** Improved efficiency and safety in food distribution.
- **Scientific:** Advancement of smart packaging from local biomaterials.

CONCLUSION

ClimaPack: Ziplast was successfully developed as **smart packaging** from agro-industrial waste, offering both **protection** and **freshness indication**. This bioplastic presents significant potential to **reduce plastic pollution**, enhance **agricultural waste value**, extend **shelf life of climacteric fruits** and improve **food system sustainability**.

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OmegaBite: Fish Cakes Formulated From Mackerel and Bambara Groundnut as a Potential Alternative to Prevent Malnutrition in Children

Dela Puspita Sari, Ayuningtyas Putri, Ismawati
*I*PB University

Elementary school children smile together as an illustration of the target for preventing child malnutrition.
Source: Pixabay Documentation (2025)

Child malnutrition remains a major issue in many developing countries, including Indonesia. According to the WHO, around 740 million children aged 5–19 are affected by malnutrition, with 190 million undernourished, 390 million overnourished, and 160 million classified as obese. This condition negatively impacts children's growth, immune function, and cognitive development. Limited access to omega-3 from marine resources has driven the development of Fisbean, designed as a nutritional solution to help prevent child malnutrition.

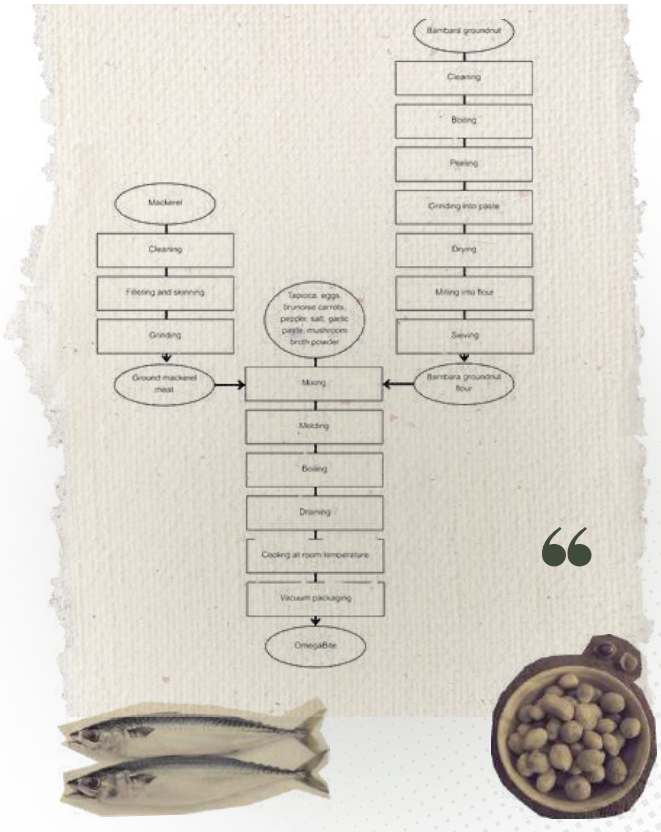
Objectives:

- To develop an innovative product based on mackerel with the substitution of Bogor nut flour as an effort to prevent malnutrition.
- To provide a solution for countries with limited aquatic resources.
- To increase children's interest through appealing product presentation.

Main ingredients include fresh mackerel as a protein source, skinless bambara groundnut flour as a filler and nutritional enhancer, as well as tapioca flour, eggs, and carrots to improve texture, fiber, and natural color. Additional ingredients such as pepper, salt, mushroom broth powder, and garlic paste are used to enhance flavor. The equipment used includes a digital scale, blender, steamer, stove, baking tray, oven, and sensory evaluation tools (plates, spoons, and questionnaires) for organoleptic testing.

This study employed a hedonic test to determine the level of panelists' preference for the product, with evaluation parameters including taste, aroma, color, and texture. A total of 30 mixed panelists (trained and untrained) were asked to assess four samples presented randomly using coded labels. The scoring method was applied to identify the most preferred sample as well as the overall product quality.

Overall, sample 233 was the most favored by panelists in terms of taste, color, and texture, while samples 372 and 621 were less preferred in certain aspects. Proximate analysis was also conducted to determine the macronutrient content of OmegaBite, which is formulated from mackerel and bambara groundnut flour.



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30	5	6	3	5	6	6	4	4	5	6	5	6	5	6	5	6
Jumlah	126	170	108	142	161	168	135	149	147	156	156	173	116	157	138	158
Rata-rata	4,2	5,67	3,6	4,73	5,37	5,6	4,5	5	4,9	5,2	5,2	5,8	3,9	5,2	4,6	5,3

No	Parameter Uji	Hasil	SD	Unit	Metode	Ref Metode
1	Kadar air	54,0975	0,1312	%	Gravimetri	SNI-01-2891-1992
2	Kadar abu	1,5416	0,0374	%	Gravimetri	SNI-01-2891-1992
3	Protein	9,7974	0,2114	%	Kjeldahl	SNI-01-2891-1992
4	Lemak	10,7355	0,8656	%	Soxhlet	SNI-01-2891-1992
5	Karbohidrat	23,8814	0,7365	%	*by difference*	AOAC, 2005

Impak!

The OmegaBite product, formulated from mackerel and bambara groundnut flour, meets the nutritional standards of SNI 7757:2013. Proximate analysis revealed a protein content of 9.78% (≥5%), which supports children's growth; carbohydrates at 23.88% as an energy source; and fat at 10.74%, still within a safe range, enriched with omega-3 fatty acids (EPA and DHA) that play a vital role in brain development. The moisture content of 54.10% is below the maximum limit (≤60%), though relatively high, indicating the need for vacuum packaging to extend shelf life. Meanwhile, the ash content of 1.54% reflects an adequate mineral composition.

Based on the nutritional requirements for children aged 4–6 years as stated in Ministry of Health Regulation No. 28 of 2019, OmegaBite contributes positively to fulfilling protein, energy, healthy fat, and micronutrient intake. In addition to its nutritional value, the product is also well-accepted organoleptically in terms of taste, aroma, color, and texture.

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MICROENCAPSULATION OF TANNINS FROM PERSIMMON:

AN INNOVATIVE NATURAL INGREDIENT FOR DIABETICS THERAPY

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Kaila Fatma Rahmadani, Alicia Marsha Nur Azizah
IPB University Vocational School

WHY PERSIMMONS MATTER IN DIABETES CARE

Diabetes is a chronic metabolic disorder characterized by elevated blood glucose levels (hyperglycemia) resulting from defects in insulin production, insulin action, or both. According to the latest data from the IDF Diabetes Atlas (2024), approximately 589 million adults worldwide are living with diabetes equivalent to 1 in 9 people. Tannins, which are abundantly found in persimmons, have been shown to act as bioactive compounds with promising benefits in diabetes management. They can help lower blood glucose levels, improve insulin sensitivity, and reduce oxidative stress and inflammation both of which are common in individuals with diabetes *(Martiniakova et al., 2025).*

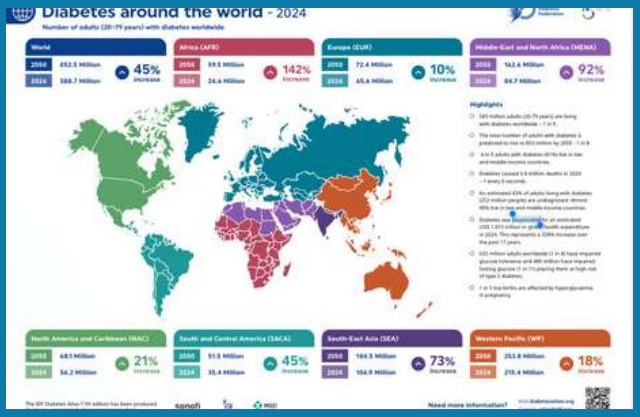
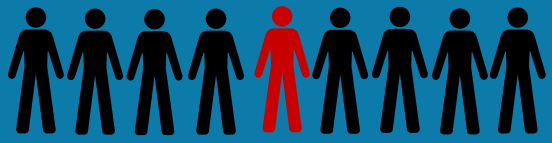


Figure 1 Distribution of Diabetes in the World

Source : https://diabetesatlas.org/



1 in 9 Adults Worldwide Live with Diabetes

Persimmons are rich in tannins that act as α-glucosidase inhibitors, thereby suppressing postprandial glucose spikes while simultaneously enhancing endogenous antioxidant defenses (SOD, CAT, GPx) to prevent oxidative damage, a key driver of diabetic complications. Meanwhile, persimmons peel extract at a dose of 100 mg/kg body weight has been shown *in vivo* to reduce fasting blood glucose levels in mice by approximately 49%. However, antioxidant activity data at this dosage remain limited, as significant increases in SOD and reductions in MDA have only been reported at higher doses (around 800 mg/kg). This highlights the strong potential of persimmons as an anti-diabetic adjuvant, though further studies are needed to confirm its specific antioxidant effects at lower doses. *(Nandhini et al., 2023)*

Figure 2 Persimmon Fruit

HOW TO MAKE MICROENCAPSULATION ?

MACERATION

Persimmon fruit and its skin are extracted using food-grade alcohol at 50°C and 120 rpm to obtain bioactive compounds such as flavonoids (*Flavan-3-ols*), tannins (*Ellagitannins and Gallotannins*), phenols (*Chlorogenic acid*), vitamins (*Ascorbic Acid)* and natural pigments *(Putri et al., 2023).*

SPRAY DRYING

The resulting extract is then mixed with maltodextrin and spray-dried at an inlet temperature of 120°C and an outlet temperature of 80°C. The powder yield from the fruit reached 9.6%, while from the skin it was 11%. The persimmon fruit and skin powder were analyzed for chemical composition, including tannin content, α-glucosidase inhibitory activity, and antioxidant activity (*Pawesti et al., 2025).*

PACKAGING

The final stage is packaging, where the analysis results are used to determine the capsule formulation for more practical consumption, quality maintenance, and extended shelf life.

CHEMICAL ANALYSIS RESULTS

Table 1 *Chemical analysis results of persimmon fruit*

Parameter	Persimmon fruit	Persimmon skin fruit
Tanin content	1,0000 ± 0,0072%	3,0000 ± 0,0085%
α - glucosidase Enzyme Activity	IC_{50} = 37,20 ppm	IC_{50} = 36,80 ppm
Antioxidant Activity	*GAE* = 6.70 Mg/Gram	*GAE* = 10.02 Mg/Gram

****GAE*** = Gallic Acid Equivalent (Antioxidants Parameter)

Persimmons exert a strong anti-diabetic effect through dual mechanisms: antioxidants (tannins, flavonoids, and phenolics) enhance endogenous defenses such as SOD, CAT, and GPx, reducing oxidative stress by approximately 40-50% compared with a standard diet, while procyanidins, catechin, and epicatechin inhibit α-glucosidase (maltase and sucrase), lowering postprandial hyperglycemia by about 30-40%. Together, these actions may reduce the risk and progression of diabetes by up to 60-70% more effectively than diets without supplementation. Based on in vivo data at 100 mg/kg body weight in mice, the human equivalent dose is approximately 567 mg of persimmon extract per day for a 70 kg adult, although clinical studies are needed to confirm efficacy and safety.

Figure 3 Microencapsulation of Tannins from Persimmon

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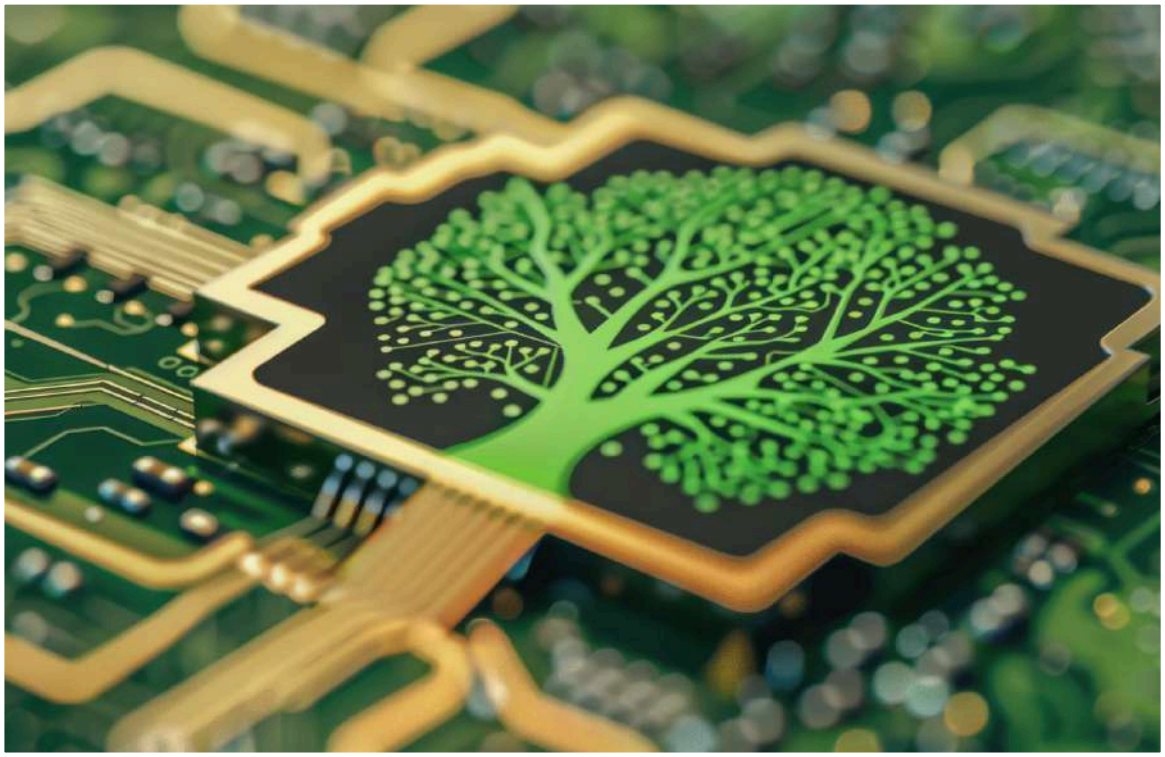


TEKNOLOGI HIJAU DAN KEJURUTERAAN

Teknologi Bersih, Masa Depan Terjamin.

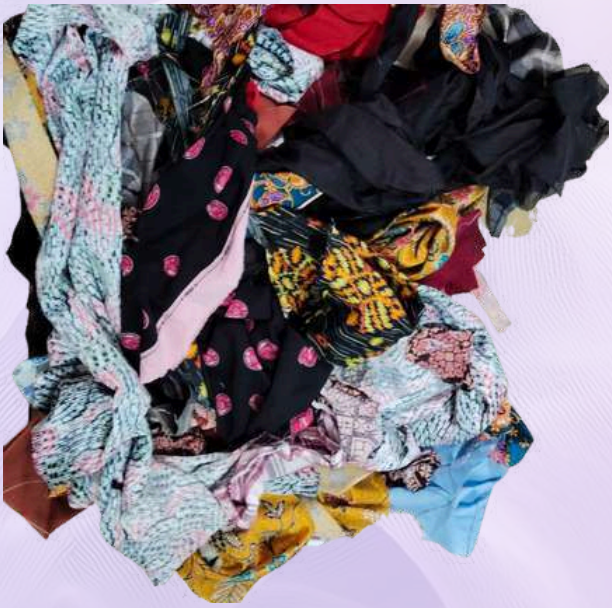
TERUSKAN MEMBACA

POCKET D'KLAZ
HASILAN SISA FABRIK

Yusmaria binti Mohd Yusoff, Siti Nor Lailiyah binti Ibrahim
Kolej Komuniti Hulu Langat

PENGENALAN

Saban tahun sisa pepejal meningkat ekoran daripada perkembangan pesat populasi dan perindustrian yang membawa kepada pencemaran alam sekitar. Menurut Rosmidahanim et al.(2025), isu ini bukanlah perkara yang baru diketengahkan pada setiap tahun namun ianya menjadi isu yang hangat diperbincangkan dalam kalangan masyarakat. Sisa kain daripada industri pakaian, langsir atau fabrik rumah sering berakhir di tapak pelupusan, menyumbang kepada pencemaran alam sekitar. Sejajar dengan salah satu bidang tumpuan Smartgreen POLYCC iaitu pengurusan sisa, maka Pocket D'Klaz dihasilkan sebagai salah satu inovasi. Pocket D'Klaz menggunakan bahan utama iaitu sisa kain untuk menghasilkan inovasi penyimpanan praktikal bagi memudahkan pelajar. Penggunaan produk ini adalah di sarung pada bahagian belakang kerusi bagi membolehkan pelajar menyimpan barangan peribadi seperti alat tulis, buku nota, dan sebagainya. Selain mengurangkan pembaziran kain, produk ini juga dapat memberi manfaat kepada kebersihan dan kekemasan bilik kuliah.



OBJEKTIF

1. Menghasilkan poket letak barang belakang kerusi menggunakan bahan sisa kain yang mesra alam.
2. Mengurangkan sisa tekstil yang dibuang ke tapak pelupusan.
3. Menyediakan ruang simpanan tambahan untuk pelajar
bagi mengekalkan kekemasan bilik kuliah.
4. Meningkatkan kesedaran pelajar tentang kepentingan
kitar semula dan kelestarian alam sekitar.

PENYATAAN MASALAH

Jumlah sisa tekstil yang tinggi menjadi ancaman kepada alam sekitar kerana proses pereputan kain sintetik mengambil masa bertahun-tahun dan melepaskan mikroplastik ke dalam tanah serta sumber air. Pada masa yang sama, pelajar sering menghadapi kekangan ruang bagi kelas yang hanya menggunakan kerusi flip di dalam bilik kuliah.

Ketiadaan ruang simpanan tambahan menyebabkan barangan berselerak di atas meja flip atau lantai, sekali gus mengganggu tumpuan belajar. Oleh itu, terdapat keperluan untuk mencipta produk yang bukan sahaja menyelesaikan masalah penyimpanan, tetapi juga mengurangkan impak negatif sisa kain terhadap alam sekitar.

METODOLOGI

Proses membuat *Pocket D'KLAZ* menggunakan bahan sisa kain:

1. Pengumpulan Sisa Kain – Mengumpulkan kain terbuang dari rumah atau bilik jahit.
2. Pemilihan Bahan – Memilih kain yang sesuai.
3. Reka Bentuk Produk – Melakar pola dan bentuk poket dengan ukuran sesuai untuk belakang kerusi pelajar.
4. Pemotongan & Jahitan – Memotong kain mengikut saiz, menjahit beberapa poket dengan rekabentuk yang sesuai.
5. Pengujian Produk – Menguji ketahanan, kapasiti, dan kemudahan penggunaan produk di bilik kuliah.

KEPUTUSAN

Pocket D'KLAZ mampu memuatkan sehingga lebih lima jenis barangan pelajar secara teratur. Kerusi pelajar kekal kemas, dan barangan mudah dicapai tanpa mengganggu pembelajaran. Dari aspek alam sekitar, penggunaan sisa kain mengurangkan jumlah bahan yang dibuang ke tapak pelupusan dan memanjangkan kitar hayat tekstil. Tambahan pula, kos pembuatan adalah rendah kerana bahan utama boleh diperoleh secara percuma.

KESIMPULAN

Pocket D'Klaz (Kitar Semula) bukan sahaja menawarkan penyelesaian praktikal untuk masalah kekurangan ruang simpanan di bilik darjah, tetapi juga membantu mengurangkan pencemaran akibat pembuangan sisa tekstil. Produk ini membuktikan bahawa inovasi berasaskan kitar semula boleh memberi impak positif terhadap alam sekitar sambil mendidik generasi muda tentang pentingnya kelestarian alam.

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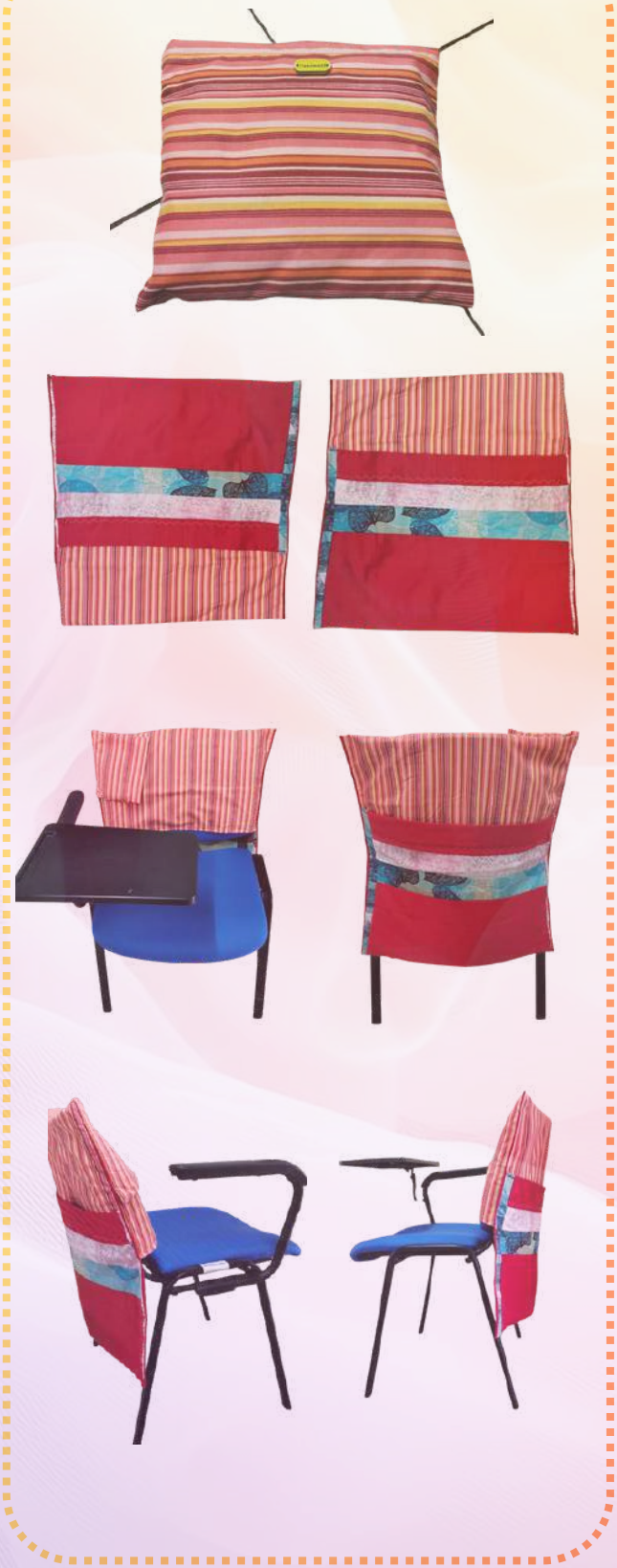

ECO-GREEN CONCRETE

Silica Waste-Based Aggregate Innovation for Sustainable Construction: An Experimental Study

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Nur Ikhsan Aswad and Della Oktara Yusril
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INTRODUCTION

The rapid expansion of infrastructure has significantly increased the demand for concrete aggregates, leading to the excessive extraction of natural sand and gravel from rivers. This practice threatens ecological balance and environmental sustainability. Meanwhile, limestone mining generates abundant silica sand and gravel waste, which remains underutilized despite its promising engineering potential. This study explores the feasibility of reusing this waste as an alternative aggregate in high-strength concrete mixtures.

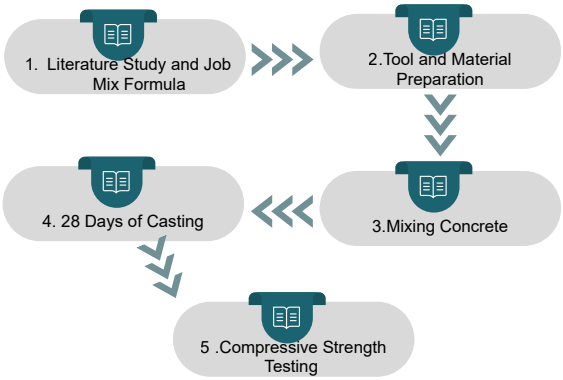
Silica sand is a waste material from limestone production for cement factory raw materials that is discarded and washed away into rivers (Mulyati and Jovari, 2024). Silica sand has a slightly coarse texture and is brownish in color.

Bakruddin et al. (2020) stated that silica sand waste contains the highest concentration of three elements, namely SiO_2 at 60%.
The highest chemical element in silica sand is silica (Si), which can reach 60%. Silica is a chemical compound that can be obtained from various sources, including mineral silica, crystal synthesis, and plant-based silica.

The use of silica sand as a partial replacement for fine aggregate in concrete has the potential to improve concrete quality. According to Nadia and Fauzi (2011), silica (SiO_2) is a chemical that can improve concrete quality due to the reaction between silica and free lime in the concrete mixture. In addition, the innovation of concrete using silica sand as a partial substitute for fine aggregate is due to the continuous production of this waste from the limestone mining process in the cement manufacturing process.

PROBLEM STATEMENTS

- Silica sand waste is currently underutilized and often becomes a source of environmental pollution.
- The availability of natural aggregates for construction is declining due to overexploitation, necessitating sustainable alternatives.
- There is no effective and economical technology to process silica sand waste into high-quality aggregates that meet construction standards.



METHODOLOGY

OBJECTIVES

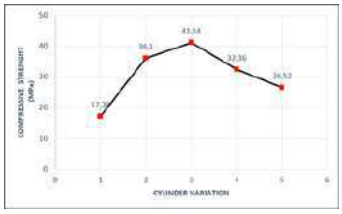
- To develop a sustainable aggregate material by utilizing silica waste as an alternative to natural aggregates in construction.
- To design and optimize a processing method for converting silica waste into high-quality construction aggregates.
- To experimentally evaluate the mechanical properties, durability, and physical characteristics of silica waste-based aggregates.

The method in this research applies the experimental method. The tests carried out in this study include material testing, compressive strength testing and concrete flexural strength testing. Test were carried out referring to the American Standard Testing and Material (ASTM) as well as some previous research literature that has been carried out in Concrete Laboratory, Department of Civil Engineering, Politeknik Negeri Padang. Silica material used in this research are from Indarung limestone waste, while fine and coarse aggregate are from natural aggregate in West Sumatera. This research was conducted to obtain the composition of the silica aggregate mixture as an additional ingredient in concrete, where the results of this study are the results of compressive strength.

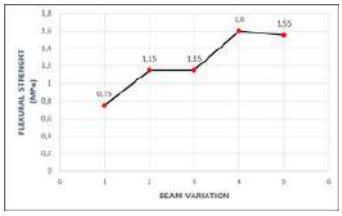
RESULT

Some variations of silica sand and gravel as aggregate substitution in concrete mixtures for compressive strength and Concrete flexural strengthtesting are as follows:

1. 100% natural fine and coarse aggregates,
2. 100% natural fine and coarse aggregates with Sika admixture,
3. 100% silica sand combined with natural coarse aggregate and Sika,
4. 100% natural fine aggregate with silica gravel and Sika,
5. 100% silica sand with silica gravel and Sika admixture.



28-day compressive strength.



Concrete flexural strength

CONCLUSION

The highest compressive strength value of concrete is obtained in the 3rdconcrete variation with a concrete mixtureof 100% Silica sand + Natural gravel + Sikament NN with a value of 41.14 MPa.

Hard and stable silica sand increases the compressive strength of concrete because it contributes to the transfer of loads between aggregate particles and the small particle size helps fill the gaps between coarse aggregates, resulting in denser and stronger concrete and the chemical reaction between the silica content in silica sand will react with calcium hydroxide ($Ca(OH)_2$) produced from the cement hydration reaction so that it can produce high compressive strength.

This makes this silica sand material very potential to be used as a substitute material for river mined sand and replace it with silica sand waste which has the potential to produce high-strength concrete.

The results of testing the compressive strength of sand concrete and silica gravel as aggregate substitution at the age of 28 days.

From the graph of 28-day compressive strength, it can be seen that the highest compressive strength value is found in 3rd variation (100% silica sand + coarse aggregate+ sika) with an average compressive strength value of 41.14 MPa.

IMPACT

1. Using silica sand waste as a sand substitute in concrete mixes with recycled aggregate can significantly increase the concrete's compressive strength. Adding 100% silica sand waste as fine aggregate resulted in a concrete compressive strength of 41.14 MPa, demonstrating improved mechanical performance for eco-green concrete.
2. Concrete using silica sand waste can reduce the environmental impact of massive river dredging and damage to river ecosystems and reprocess limestone mining waste, thereby ensuring the sustainability of construction materials.
3. Hard and stable silica sand increases the compressive strength of concrete because it contributes to the transfer of loads between aggregate particles and the small particle size helps fill the gaps between coarse aggregates, resulting in denser and stronger concrete and the chemical reaction between the silica content in silica sand will react with calcium hydroxide ($Ca(OH)_2$) produced from the cement hydration reaction so that it can produce high compressive strength.
4. The use of silica sand waste contributes significantly to the Sustainable Development Goals (SDGs). The Sustainable Development Goals (SDGs) are a global commitment to improving the well-being of society, encompassing 17 global goals to be achieved by 2030. The use of silica sand waste as a concrete mixture material addresses two key goals: Goal 9, industry, innovation, and infrastructure and Goal 11, sustainable cities and settlements.

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SOLID WASTE MANAGEMENT SYSTEM

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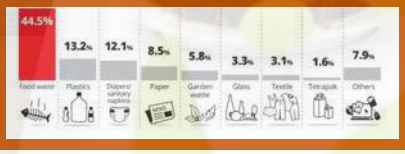
INTRODUCTION

In the modern era, awareness of the issue of food waste is high. However, food waste disposal still relies on landfills. The problem is that landfills produce methane gas that can pollute the environment.

Therefore, food waste management systems are designed to manage food waste or surplus food systematically and environmentally friendly. This system involves the process of collecting food waste, processing it, and converting it into useful materials such as organic fertilizer and biogas (methane gas and carbon dioxide) through anaerobic digestion.

PROBLEM STATEMENT

- Awareness of food waste issues in Malaysia is high, but disposal still relies heavily on landfills.
- Landfills produce methane gas and pollute the environment.
- AD (anaerobic digestion) and CCS (carbon capture & storage) technologies have proven effective, but are rarely used at the local or household level.



OBJECTIVE

- To design a solid waste management system by controlling the release of carbon dioxide and methane gas.
- To compare organic fertilizers produced from the anaerobic process with chemical fertilizers available on the market in terms of quality and performance.

Food waste management plays a very important role in the environmental balance. Therefore, efficient management can reduce environmental pollution, in terms of the production of leachate and toxic gases. Indirectly, it can also reduce public health problems

n conclusion, the implementation of an innovative food waste management system is very important to ensure environmental sustainability and community well-being. Through systematic management and the use of green technologies such as anaerobic digestion, food waste can be converted into valuable resources, thus contributing to a cleaner, more efficient and sustainable future.

METHODOLOGY

The method in this research uses experimental methods. The tests carried out in this study are anaerobic digestion process, biogas production tests, and quality analysis of the organic liquid and solid fertilizer produced. All these tests were carried out based on references to previous literature reviews from 2019 to 2024 related to food waste management and biogas production. This study uses food waste such as vegetables, rice, fish meat, chicken meat, etc. as the main ingredients. This study aims to evaluate the effectiveness of the process of converting food waste into liquid fertilizer, solid fertilizer and biogas.

RESULTS AND ANALYSIS

The expected results of this food waste management are organic liquid fertilizer, organic solid fertilizer, methane gas and carbon dioxide. Carbon dioxide and methane gas are expected to be produced from the anaerobic digestion process used in the decomposition of food waste. Methane gas is expected to be collected and stored safely to be used as an alternative source such as fuel. While carbon dioxide is collected and sent to greenhouses to help the growth of trees planted in the greenhouse. In addition, liquid and solid organic fertilizers are used for agriculture as a replacement for chemical fertilizers on the market. This is because it is to maintain plant growth and soil fertility.

CONCLUSION

Overall, this project focuses on food waste management using anaerobic digestion to produce biogas and organic fertilizer. Through the system developed, food waste can be converted into a renewable energy source in the form of methane gas and liquid fertilizer that is rich in nutrients for agriculture and can fertilize the soil. This process not only helps reduce the amount of food waste thrown into landfills, but also controls the emission of greenhouse gases such as carbon dioxide and methane that contribute to global warming. In addition, the results of this project have the potential to be a more environmentally friendly alternative to the use of chemical fertilizers, in addition to increasing public awareness of the importance of sustainable food waste management. Indirectly, this project contributes to efforts to achieve sustainable development through a balanced combination of environmental, social and economic aspects.

IMPACT

- Lower methane emissions from landfills.
- Renewable energy source for households.
- Support urban farming & greenhouse projects
- Community empowerment in waste management.
- Promotes sustainable agriculture & soil health.

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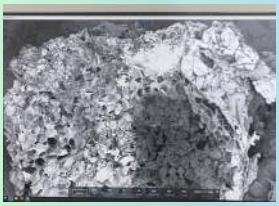
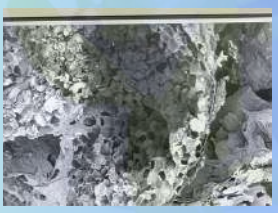
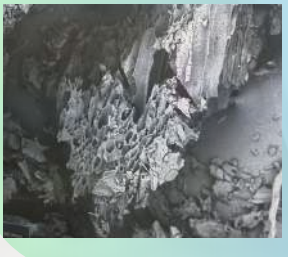
PROSES WORKS

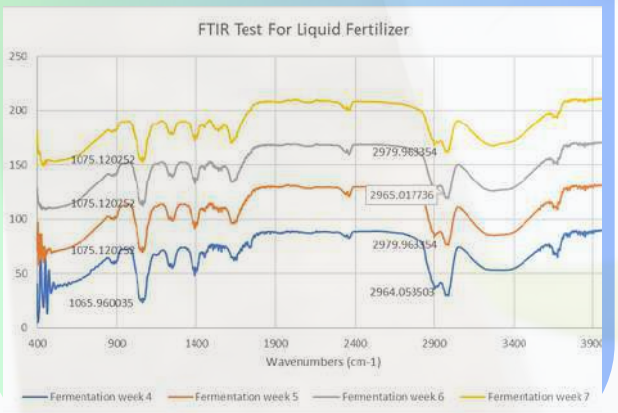
ANALYSIS

SCANNING ELECTRON MICROSCOPE (SEM)

500X MIKRO METER

FOURIER TRANSFORM INFRARED SPECTROSCOPY (FTIR)



DUAL AXIS SOLAR TRACKER WITH IOT MONITORING

Mohamad Ikhwan bin Mohamad Mazuki, Maximus Manchu anak Kanang, Hasyireen binti Abdul Halim
Politeknik Tun Syed Nasir Syed Ismail

Introduction

Solar energy plays a critical role in addressing the global demand for clean and sustainable power. However, the efficiency of photovoltaic (PV) panels depends heavily on their orientation toward the sun. Fixed solar panels are unable to capture maximum irradiance throughout the day, which reduces their overall performance. Dual-axis solar tracking systems, capable of adjusting both azimuth and elevation angles, significantly improve energy yield by maintaining an optimal orientation to the sun. With the integration of the Internet of Things (IoT), monitoring and control can be performed remotely in real time, enabling efficient system performance, predictive maintenance, and user-friendly operation.

Objective

The aim of this project is to design a dual-axis solar tracker that can automatically adjust the position of solar panels to follow the sun, to improve the efficiency of solar power systems by about 30–40% through better alignment, and to add IoT monitoring for real-time tracking of performance, panel movement, and environmental conditions.

Source: yahoo!

Source: yahoo!

Problem Statement

Conventional solar panels and single axis trackers fail to achieve maximum energy output due to their limited orientation capabilities. Furthermore, existing dual-axis systems are often costly, energy-intensive, and lack intelligent monitoring features. There is a need for an affordable, efficient, and IoT-enabled dual-axis solar tracker that improves PV efficiency while offering remote monitoring and system management.

Methodology

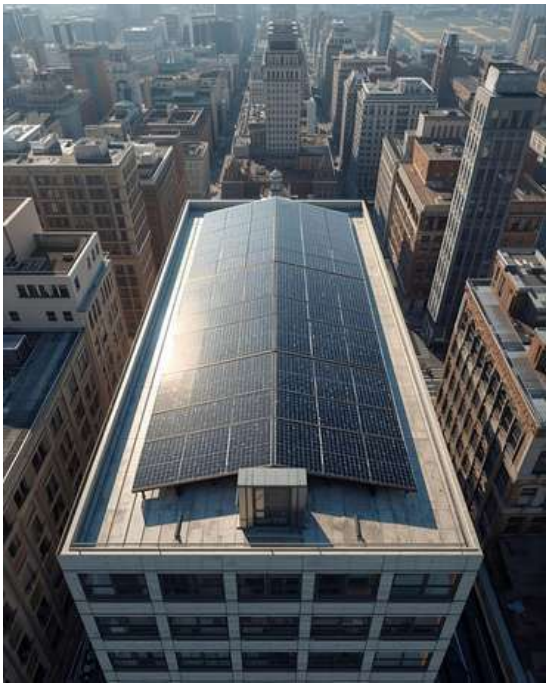
The proposed system integrates mechanical, electronic, and IoT components. Dual-axis movement is achieved through stepper motors controlled by a microcontroller, which receives input from light-dependent resistors (LDRs) to track the sun's position. An IoT module (e.g.,ESP32) is used to transmit real-time performance data such as voltage, current, and panel orientation to a cloud-based platform for monitoring. The design was tested under varying sunlight conditions to compare its performance with fixed-panel configurations.

Results

Experimental results show that the IoT enabled dual-axis solar tracker consistently produced higher energy output compared to fixed panels and single-axis systems. On average, the proposed system improved energy capture by 25–35% over static panels. The IoT monitoring feature successfully transmitted real-time performance data, enabling remote supervision and early fault detection. These results confirm that the system enhances both the efficiency and reliability of solar energy generation.

Conclusion

This research demonstrates the effectiveness of an IoT-enabled dual-axis solar tracker in improving photovoltaic efficiency and enabling intelligent monitoring. The system offers a cost effective, scalable, solution for and sustainable renewable applications. technology, By it integrating ensures energy IoT remote accessibility, better maintenance, and greater adaptability for both residential and commercial use. Future work may focus on incorporating AI-based predictive tracking to further optimize performance and reduce actuation energy.



Source: yahoo!

Source: Real Project

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BIOVERTO: MICROEMULSION BASED BIOPESTICIDE

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IPB University, Indonesia

WHY BIOPESTICIDE

The agricultural sector worldwide utilizes several supporting components to boost the yield of certain agricultural commodities, one of which is pesticides. Pesticides are chemicals or compounds used to control or eradicate specific pests on crops. Chemical pesticides have a significant impact on the environment. Chemical pesticides also have negative effects on humans if their concentration exceeds the recommended limit.

One alternative solution to this problem is the use of biopesticides.***Dioscorea* hispida tuber** is one of the natural ingredients that can be made into a biopesticide because it contains active compounds that have **toxic properties to control pests**, these compounds include dioscorin, saponin, and cyanide acid. Thia tuber have a **hydrocyanic acid** content in the tubers, which can be used as a biopesticide.

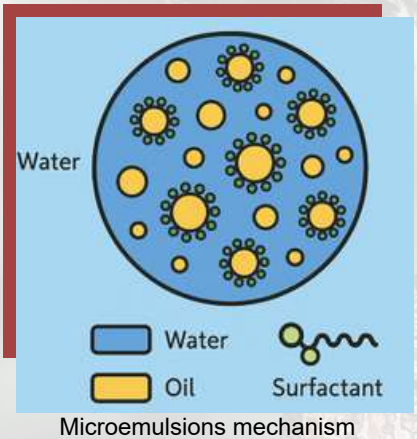
Natural ingredients used as pesticides, and the chemical content in them.

Biopesticides are pesticides made from natural substances such as microorganisms, bacteria, viruses, fungi, or plant extracts that have the effect of preventing or killing agricultural pests. The problems caused by the use of chemical pesticides have encouraged the use of **biopesticides as an alternative to chemical pesticides.** One part of the plant that can be used as a biopesticide is the gadung tuber (*Dioscorea* hispida).

A combination of several plant extracts can enhance the effectiveness of biopesticides. A combination of **turmeric** extract and ***Ageratum conyzoides L***. leaves can be used. Because the extract from the tuber *Dioscorea* hispida uses water as a solvent, additional ingredients that are resistant to bacteria are needed. **Turmeric extract contains antibacterial compounds**, which extend the shelf life of the extract. Extracts from ***Ageratum conyzoides* L leaves** can improve the performance of biopesticides because these extracts contain **alkaloid compounds** that are disliked by most plant pests.

Product innovation offered!

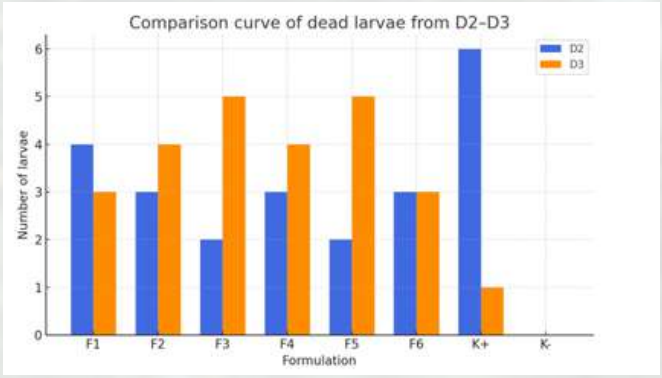
Microemulsions are transparent, thermodynamically stable liquid dispersion systems consisting of air, oil, surfactants, and cosurfactants with droplet sizes ranging from 1**0 to 400 nanometers**. In agriculture, these formulations are used to test the **stability** and **effectiveness** of active compounds in botanical pesticides. The main challenges for biopesticides are the volatility and sensitivity of natural compounds such as essential oils or plant extracts to light, oxygen, and temperature, which accelerate the degradation of the active compounds.



Microemulsions mechanism

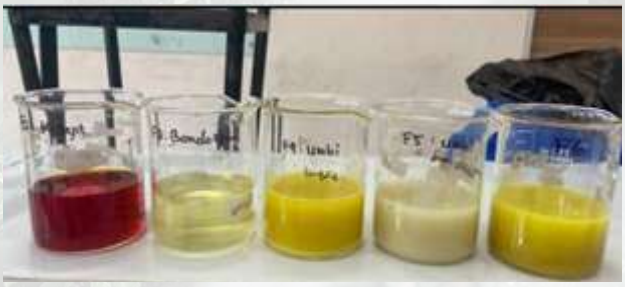
HOW TO MAKE A MICROEMULSION BASED BIOPESTICIDE

The final product BIOVERTO



Comparison curve

The results of the **antifeedant test** showed that the formula with *Dioscorea* hispida tuber extract produced a **more significant** value in killing larval growth. Tests were also conducted with biopesticides without formulation in the form of microemulsions, the results showed that biopesticides in the form of microemulsions could kill pests within 3 days.



Microemulsion formulation

The results of quantitative test showed that the **curcumin content** in the extract was **61.16 ppm**. Qualitative testing of **saponins in Ageratum conyzoides L.** leaf extract showed **positive results** and quantitative tests of **cyanide acid in Dioscorea hispida tuber extract** produced levels of **200-280 ppm**.

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SMARTFERT GREENTECH : AUTOMATED FERTILIZER SYSTEM FOR SUSTAINABLE AGRICULTURE

Norhafzan binti Bariman
Politeknik Muadzam Shah

Fertilizer is a fundamental component of agriculture, supplying essential nutrients such as nitrogen (N), phosphorus (P), and potassium (K) to ensure healthy crop growth and high yields. However, conventional fertilizer application methods as shown in Fig. 1 are often inefficient, labor-intensive, and environmentally unsustainable due to issues such as overuse, nutrient leaching, and runoff that leads to water pollution (Yu & Wu, 2018). These challenges not only waste valuable resources but also contribute to greenhouse gas emissions and ecological degradation.

Precision agriculture, which integrates automation, sensing technologies, and data-driven decision-making, has emerged as a viable solution to improve efficiency and sustainability in farming (Liu, Wu, & Riaz, 2025). By monitoring real-time soil conditions and dynamically adjusting nutrient supply, precision systems ensure optimal plant growth while reducing environmental impact (Getahun, Kefale, & Gelaye, 2024).

Fig. 1 : Conventional Fertilizer
Source: AI Canva

This study introduces SmartFert GreenTech, an Automated Fertilizer Dispensing System designed using a Programmable Logic Controller (PLC). The system integrates real-time soil nutrient sensors with automated pumps and valves to deliver precise quantities of fertilizer. SmartFert GreenTech aligns with the principles of green technology by promoting resource efficiency, reducing pollution, and supporting sustainable agriculture.

>>> PROBLEM STATEMENT

Conventional fertilizer application is labor-intensive, inaccurate, and environmentally harmful due to nutrient leaching and emissions, which reduce crop yields and threaten farmer health (Suzer, Senbayram, & Çullu, 2024). Although precision methods like variable-rate application (VRA) can mitigate these issues (Obi Reddy, Dwivedi, & Ravindra Chary, 2023), there remains a need for an automated, efficient, and eco-friendly fertilizer system that supports sustainable agriculture as shown in Fig. 2.

Fig. 2 : Sustainable Agriculture
Source: AI Canva

>>> OBJECTIVE

This study aims to design and develop a PLC-based Automated Fertilizer Dispensing System (AFDS), evaluate its consistency in nutrient delivery, and assess its impact on crop growth and sustainable agriculture.

>>> METHODOLOGY

The SmartFert GreenTech AFDS was designed to optimize nutrient delivery for strawberry plants. The system integrates a Programmable Logic Controller (PLC) with NPK sensors, an Electrical Conductivity (EC) meter, solenoid valves, water pumps, and fertilizer tanks as shown in Fig. 3. The PLC regulates fertilizer application based on real-time sensor readings to maintain an EC level of 1.9 mS/cm, optimal for strawberry growth.

Fertilizer and water were dispensed at fixed intervals (9 am, 5 pm, and 1 am) daily, to ensure consistent nutrient delivery. The trial involved strawberry leaf color, and root development were recorded. Fertilizer consumption was compared with conventional manual fertilization to evaluate efficiency and sustainability outcomes..

Fig. 3 : SmartFert Greentech System

>>> RESULT

The SmartFert GreenTech system demonstrated strong compatibility with strawberry plants. The results showed consistent nutrient delivery, improved leaf development, and stronger root growth. Fertilizer efficiency was improved with approximately 30% savings compared to traditional methods. Data collected from the trial is summarized in the Table 1.

Table 1 : Plant Growth Performance

Day	Leaf Condition
1	Light green
5	Greener leaves
10	Healthy green
14	Dark green

The study on strawberry plants demonstrated that the SmartFert GreenTech systems maintained EC stability at 1.9 mS/cm, which is optimal for early vegetative growth. Data collected from the study. The plants showed an increase in leaf count, stronger root development, and healthier leaf coloration, indicating efficient nutrient uptake.

>>> CONCLUSION

This study demonstrates that SmartFert GreenTech is highly effective for cultivation. By integrating PLC-based automation with real-time nutrient monitoring, the system delivered precise fertilizer application that resulted in healthier plants, improved leaf development, and stronger root systems. Fertilizer use was reduced by approximately 30%, minimizing waste and lowering the risk of nutrient leaching. From a sustainability perspective, SmartFert GreenTech exemplifies green technology principles by combining productivity with environmental responsibility. The system not only enhances strawberry growth and farm efficiency but also supports long-term soil health and ecological balance, positioning it as a scalable and eco-efficient innovation for modern farming.

Fig. 4 : Strawberry Plant after using SmartFert

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ECO-INSULATION: SUSTAINABLE HOME INSULATION USING RECYCLED TEXTILE FIBERS

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Ahmed Yasin Bin Muhammad Rizal, Mohamad Zuhair Bin Mohamad Zahid, Muhammad Hazrin Bin Zulkeplee, Muhammad Zahin Bin Sazali
Politeknik Tun Syed Nasir Syed Ismail

>>> INTRODUCTION

In recent years, global awareness of environmental sustainability has encouraged the use of recycled materials in various industries. The textile industry produces a large amount of waste every year, much of which ends up in landfills and contributes to pollution.

To reduce this issue, recycled textile fibers can be repurposed into valuable materials such as home insulation.

This project focuses on developing an eco-friendly insulation material made from waste textile fibers combined with natural binders such as borax and gum arabic. The goal is to create a sustainable, cost-effective, and thermally efficient insulation that can be used in buildings while reducing textile waste.

>>> PROBLEM STATEMENT

Traditional insulation materials such as fiberglass and foam are effective but have environmental drawbacks they are non-biodegradable, energy-intensive to produce, and can cause irritation or health hazards during installation.

Meanwhile, large quantities of textile waste are generated globally, contributing to landfill accumulation and resource depletion. Therefore, there is a need for a sustainable alternative insulation material that is environmentally friendly, safe to handle, and utilizes recycled resources.

>>> OBJEKTIF

- To produce home insulation material using recycled textile fibers (polyester fleece and cotton).
- To evaluate the effectiveness of different fiber ratios and natural binders (such as borax and arabic gum).
- To analyze the thermal insulation performance and physical properties of the produced material.
- To promote sustainable waste management through the reuse of textile waste.

METODOLOGI

1.Material Preparation

- **Recycled textile fibers:** Polyester fleece and cotton obtained from waste clothing or fabric scraps.
- **Binders:** Borax (fire retardant and antifungal agent) and Arabic gum (natural adhesive).
- **Equipment:** Mixer, molds, oven, thermometer, heat source, and analytical instruments (SEM, FTIR).

2.Preparation Process

- **Collection and Cleaning:** Textile waste was collected, washed, and dried to remove dust, oil, and contaminants.

- **Cutting and Blending:** The fibers were cut into small pieces and mixed in different ratios — 100:0, 70:30, 30:70, and 0:100 (polyester:cotton).

- **Binder Preparation:** A solution of borax and arabic gum was prepared in water and mixed until fully dissolved.

- **Forming Insulation Mats:** The fiber mixtures were combined with the binder, placed in molds, and pressed to form uniform layers.

- **Drying Process:** Samples were dried in an oven at a controlled temperature to remove moisture and solidify the structure.

- **Post-Treatment:** Dried samples were conditioned at room temperature before testing.

3.Testing & Analysis

- **Thermal Performance Test:** Measured the heat resistance and insulation efficiency using a heat source and thermometer.
- **Fourier Transform Infrared Spectroscopy (FTIR):** Used to identify the chemical bonding between binder and fiber.
- **Scanning Electron Microscopy (SEM):** Observed surface morphology and fiber bonding quality.
- **Physical Observation:** Evaluated texture, flexibility, and overall appearance.

>>> RESULT

The produced eco insulation showed promising results in terms of texture, structure, and insulation capability.

- The best composition was found to be 70% polyester fleece and 30% cotton, which provided good fiber bonding and durability.
- Borax acted as both a fire retardant and anti-fungal agent, improving the product's safety.
- FTIR and SEM analyses confirmed good fiber bonding and chemical interaction between binder and fiber.
- The insulation demonstrated low heat transfer, indicating good thermal performance suitable for home use.

RESULT

SEM ANALYSIS
500X

70% POLYESTER FLEECE, 30% COTTON

70% COTTON, 30% POLYESTER FLEECE

RESULT

50% POLYESTER FIBER, 50% POLYESTER FLEECE

33% POLYESTER FLEECE, 33% POLYESTER FIBER, 33% COTTON

>>> CONCLUSION

This project successfully developed a home insulation material using recycled textile fibers and natural binders. The material exhibited good insulation properties, eco-friendliness, and safe handling compared to conventional insulators. With further optimization, it has the potential for commercial application and can contribute significantly to sustainable building practices.

>>> IMPACT

1. **Environmental Impact:** Reduced textile waste by transforming discarded fabrics into useful materials.
2. **Economic Impact:** Provides a low-cost insulation alternative for households and small industries.
3. **Social Impact:** Promotes community awareness of recycling and sustainability practices.
4. **Scientific Impact:** Contributes to research on green materials and circular economy approaches in construction.

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ENGINEERING SUSTAINABLE BRICKS WITH SAGO FINE WASTE:

BALANCING STRENGTH, INSULATION, AND ENVIRONMENTAL IMPACT

Ts. Dr. Norhayati Abd Wahab & Dr. Noor Azah Abdul Raman
Politeknik Merlimau Melaka

INTRODUCTION

The construction sector remains one of the largest contributors to global carbon emissions, largely due to the extensive use of Ordinary Portland Cement (OPC), which is energy-intensive in production (Andrew, 2020).

In response to sustainability goals and the transition towards a circular economy, recent innovations have focused on partially replacing traditional construction materials with agro-industrial waste (Sharma & Khan, 2022).

This study examines the use of Sago Fine Waste (SFW), a treated fibrous by-product from the local sago industry, as a partial cement replacement in brick production (I Hadi Izaan et al., 2022). Instead of being discarded, the sago waste is reused as a value-added material that can improve the mechanical and environmental performance of bricks while also reducing disposal issues such as landfill buildup and water pollution.

This research examines how Sago Fiber Waste (SFW) affects compressive strength, carbonation resistance, and thermal conductivity in cement bricks (Zhao et al., 2021; Wei et al., 2021). These performance indicators help determine whether SFW bricks are a viable and sustainable option for the built environment (Fig. 1).

The study also supports Malaysia's climate goals and the Sustainable Development Goals (SDGs), especially those focused on responsible production and climate-resilient infrastructure (United Nations, 2023).

PROBLEM STATEMENT

Cement production is a major source of global CO_2 emissions, contributing about 7–8% of all human-generated greenhouse gases, making it one of the largest industrial emitters (Andrew, 2020; Yilmaz & Ediz, 2023)

The sago processing industry also produces large amounts of fibrous waste that is usually thrown into landfills or waterways, leading to pollution and environmental damage (Hasan et al., 2022). These combined problems—high carbon emissions, high energy use, and poor waste management—show the need for sustainable solutions that can cut CO_2 emissions, reuse agro-industrial waste, and improve the thermal performance of construction materials.

OBJECTIVES

The study aims to optimize SFW bricks by achieving a balance between mechanical strength, CO_2 absorption, measure thermal insulation, and identify optimal SFW percentage to support sustainable construction

Wet sago waste | Sago Fine Waste (SFW) | Sago Fine Waste Bricks (SFWB)

Fig 1: From waste to innovation

METHODOLOGY

This study produced cement bricks containing 2%, 4%, 6%, 8%, and 10% Sago Fine Waste (SFW) by weight of cement, along with a control mix, using two water–cement ratios (0.5 and 0.6) to examine the effect of moisture on material performance (Norhayati A.W. et al., 2023).

The SFW was sun-dried, ground, and sieved into a fine powder following established methods (Norhayati A.W. et al., 2025) (Fig. 2). Cement, sand, SFW, and water were mixed manually, molded into standard brick specimens, and cured in water for 7, 28, 56, 90, 112, and 180 days to evaluate both early and long-term behavior.

RESULTS & FINDINGS

The results demonstrated that incorporating 2% SFW with a 0.6 w/c ratio yielded the highest compressive strength of 15.78 N/mm², showing a 3.34% improvement over the control sample and meeting the requirements for load-bearing use (MS 76:1972; ASTM C90, 2016).

Carbonation tests over 180 days showed that CO_2 absorption increased with higher SFW content, with 10% SFW bricks reaching a carbonation depth of 8.1 mm, suggesting good potential for carbon capture in buildings.

Thermal conductivity results were also encouraging, as SFW bricks recorded values as low as 0.09 W/mK, making them effective thermal insulators. These low values are similar to lightweight insulating materials, showing that SFW improves heat resistance (Chung et al., 2020). This property is especially important in tropical climates, where reducing heat transfer can help lower cooling energy use in buildings.

Fig 2: Process of drying, grinding, and sieving Sago Fine Waste (SFW)

CONCLUSIONS

The results showed that bricks with 2% SFW at a 0.6 w/c ratio achieved the highest compressive strength of 15.78 N/mm², which is 3.34% higher than the control and meets load-bearing standards (MS 76:1972; ASTM C90, 2016).

By reducing cement use and incorporating agro-waste, this approach helps address major environmental issues such as carbon emissions, waste management, and building heat inefficiency. The SFW bricks achieved good mechanical strength, better thermal performance, and showed potential for CO_2 sequestration through carbonation.

Overall, the findings highlight SFW as an effective green additive that supports both technical performance and environmental sustainability. This innovation also aligns with TVET-based applied research and contributes to Malaysia's green technology and low-carbon development goals.

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SMART BIOSOLAR WALL: AN IOCT-BASED VERTICAL SOLUTION FOR EMISSION REDUCTION AND URBAN HEAT MITIGATION IN DENSE TROPICAL RESIDENTIAL AREAS

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IPB University Vocational School

INTRODUCTION

Tropical residential areas face major challenges, namely **high carbon emissions** from fossil fuels and the **urban heat island (UHI) effect**, which worsen living conditions. Large building surfaces, especially non-glazed concrete walls, are a major contributor to heat accumulation due to their ability to absorb solar radiation. At the same time, the lack of green open spaces exacerbates air pollution and reduces carbon absorption. Green technological innovations are needed to reduce emissions while cooling cities. One solution is the Smart BioSolar Wall (SBW), a modular solar-powered green wall that functions as thermal insulation, a clean energy provider, and an IoCT-based monitoring system.

Figure 1. Smart Biosolar Wall

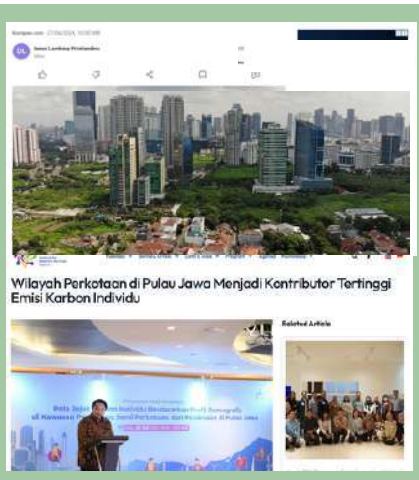
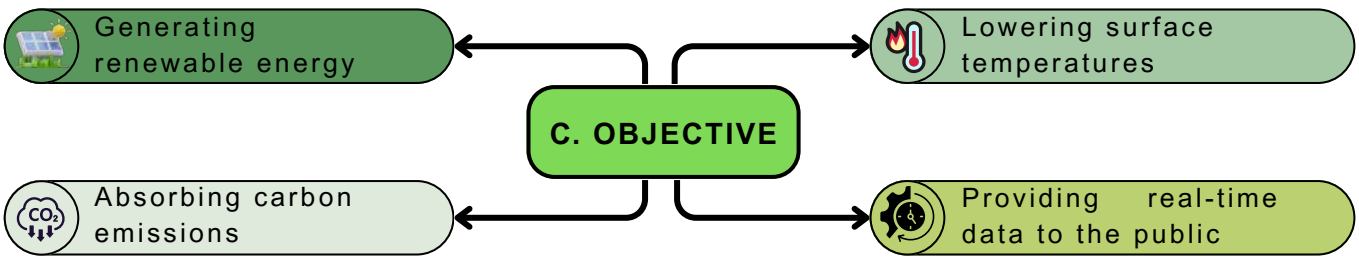


Figure 2. High Carbon Emission & UHI Effect

PROBLEM STATEMENT

High electricity consumption for air conditioning adds to **carbon emissions** (Climate Transparency, 2022). Meanwhile, limited green space exacerbates pollution. Technologies such as vertical gardens or solar panels exist, but they are usually separate. Vertical gardens are expensive and require maintenance, while solar panels are limited by roof space. Therefore, a **modular solution is needed that is inexpensive, easy to install, and integrates natural cooling, clean energy, and real-time monitoring** (ArchDaily, 2022).



METHODOLOGY

The Smart Biosolar Wall (SBW) consists of a 1x1 m module with the following components:

1. **Solar panels** (100–150 Wp, tilted at 15°) as a canopy.
2. **Layered vegetation:** moss, ferns/epiphytes, and vines (Epipremnum aureum).
3. **IoT sensors** for temperature, humidity, soil, and CO_2 (Crodeon, 2025).
4. **Automatic irrigation system** with a mini pump.
5. **Backup battery** for energy independence.

Performance estimates are based on Jakarta's radiation potential (4.8 kWh/m²/day; IESR, 2021), PLN's electricity emission factor (0.83 kg CO_2/kWh; Climate Transparency, 2022), and literature on carbon sequestration and green wall emissions (Carlucci et al., 2023).

Figure 3. Smart Biosolar Wall Design

Figure 4. Smart Biosolar Wall Apps

RESULTS

Table 1. Smart Biosolar Wall Potentials

Energy	Emission Reduction	Cooling	Cost	Monitoring
±0.6 kWh/day or 200–250 kWh/year, sufficient for sensors, irrigation, and auxiliary power.	Replaces PLN electricity equivalent to 0.17–0.20 tons of CO_2/year per module, plus vegetation absorption of ±2–3 kg/year (ArchDaily, 2022).	Wall temperatures drop by 10–15°C, even 27°C; local air temperatures drop by 6–8°C (Carlucci et al., 2023).	IDR 3–5 million/module, relatively inexpensive compared to vertical gardens (~IDR 2 million/m²) because it includes panels, batteries, sensors, and plants.	The app displays energy, temperature, humidity, water, and CO_2 absorption in real time, enhancing transparency and education (Crodeon, 2025).

CONCLUSION

SBW is a practical & scalable innovation for dense tropical cities. Modular & easy retrofit, it provides clean energy, natural cooling, open monitoring. When installed massively, thousands of modules can reduce hundreds of tons of emissions per year while cooling the city. More than just aesthetics, SBW transforms walls into green infrastructure that supports the vision of a net-zero emission urban ecosystem (ArchDaily, 2022).

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UTILIZATION OF COCONUT SHELL WASTE AS ACTIVATED CARBON IN ZNO–CARBON NANOCOMPOSITE-BASED AMMONIA GAS SENSOR INTEGRATED WITH ARDUINO FOR INDUSTRIAL MONITORING

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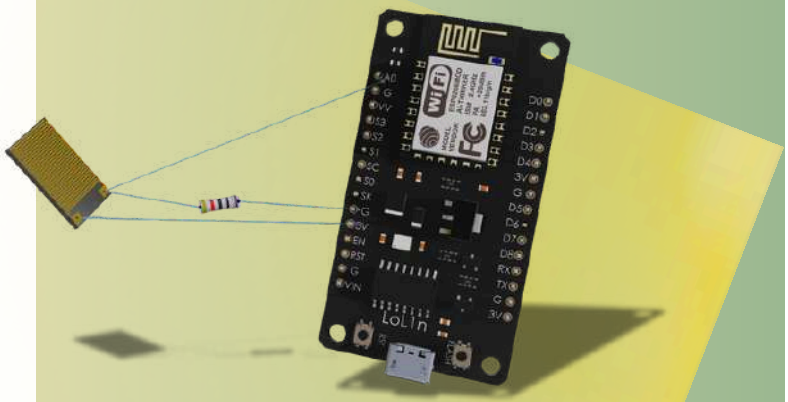
IPB University, Indonesia

INTRODUCTION

Indonesia produces around **350,000 tons** of coconut shell waste annually, most of which remains underutilized despite its potential as a valuable raw material. Coconut shells can be converted into activated carbon, a porous material with excellent adsorption capacity (Gul et al., 2022), making it suitable for sensor applications. Combining activated carbon with zinc oxide (ZnO) nanoparticles forms a nanocomposite that can be applied as a sensing layer for ammonia (NH_3) gas detection, an important requirement in industrial safety and environmental monitoring (Agarwal et al., 2019).



Sensor Schematic illustration of ZnO–activated carbon nanocomposite-based ammonia gas sensor integrated with Arduino.

METHODOLOGY

Activated Carbon (CBC) & **ZnO Nanoparticles Synthesis** (precipitation method) **ZnO–CBC Nanocomposite Formation** (mixing & calcination)

Sensor Fabrication → Coating nanocomposite on electrode.
Integration with Arduino → Calibration with NH_3 chamber

Testing → Sensitivity, Selectivity, Response/Recovery, Repeatability

PROBLEM STATEMENT

Ammonia exposure in industrial environments can cause respiratory irritation, equipment corrosion, and environmental hazards (Kumar et al., 2015). Conventional gas sensors are often costly, less sustainable, and lack sensitivity at low concentrations. Therefore, it is crucial to explore affordable, green, and highly sensitive alternatives using locally available waste-derived materials (Chen et al., 2012).

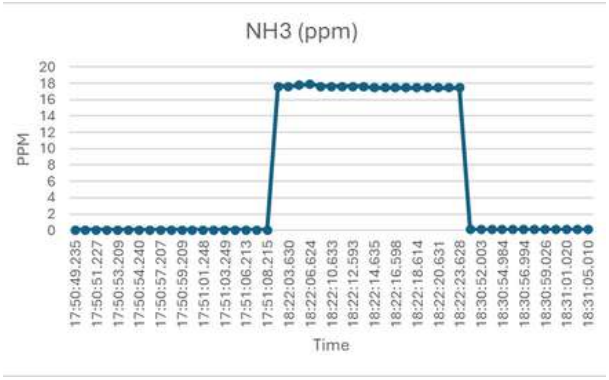
OBJECTIVE

This study aims to develop and evaluate an ammonia gas sensor based on ZnO–activated carbon nanocomposite integrated with Arduino for low-cost, eco-friendly, and efficient industrial monitoring.

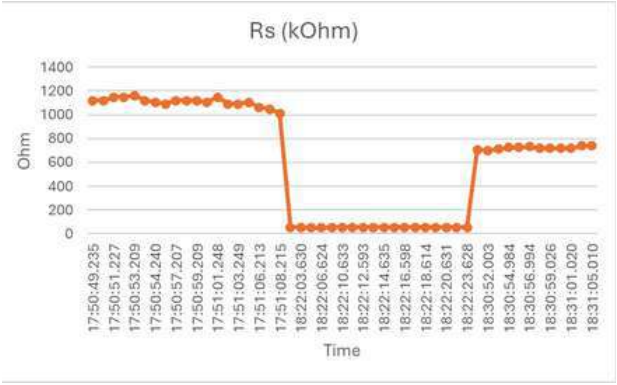
RESULT

$$s = \frac{Rgas}{Rudara} \approx \frac{1100}{50} \approx 22$$

The ZnO–activated carbon (80:20) sensor successfully detected NH_3 at concentrations as low as 18–20 ppm. The resistance decreased significantly from ~1100 kΩ in clean air to ~50 kΩ upon NH_3 exposure, yielding a sensitivity value of approximately 22. Despite strong sensitivity, the sensor exhibited a slow response time (~30 minutes) and incomplete recovery, with baseline resistance returning only to ~700 kΩ. These limitations were attributed to the absence of signal amplification and the limited resolution of the Arduino/ESP8266 ADC.



Concentration profile of ammonia (NH_3) gas at 18–20 ppm during exposure time.



Variation of sensor resistance (Rs) of ZnO–activated carbon nanocomposite upon exposure to NH_3 gas.

CONCLUSION

This study demonstrates that coconut shell waste can be innovatively transformed into activated carbon for nanocomposite-based gas sensors. The ZnO–carbon sensor shows high sensitivity to ammonia and potential for industrial application. However, improvements in signal amplification and circuit design are necessary to enhance response speed and recovery. Future research should optimize material composition and electronic integration to achieve more reliable real-time monitoring.

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DIGES TEESRec PTSN

REVOLUSI INDUSTRI 4.0

Inovasi Pintar, Dunia Tanpa Sempadan

TERUSKAN MEMBACA

Azirah binti adnan, Halina binti Hamid and
Nur Farhanna binti Ibrahim
Politeknik Sultan Azlan Shah, Perak

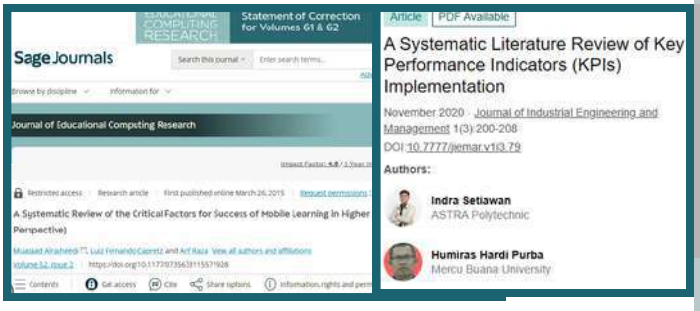
INTRODUCTION

In today's rapidly evolving academic and professional environments, effective performance monitoring and data-driven decision-making are essential for institutional growth and accountability. In the context of Civil Engineering Department, especially within Politeknik Sultan Azlan Shah (PSAS), monitoring Key Performance Indicators (KPIs) plays a vital role in evaluating departmental achievements, aligning with Pelan Strategik PSAS 2021-2025 and Kamus KPI POLYCC 2025, and ensuring continuous improvement in teaching, research, service delivery, and operational management.However, many departments especially in PSAS still rely on manual or semi-digital processes for KPI data collection, reporting, and internal communication.

These disjointed systems often involve the use of spreadsheets, email threads, and scattered document storage platforms, which lead to inefficiencies, data redundancy, limited accessibility and delayed reporting.

Moreover, the lack of a centralized platform makes it difficult to track progress, maintain transparency, and foster a collaborative working environment.

Additionally, with the increasing demand for digital transformation in higher education, there is a pressing need to develop an integrated solution that not only simplifies data entry and performance tracking but also enhances communication and access to reference materials. A mobile application named iCED: KPI MONITOR has been developed and that consolidates KPI monitoring, dashboard visualization, reference document storage, and a built-in communication platform offers a practical and innovative approach to address these gaps. This innovation aims to support the Civil Engineering Department in PSAS by providing a user-friendly, mobile-based system that enables staff and administrators to input, access, and evaluate performance data anytime and anywhere, thus promoting accountability, efficiency, and informed decision-making.



PROBLEM STATEMENT

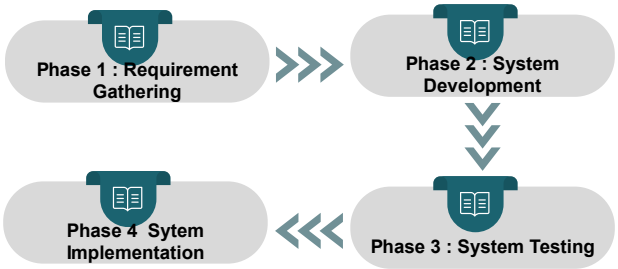
1. Lack of a systematic KPI monitoring mechanism at Politeknik Sultan Azlan Shah
2. Difficulty in accessing real-time performance data
3. Challenges in data coordination across units or departments.

OBJECTIVE

1. To develop a smart mobile application (iCED: KPI Monitor) based on identified requirements.

2. To evaluate the performance of the developed application in terms of usability, functionality, and impact on KPI management.

METHODOLOGY



STORYBOARD ICED:KPI MONITOR

ICED:KPI MONITOR DEVELOPMENT

The iCED;KPI Monitor was build using Glide as a no-code app platform and Google Spreadsheet as its database. The integration enables real-time monitoring and reporting of Key Performance Indicator (KPIs)

- Glide App - provides a simple, user - friendly interface with visual dashboards and reports.
- Google Spreadsheet - stores and updates KPI data in real time.

CONCLUSION

The iCED: KPI Monitor is a strategic innovation that enhances performance management through real-time monitoring, streamlined reporting, and increased staff engagement. Aligned with PSAS's strategic goals, it supports data-driven decision-making and promotes digital transformation and transparency. This system also has the potential to serve as a model for other institutions within the JPPKK network.

IMPACT

The development of iCED: KPI Monitor is expected to bring significant impact to the performance management process within the Civil Engineering Department at PSAS. By aligning the application's features with the Strategic Plan of Politeknik Sultan Azlan Shah and the KPI Dictionary of Politeknik Sultan Azlan Shah, the system offers a structured and accessible platform for real-time KPI monitoring, reporting, and communication.

The application is anticipated to streamline the preparation of KPI reports, increase staff awareness and engagement with departmental performance, and enhance strategic decision-making through accurate and timely data. Furthermore, it supports the broader goals of digital transformation and performance transparency within academic departments. The findings from this study may also serve as a reference for other departments or institutions within the JPPKK network that aim to implement similar smart monitoring solutions, contributing to improved accountability and data-driven management in the education sector.

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CENTDÓNE SMART SYSTEM

Ts Mohd Zaiham Bin Hamzah
Amirul Amir Bin Rafizi, Norhaqimi Bin Shahan Shah @ Mohd Syukri
Politeknik Sultan Haji Ahmad Shah

>>> INTRODUCTION

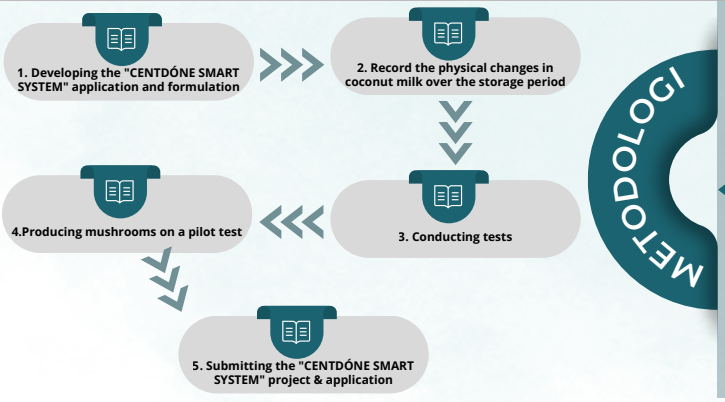
Microcontroller-based temperature automation system called the centoone smart system was created to improve control, efficiency, and comfort. This system, which is based on the potent ESP3266 (NODEMCU) USES A DHT11 sensor to read temperature data in real time, shows it on an lcd, and uses a relay module to intelligently control linked devices.

The development of the mushroom cultivation industry in Malaysia is due to high demand and consumer awareness of the nutritional and medicinal value of mushrooms. In addition, there are many encouragements and incentives given by the government to ensure that this industry thrives. The 9th Malaysia Plan (RMK- 9) also provides incentives and wider opportunities for the private sector and farming communities to engage in commercial and large-scale agriculture to increase productivity and add value to the produce. Species Temperature (°C) Relative Humidity (%) CO_2 (ppm) Light (lux) Duration (days) Pleurotus ostreatus Grey Oyster Mushroom,Commercial grey oyster mushroom cultivation methods involve several procedures that require precision and complexity. Each phase must be carried out with care to reduce damage due to disease infection.

PROBLEM STATEMENT

In many homes and workplaces, temperature-dependent, devices like fans, heaters, or exhaust systems are still operated manually, leading to energy waste, delayed. response, and inconsistent comfort.

There is a growing need for an affordable, automated,and smart solution that can monitor environmental conditions in real-time and control appliances efficiently. without constant human intervention.



OBJECTIVES

•TO DEVELOP CONNECTION AND CONFIGURING THE SENSOR IE.G., TEMPERATURE, MOTION, ETC.).

•TO SET UP THE LCD DISPLAY TO SHOW REAL-TIME SENSOR READINGS..

•TO BUILD SET UP TELEGRAM BOT USING BOTFATHER AND GET THE API TOKEN

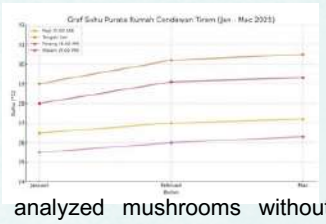
•TO ACHIEVE PROGRAM WE HAVE PROGRAM THE SYSTEM TO SEND SENSOR DATA AND ALERTS TO TELEGRAM.

>>> PENYELESAIAN

Mushroom Formulation Calculator

All project objectives were successfully achieved by using the Arduino IDE software as the main platform for writing, uploading and testing program code to the ESP32 microcontroller. The temperature sensor (DHT11) and motion sensor (PIR) were successfully connected and configured through the code in the Arduino IDE

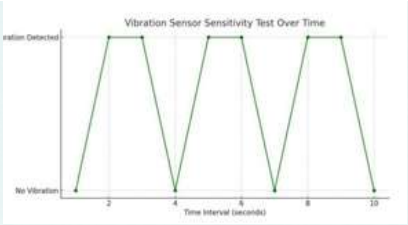
Acceptance level of company representatives

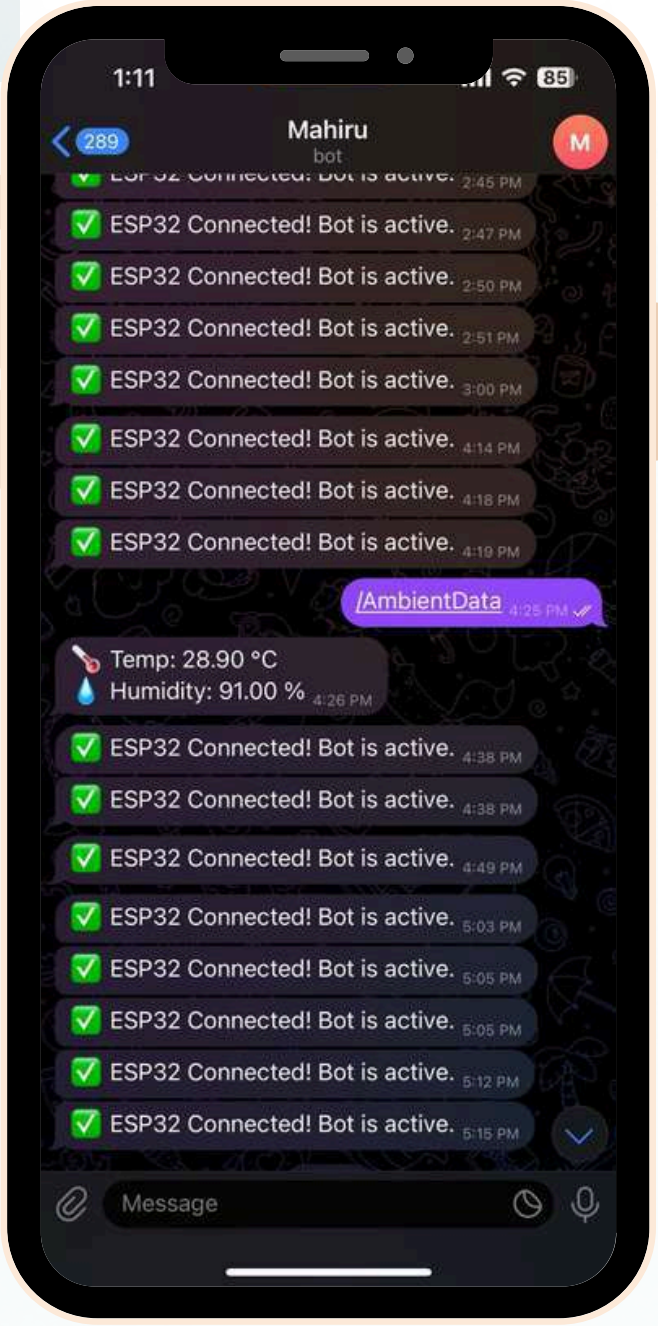


Previously, we analyzed mushrooms without this system. Mushrooms become damaged and moldy due to insufficient humidity due to weather factors that cause hot temperatures and conditions in the area where mushrooms are grown.

Tempoh simpanan santan

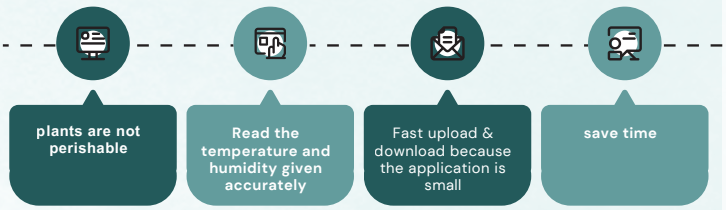
Bulan	Sebelum Hujan (kWh/m²)	Sebelum Hujan (kWh/m²)	Selepas Hujan (kWh/m²)	Selepas Hujan (kWh/m²)	Kemiangan Sebelum Hujan (%)	Kemiangan Selepas Hujan (%)
Januari	7.05	6.91	4.78	4.74	1.99	0.84
Februari	7.02	6.88	4.74	4.70	1.99	0.84
Mac	7.01	6.87	4.72	4.68	2.00	0.85





>>> CONCLUSION

Advantages of CENTDÓNE SMART SYSTEM



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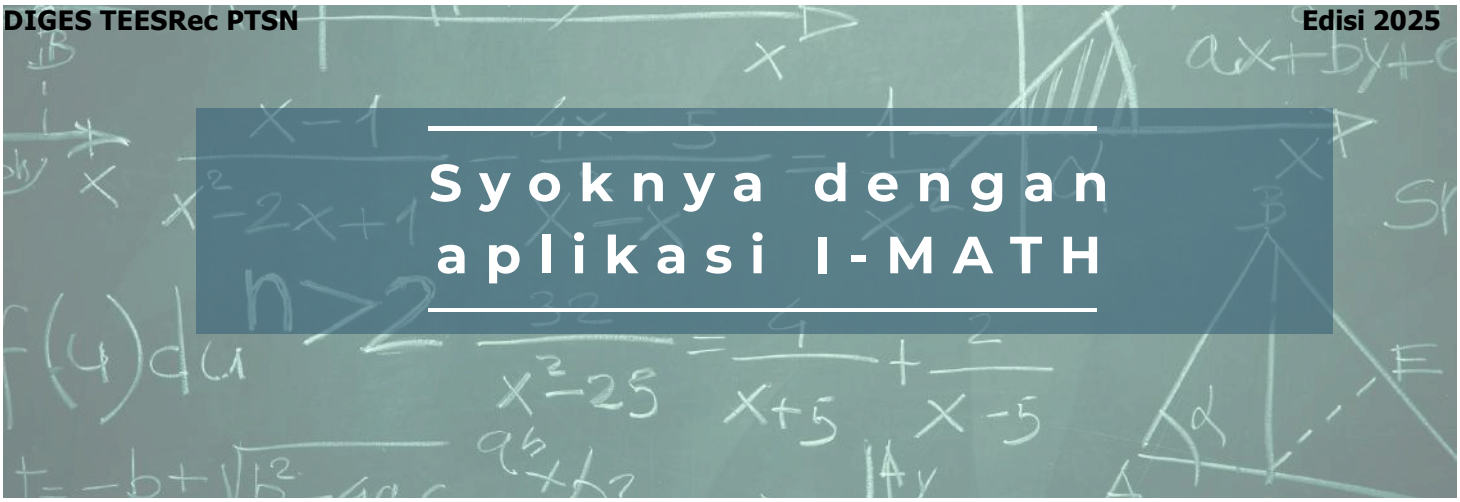
>>> IMPAK

1. **Impact on Farmers / UsersIncreased productivity –** Automated control of temperature, humidity, and environment ensures consistent crop growth without constant manual monitoring.
2. **Impact on Product Quality-**Consistent yields – Stable environmental conditions improve the quality and size of crops
3. **Impact on Technology & Innovation-**Adoption of IoT & AI – Brings modern technology into agriculture, enhancing competitiveness
4. **Impact on Environment-**Efficient resource usage – Optimized use of water, electricity, and space.Reduced environmental pollution – Automation prevents excessive use of chemicals or energy



Syoknya dengan aplikasi I-MATH

Yusmaria Mohd Yusoff, Siti Nor Lailiyah Ibrahim
Kolej Komuniti Hulu Langat

PENGENALAN

Aplikasi I-MATH merupakan satu inovasi digital dalam bidang pendidikan yang dibangunkan untuk membantu pelajar menguasai asas matematik dengan lebih mudah, interaktif dan menarik. Ini bertujuan bagi meningkatkan kefahaman dan minat pelajar khususnya yang mengambil subjek matematik di kolej komuniti. I-MATH direka khas untuk menyokong proses pembelajaran melalui pendekatan mesra pengguna, visual yang menarik serta penggunaan teknologi terkini. Aplikasi ini mengandungi nota langkah demi langkah dan latihan yang membantu pelajar memahami konsep asas matematik.

METODOLOGI

- Membangunkan aplikasi I-MATH.
- Aplikasi di perkenalkan kepada pelajar.
- Pelajar muat turun aplikasi I-MATH dan mencuba fungsi aplikasi tersebut.
- Pelajar sedia menggunakan I-MATH untuk merujuk nota serta membuat latihan.
- Pelajar memberi maklumbalas terhadap I-MATH bagi tujuan penambahbaikan.

PENYATAAN MASALAH

Semasa proses pengajaran dan pembelajaran, pensyarah-pensyarah akan menggunakan pelbagai kaedah penyampaian bagi memudahkan berlakunya perubahan minat, tingkah laku, kemahiran dan kognitif pelajar-pelajar supaya memudahkan sesuatu proses pengajaran dan pembelajaran itu berlaku. Aktiviti yang dijalankan oleh pensyarah dalam pembelajaran amat berbeza mengikut keadaan. Kepelbagaian kaedah penyampaian pengajaran merupakan komponen penting untuk memotivasikan minat pelajar-pelajar terhadap pembelajaran. Oleh itu, inovasi aplikasi I-MATH dibina untuk membantu dalam memudahkan proses pengajaran dan pembelajaran bagi subjek SBM 10022 Matematik bagi topik kuantiti asas dan pengukuran dalam menyelesaikan masalah iaitu;

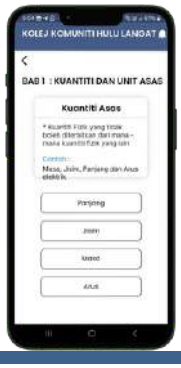
- Pelajar tidak berminat dengan subjek matematik yang dianggap susah.
- Pelajar sukar untuk menyelesaikan masalah matematik asas.

OBJEKTIF

- Meningkatkan minat pelajar terhadap subjek Matematik.
- Meningkatkan motivasi pembelajaran matematik di dalam kelas.
- Memudahkan pelajar semasa proses pengajaran dan pembelajaran.

PENYELESAIAN

- Aplikasi ini mudah dicapai dengan menggunakan telefon bimbit.
- Penggunaan aplikasi I-MATH adalah interaktif dan menarik.
- Meningkat minat pelajar kepada subjek matematik.
- Membantu pelajar memahami konsep asas matematik.



KELEBIHAN

01 Meningkatkan Kefahaman Pelajar

02 Menyokong Pembelajaran Kendiri

03 Interaktif dan Praktikal

04 Penggunaan Teknologi Terkini

IMPAK

- Menambah minat pelajar terhadap subjek matematik.
- Memudahkan pelajar untuk membuat rujukan pada masa hadapan.
- Aplikasi yang mudah untuk digunakan secara mobiliti.
- meningkatkan minat dan motivasi dalam pembelajaran matematik.
- Membina keyakinan dalam menyelesaikan masalah matematik secara kendiri.

Antaramuka i-MATH

KESIMPULAN

Aplikasi I-MATH merupakan satu inovasi digital yang berperanan penting dalam menyokong pembelajaran matematik. Pembangunan aplikasi ini berasaskan pendekatan interaktif, mesra pengguna dan penggunaan teknologi terkini bagi membantu pelajar menguasai asas matematik dengan lebih mudah, menarik dan berkesan.

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SMART COMMAND LINE INTERFACE TOOL FOR CISCO PACKET TRACER (sCLIt)

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Politeknik METrO Tasek Gelugor

>>> INTRODUCTION

Students under Diploma in Information Technology in Semester 2 Polytechnics which taking the core computing course of DFC20293 Network and Data Communication often face significant challenges when understanding and using the Cisco Command-Line Interface in Cisco Packet Tracer. Common problems include difficulty remembering correct commands, identifying syntax errors, and troubleshooting configuration issues efficiently. In traditional teaching setups, such errors are often corrected by instructors during lab sessions, but this approach becomes inefficient in large classrooms or remote learning environments, where immediate, personalised feedback is limited.

While Cisco Packet Tracer is a powerful simulation tool, it does not inherently provide real-time guidance or syntax correction for novice learners.

>>> PROBLEM STATEMENT

- Networking students struggle to master Cisco CLI in Packet Tracer.
- Difficulties include:
  i. Remembering correct commands
  ii. Identifying syntax errors
  iii. Troubleshooting effectively
- Large classes & remote learning limit immediate instructor feedback.
- Cisco Packet Tracer shows only generic errors (e.g. “Invalid input detected at ‘^’ marker”) without solutions.

>>> OBJECTIVES

Students who enter incorrect commands often receive only generic error messages (“Invalid input detected at '^' marker”), without context or solutions. This will result in various problem such as wasted lab time trying to guess correct commands, increased dependence on instructors, reduced confidence in self-learning and also facing difficulty in troubleshooting without guidance.To address this, the sCLIt (Smart CLI Tool) was developed as an educational innovation to work alongside Cisco Packet Tracer. It acts as an smart command helper, validator, and troubleshooting aid which effectively functioning as a virtual tutor.

>>> METHODOLOGY

- Design
  - Quantitative descriptive study
  - Prototype-driven, iterative development (test–feedback–refine)
- Participants
  - 30 Diploma students (Cohort 2, 2024/2025)
  - Course: DFC20293 – Network & Data Communication
- Procedure
  - 4 weeks of implementation
  - Orientation → Lab practice with sCLIt → Feedback collection
- Features of sCLIt
  1. Real-time command validation
  2. Syntax correction suggestions
  3. Environment awareness (Exec/Config modes)
  4. Learning mode with hints
  5. Works online & offline
- Data Collection
  - Questionnaire (usefulness, ease, confidence)
  - Final exam results
  - Open-ended student feedback
- Data Analysis
  - Descriptive analysis (SPSS)
  - Comparison of exam scores between groups

>>> SOLUTION

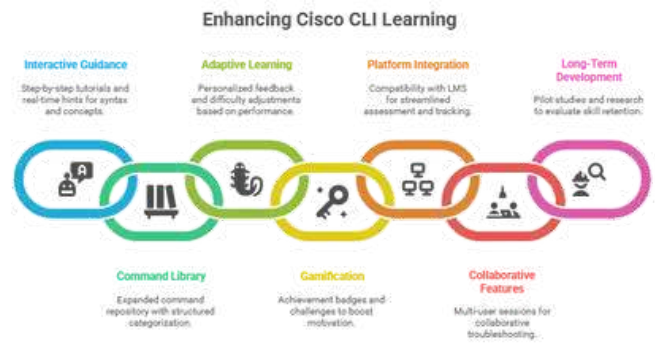
Main Interface

User Exec Mode (>)

Privileged Exec Mode (#)

Global Configuration Mode (Config)#

Check Command



1. Real-time command validation which it will check the command accuracy instantly.
2. Syntax correction suggestions where it will recommend the proper format when an error is detected.
3. Environment awareness which it will advise if command should be used in user exec mode, privileged exec mode, or global configuration mode.
4. Learning mode where it offers hints and explanations for beginner users.
5. Offline and online use where it can function during in-class labs or remote learning.

>>> RESULTS AND DISCUSSION

This innovation and studies aimed to help and guide students to use Smart CLI Tool (sCLIt) as an education engagement tool in the core subject of networking by comparing student's examination performance for 1 cohort (Session 2: 2024/2025) in 2 classes which is DIT2A which not using this tool and DIT2B which use the sCLIt tool. The studies show that this tool is relevant and effective to be used along with Cisco Packet Tracer as an aid for this course specifically.

Table 1. Class Statistics Based on examination result

Label	Class	n	Mean	Std. Deviation
Class A	DIT2A	30	48.97	14.26
Class B	DIT2B	32	53.66	17.78

>>> RECOMMENDATION AND CONCLUSION

The Smart CLI Tool (sCLIt) has proven to improve students' learning in Cisco Packet Tracer by increasing confidence, command understanding, and troubleshooting skills. Overall satisfaction was high, showing it is an effective supplementary tool.

However, exam results revealed that weaker learners still need extra support. sCLIt is best seen as a complementary aid, not a full replacement for instructors.

Recommendations

1. Stronger Guidance – Add tutorials, step-by-step examples.
2. More Resources – Provide a command library, quizzes, sandbox practice.
3. Better Feedback – Real-time hints, progress tracking, interactive tips.
4. Support for Weaker Students – Adaptive features for those struggling.
5. Future Development – Wider testing, online learning integration, long-term evaluation.

Conclusion

sCLIt is a promising innovation that makes networking labs more effective, boosts independent learning, and builds student confidence—while still benefiting from instructor integration.

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REKA BENTUK DAN PEMBANGUNAN PORTAL E-ADUAN BERASASKAN ANTARA MUKA MESRA PENGGUNA DI KOLEJ KOMUNITI BESUT

Hasnuzi Hasim, Nurfaezah Mamat, Nik Mohd Kamil Nik Hanafi@Ibrahim,
Syilawati Zakarna & Muhammad Aiman Zulkafle
Kolej Komuniti Besut

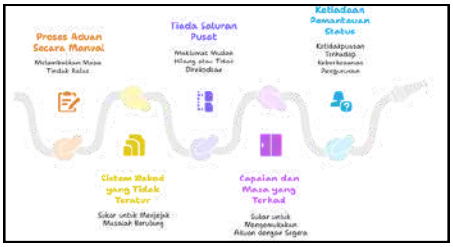
PENGENALAN

Dalam era pendigitalan masa kini, sistem pengurusan aduan yang berkesan amat penting dalam sesebuah institusi pendidikan bagi memastikan setiap permasalahan dapat ditangani secara telus dan cepat. Namun begitu, proses pengurusan aduan secara manual seringkali menimbulkan cabaran seperti kehilangan rekod, kelewatan tindakan, dan kurangnya ketelusan (Ahmad & Ismail, 2021).

Sehubungan itu, inovasi Reka Bentuk dan Pembangunan Portal E-Aduan Berasaskan Antara Muka Mesra Pengguna di Kolej Komuniti Besut dibangunkan sebagai satu platform digital berpusat yang membolehkan warga kolej mengemukakan aduan dengan lebih mudah, cepat, dan sistematik. Portal ini bukan sahaja memudahkan pengguna menghantar aduan pada bila-bila masa melalui komputer atau telefon pintar, malah ia turut menyediakan sistem rekod automatik yang lebih teratur.

PENYATAAN MASALAH

Pengurusan aduan yang berkesan merupakan aspek penting dalam meningkatkan kepuasan pelanggan dan memastikan kelancaran operasi sesebuah organisasi. Berikut adalah senarai masalah yang ditemui seperti yang disenaraikan pada Rajah 1.



Rajah 1: Penyataan Masalah Pembangunan Inovasi

OBJEKTIF

- Menyediakan platform aduan berpusat yang mudah diakses
- Mempercepatkan tindakan balas terhadap aduan
- Merekod aduan secara sistematik dan teratur.
- Membolehkan pemantauan status aduan secara real time.
- Menyokong agenda transformasi digital kampus.

TINJAUAN LITERATUR

Pembangunan sistem aduan digital semakin meluas di institusi pendidikan kerana ia mampu meningkatkan kecekapan komunikasi serta mempercepatkan proses penyelesaian aduan. Kajian oleh Alwi, Abidin, dan Rahman (2022) menunjukkan bahawa sistem e-Aduan dengan elemen gamifikasi dapat meningkatkan penglibatan pelajar dan mempercepatkan maklum balas pentadbir.

Selain itu, UPM telah membangunkan Sistem e-Aduan Kerosakan yang berjaya mengurangkan birokrasi melalui rekod digital yang lebih mudah diakses. Kajian oleh Zulkefli dan Rahman (2023) pula menegaskan bahawa penerimaan pengguna terhadap portal e-aduan bergantung kepada kualiti sistem, tahap mesra pengguna, antara muka yang jelas serta keberkesanan maklum balas pentadbir.

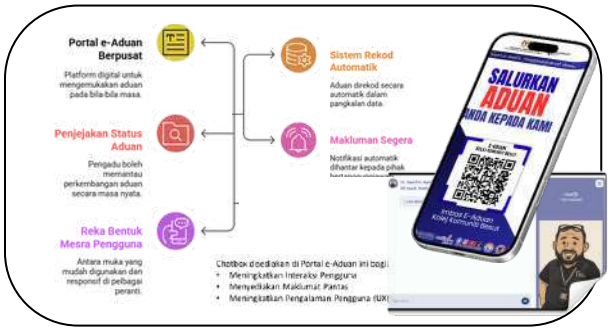
Kajian lepas menunjukkan bahawa penggunaan portal aduan digital dalam institusi pendidikan dapat meningkatkan keberkesanan komunikasi serta mempercepatkan penyelesaian isu berbanding kaedah manual (Rahman, Aziz, & Salleh, 2020). Sistem ini juga menyokong rekod automatik dan pangkalan data bersepadu, sekali gus memudahkan carian serta rujukan aduan (Ahmad & Ismail, 2021).

PENYELESAIAN

Hasil daripada penemuan permasalahan dalam proses aduan manual serta kajian lepas, pihak kami telah membangunkan Portal e-Aduan Berpusat di Kolej Komuniti Besut. Portal ini membolehkan pelajar dan staf mengemukakan aduan pada bila-bila masa melalui komputer atau telefon pintar, sekali gus mengatasi kekangan lokasi dan masa (Rahman, Aziz, & Salleh, 2020).

Portal ini turut dilengkapi dengan sistem rekod automatik dan pangkalan data bersepadu yang memudahkan carian, penapisan dan rujukan semula aduan (Ahmad & Ismail, 2021). Selain itu, fungsi penjejakan status aduan secara masa nyata memberi keyakinan kepada pengguna bahawa aduan sedang diambil tindakan (Tan & Lim, 2019).

Di samping itu, portal ini menyediakan notifikasi segera dalam bentuk e-mel atau mesej automatik kepada pihak berkaitan, membolehkan tindakan pantas diambil terhadap sebarang isu yang dilaporkan (Lee, 2022).



Rajah 2: Cadangan Penyelesaian Permasalahan

METADOLOGI

Framework yang digunakan untuk menghasilkan inovasi **Pembangunan Portal E-Aduan Kolej Komuniti Besut** - *ADDIE Model (Rosset, 1987)* seperti yang ditunjukkan di Rajah 3.

Rajah 3: Pembinaan *Framework* berdasarkan *ADDIE Model (Rosset, 1987)*

DAPATAN & ANALISIS

Rajah 4 di bawah menunjukkan dapatan dan analisis tinjauan kepuasan pengguna Portal E-Aduan Kolej Komuniti Besut yang melibatkan 30 orang responden terdiri daripada 20 orang pelajar dan10 orang staf

Rajah 4: Analisis Tinjauan Kepuasan Pengguna Portal E-Aduan Kolej Komuniti Besut

Dapatan Tinjauan

- Kemudahan Akses
  - 85% responden menyatakan portal mudah diakses menggunakan telefon pintar dan komputer.
  - 15% mencadangkan peningkatan kestabilan capaian pada waktu sibuk.
- Antara Muka *(User Interface)*
  - 90% berpuas hati dengan reka bentuk mesra pengguna dan susun atur jelas.
  - 10% mencadangkan penggunaan lebih banyak ikon visual untuk navigasi cepat.
- Fungsi Aduan
  - 80% mendapati proses mengisi dan menghantar aduan mudah.
  - 20% merasakan borang aduan boleh dipendekkan atau dipermudah.
- Maklum Balas Aduan
  - 70% berpuas hati dengan kecepatan maklum balas awal.
  - 30% mencadangkan notifikasi automatik (email/telegram) apabila status aduan berubah.
- *Chatbox* & Notifikasi
  - 75% menilai fungsi chatbox membantu mendapatkan maklumat segera.
  - 25% mencadangkan penambahan bot pintar atau pegawai khusus untuk balasan lebih pantas.

Analisis Ringkas

- Kekuatan: Portal mudah diakses, antara muka mesra pengguna, dan chatbox dianggap ciri menarik.
- Kelemahan: Masa maklum balas perlu dipercepatkan, serta borang aduan boleh dipermudah.
- Cadangan: Integrasi notifikasi automatik & penggunaan chatbot pintar untuk meningkatkan keberkesanan komunikasi.

IMPAK

- Meningkatkan kecekapan pengurusan aduan
- Memudahkan akses pengguna
- Meningkatkan ketelusan & Akauntabiliti
- Mengurangkan Penggunaan Kertas
- Pengkalan aduan yang teratur
- Memupuk budaya komunikasi terbuka
- Boleh dikembangkan ke aplikasi telefon

KESIMPULAN

Secara ringkasnya, pembangunan Portal E-Aduan Berasaskan Antara Muka Mesra Pengguna di Kolej Komuniti Besut merupakan satu langkah inovatif bagi memperkasakan sistem pengurusan aduan di institusi pendidikan. Portal ini mampu mengatasi kelemahan kaedah manual melalui penyediaan platform digital yang mudah diakses, sistem rekod automatik, fungsi penjejakan aduan secara masa nyata, serta notifikasi segera kepada pihak bertanggungjawab.

Dengan adanya ciri-ciri ini, portal e-Aduan dijangka dapat meningkatkan tahap ketelusan, kecekapan, dan kepuasan pengguna, di samping menyokong aspirasi pendigitalan pendidikan serta amalan tadbir urus yang lebih telus. Secara keseluruhannya, inovasi ini berpotensi menjadi model rujukan yang boleh diaplikasikan di institusi lain bagi memperkukuh keberkesanan pengurusan aduan.

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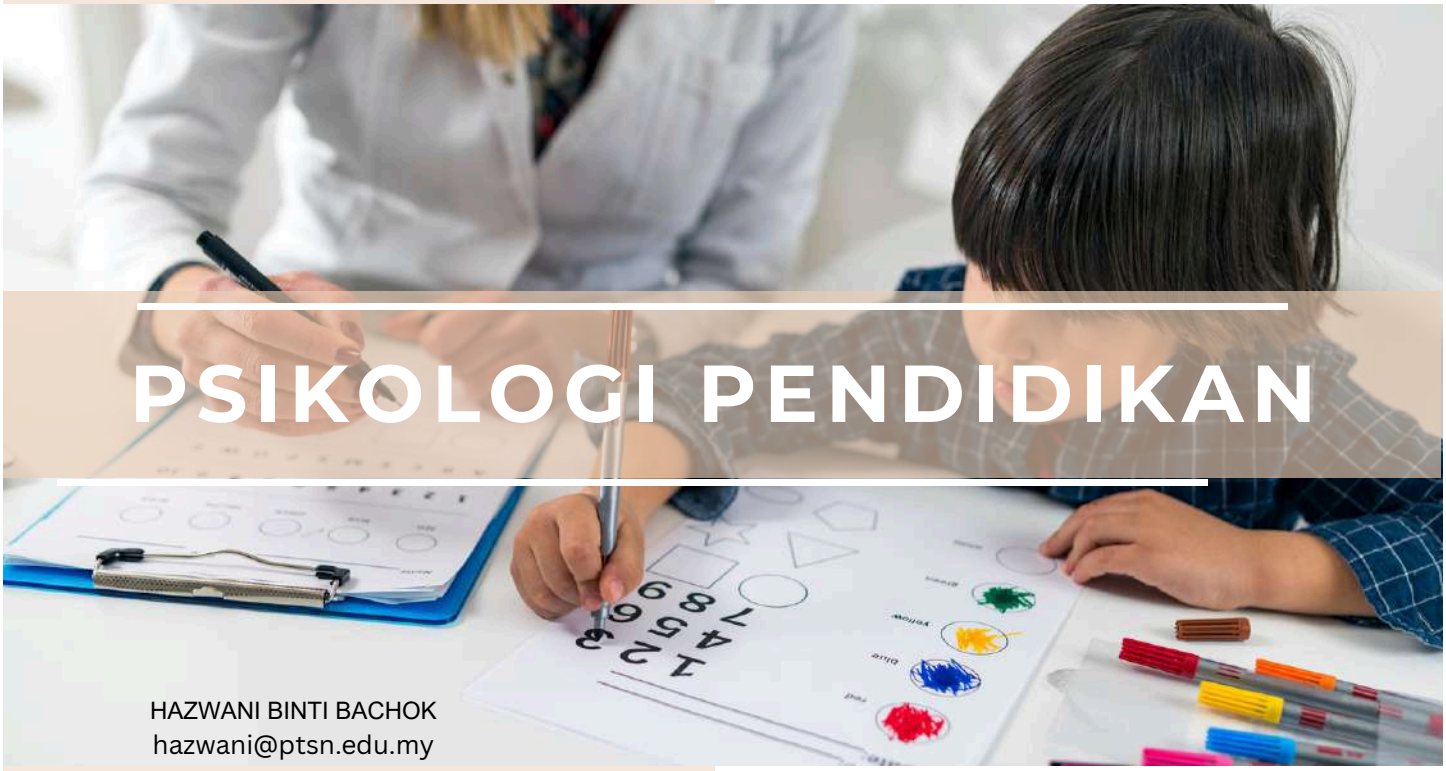
DIGES TEESRec PTSN

PENULISAN KREATIF

Menghidupkan Idea,
Menggerakkan Imaginasi.

TERUSKAN MEMBACA



PSIKOLOGI PENDIDIKAN

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DEFINISI

Definisi Psikologi Pendidikan merujuk kepada cabang ilmu yang mengkaji tingkah laku manusia dalam konteks pembelajaran dan pengajaran, serta menerapkan prinsip-prinsip psikologi untuk meningkatkan keberkesanan proses pendidikan.

Psikologi pendidikan ialah bidang psikologi gunaan yang berfokus pada aspek praktikal. Bidang ini membina serta mengembangkan teori dan prinsip yang menjadi asas untuk memahami tingkah laku, emosi, dan pemikiran dalam konteks pembelajaran.

Psikologi pendidikan memberikan panduan berguna kepada pendidik dan calon guru bagi meningkatkan kecekapan proses pengajaran dan pembelajaran dalam pelbagai situasi.

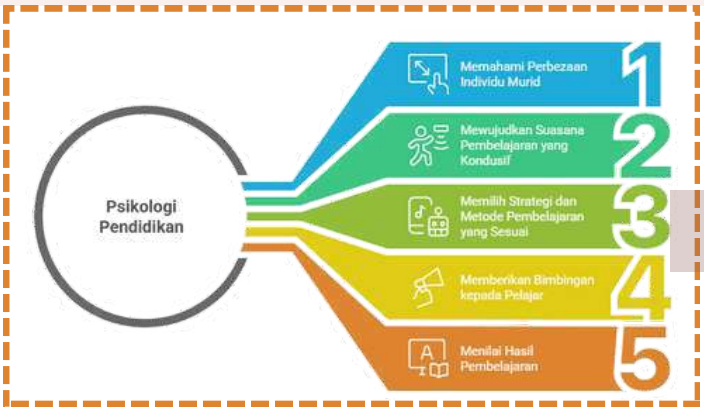
1 Proses pembelajaran

Psikologi pendidikan mempengaruhi proses pembelajaran individu dari segi proses memerhati, mengolah, menginterpretasi dan mengingat informasi yang telah diterima.

2 Pengajaran & pembelajaran

Psikologi pendidikan adalah proses yang meilbatkan pendidik, pelajar dan persekitaran. Pengajaran & pembelajaran yang efektif melibatkan beberapa prinsip. Antaranya ialah penglibatan pelajar yang aktif didalam kelas, pembelajaran berasaskan penyelesaian masalah dan penggunaan teknologi dalam meningkatkan kualiti pembelajaran.

TUJUAN



Memahami perbezaan individu murid

Setiap pelajar mempunyai karakter, tingkah laku, pemikiran, dan emosi yang berbeza. Pemahaman mendalam tentang perbezaan ini membolehkan pendidik menyesuaikan pendekatan pembelajaran dengan lebih berkesan, serta mengambil kira aspek pertumbuhan dan perkembangan setiap individu.

Mewujudkan suasana pembelajaran yang kondusif

Suasana pembelajaran yang selesa dan teratur amat mempengaruhi keberkesanan proses pembelajaran.Pengetahuan psikologi pendidikan membantu para pendidik mengatur persekitaran fizikal dan emosi yang sesuai, seterusnya memudahkan proses penyampaian ilmu.

Memilih strategi dan kaedah pembelajaran yang sesuai

Psikologi pendidikan membantu pendidik memilih kaedah pengajaran yang selari dengan tahap perkembangan, gaya belajar, dan keunikan setiap pelajar. Pendekatan yang sesuai dapat meningkatkan motivasi dan pemahaman murid.

Memberikan bimbingan kepada pelajar

Pendidik bukan hanya berperanan sebagai pengajar, tetapi juga sebagai pembimbing yang membantu pelajar menghadapi masalah akademik mahupun masalah peribadi. Bimbingan yang efektif dapat membantu pelajar mencari penyelesaian serta berkembang secara holistik.

Menilai hasil pembelajaran

Penilaian berterusan penting untuk mengukur tahap pemahaman, kemahiran dan perkembangan pelajar. Selain itu psikologi pendidikan menyediakan kaedah dan prinsip penilaian yang tepat, yang dapat digunakan untuk memperbaiki proses pembelajaran.

MANFAAT

Memahami murid dengan lebih baik

Para pendidik boleh memahami sebab-sebab di sebalik tingkah laku pelajar. Hal ini dapat memudahkan pengurusan didalam kelas dan dapat membantu murid memahami diri sendiri.

Merancang pengajaran yang lebih berkesan

Para pendidik boleh menetapkan matlamat pembelajaran yang sesuai dengan tahap dan keperluan pelajar. Dengan memahami perkembangan manusia, strategi pengajaran dapat dirancang dengan lebih menarik dan relevan.

Menyelesaikan masalah pendidikan

Para pendidik boleh menyelidik isu-isu yang timbul yang melibatkan disiplin para pelajar. Hal ini sedikit sebanyak dapat meningkatkan kualiti pengajaran.

Pendekatan untuk murid berkeperluan khas

Para pendidik menjadi lebih prihatin dan sabar dalam membimbing murid yang lambat dari segi pelajaran. Hal ini sedikit sebanyak memberi input kepada pendidik berkaitan faktor-faktor yang mempengaruhi kecerdasan para pelajar. Kaedah ini mendorong para pendidik menggunakan pendekatan yang lebih inklusif.

Membentuk sahsiah dan nilai murni

Para pendidik bukan hanya mengajar ilmu akademik, tetapi juga membentuk pelajar dari segi tutur kata, tingkah laku, sikap bertanggungjawab, serta seimbang dari segi emosi dan sosial.

BESI: INTEGRASI ALAM, TEKNOLOGI, DAN WAHYU

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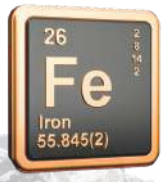
Bijih besi - hematit

Struktur binaan berasaskan besi

Besi atau ferum ialah logam peralihan dengan simbol 'Fe'. Besi tulen berwarna kelabu berkilat. Logam ini lebih stabil dalam bentuk oksidanya dalam persekitaran bumi.



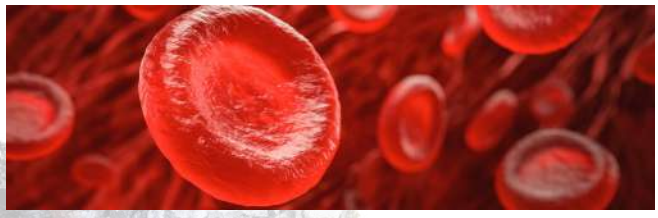
Sifat ini menyebabkan besi cepat mengalami proses pengaratan apabila bertindakbalas dengan oksigen dan air. Besi bersifat feromagnetik, iaitu boleh dimagnetkan dan menghasilkan medan magnet yang kuat. Dari aspek mekanikal, besi mempunyai kekuatan tegangan dan sifat keplastikan yang baik membolehkan besi ditempa dan dilentur semasa proses pembuatan.

Peranan Besi dan Alam

Logam besi adalah antara logam yang boleh diperolehi dalam perut bumi. Teras bumi yang kaya dengan kandungan besi dan nikel cair boleh menghasilkan fenomena yang dikenali sebagai geodinamo, iaitu proses yang membentuk medan magnet bumi. Medan magnet ini melindungi bumi daripada sinaran berbahaya matahari dan menjadikan keadaan planet bumi lebih stabil. Bumi akan kehilangan perisai semula jadi yang penting untuk keseimbangan ekosistem sekiranya tiada unsur besi dalam terasnya.

Medan magnet bumi bertindak menahan kesan angin suria matahari, iaitu aliran zarah berkelajuan tinggi

Peranan Besi Dalam Tubuh Manusia



Zat besi penting dalam pembentukan hemoglobin darah

Zat besi ialah mineral penting dalam tubuh manusia. Sumber zat besi boleh diperolehi daripada makanan seperti daging merah, hati ayam, sayuran berdaun hijau, kekacang, dan bijirin. Zat besi berperanan dalam pembentukan hemoglobin darah. Hemoglobin berperanan membawa oksigen ke seluruh badan. Kekurangan zat besi dalam tubuh menyebabkan penyakit anemia dengan gejala seperti keletihan, pucat, pening, dan kemerosotan daya tumpuan. Kanak-kanak, remaja serta ibu mengandung turut berisiko jika kekurangan zat besi kerana fasa pertumbuhan pesat memerlukan lebih zat besi bagi membantu perkembangan otak dan tubuh. Oleh itu, pengambilan zat besi yang mencukupi penting untuk kesihatan dan prestasi menyeluruh tubuh manusia.

Sumber makanan yang mengandungi zat besi

KEAJAIBAN BESI: INTEGRASI ALAM, TEKNOLOGI, DAN WAHYU

Kaedah konvensional penghasilan produk besi

Besi dan Peradaban

Sejak zaman purba, besi telah memainkan peranan penting dalam membentuk tamadun manusia. Peralihan daripada Zaman Gangsa ke Zaman Besi membawa kepada kemajuan teknologi dengan penghasilan senjata dan alat pertanian yang lebih kuat serta tahan lama. Hal ini membolehkan manusia memperluaskan pertanian, mempertahankan wilayah, dan membina penempatan yang lebih tersusun. Apabila besi diproses menjadi keluli, peranannya menjadi semakin besar. Dalam revolusi perindustrian, keluli menjadi asas kepada pembangunan mesin, rel kereta api, jambatan, kapal wap, dan bangunan besar yang mengubah landskap ekonomi serta sosial dunia.

Menara Berkembar Petronas: Bukti kehebatan dan kepentingan besi dalam pembinaan moden

Hari ini, besi dan keluli kekal sebagai nadi pembangunan moden. Struktur ikonik seperti Menara Eiffel di Perancis, Jambatan London di United Kingdom, dan Menara Berkembar Petronas di Malaysia membuktikan kehebatan teknologi berasaskan logam ini. Tambahan pula, menurut World Steel Association (2023), keluli merupakan bahan paling banyak dikitar semula di dunia, menjadikannya bukan sahaja simbol kemajuan tetapi juga kunci kepada pembangunan mampan.

Perspektif Islam tentang Besi

Al-Quran juga menyebut tentang kepentingan besi dalam kehidupan. Dalam Surah Al-Hadid ayat 25, besi digambarkan sebagai logam yang sangat kuat dan banyak manfaatnya. Tafsiran moden menjelaskan bahawa hal ini selari dengan penemuan sains iaitu ferum di bumi dipercayai berasal daripada meteor yang "turun" dari angkasa (Akhavanmoghadam, 2023). Ini menunjukkan adanya kaitan antara ilmu wahyu dan pengetahuan sains.

Illustrasi meteor yang turun ke bumi membawa bersama unsur besi

Selain itu, dalam Surah Al-Kahfi (ayat 94–96), kisah Zulkarnain menceritakan penggunaan besi untuk membina tembok bagi menahan Yakjuj dan Makjuj. Peristiwa ini menunjukkan bahawa besi telah lama digunakan sebagai bahan binaan yang penting untuk melindungi masyarakat dan membangunkan sistem kehidupan yang lebih teratur.

Hari ini, besi masih menjadi asas pembangunan moden. Besi digunakan dalam pembinaan jambatan, bangunan tinggi, kenderaan, serta pelbagai teknologi industri. Kisah wahyu dan sejarah tentang besi membuktikan bahawa logam ini kekal penting dari zaman dahulu hingga kini sebagai tunjang pembangunan dunia manusia.

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Tenaga hijau

Anda adalah titik mula perubahan

Ditulis oleh Nuryasmin Md Asri, Khamisah Mohamed
Politeknik Tun Syed Nasir Syed Ismail

Gambar 1. Penumpu Solar yang boleh memanaskan air untuk menghasilkan elektrik(2).

Dengan perjuangan perubahan iklim dan kemerosotan alam sekitar di seluruh dunia, penyelesaian tenaga hijau semakin penting. Radiasi matahari, yang ditukar kepada tenaga suria, adalah sumber yang boleh diperbaharui dan berterusan yang semakin popular kerana faedah alam sekitar dan keupayaan untuk menangani isu penggunaan tenaga.

Tenaga suria semakin banyak digunakan dalam komersil, kawasan perindustrian dan kediaman serta membantu mengurangkan pelepasan gas rumah hijau dan menentang perubahan iklim. Ideanya adalah untuk memecahkan sisa plastik kepada produk seperti bahan bakar minyak, syngas, dan arang (3).

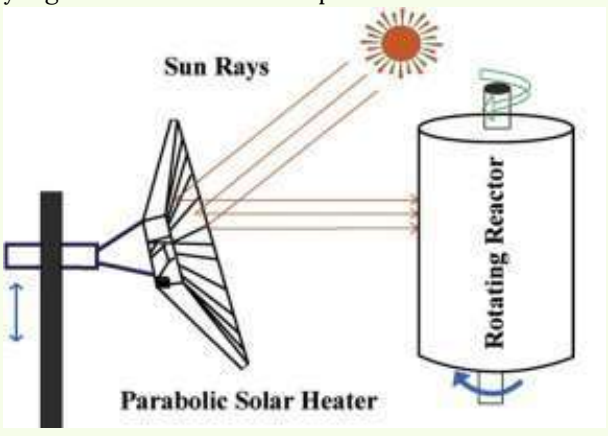
Daripada menggunakan kaedah pirolisis biasa, meggunakan tenaga suria untuk memulihkan sampah dan membantu mengurangkan pelepasan karbon. Memandangkan inovasi terus memacu kemajuan dalam bidang ini, impak gabungan tenaga suria dan pirolisis plastik berpotensi untuk membentuk semula pendekatan kami terhadap pengurusan tenaga dan sisa dengan membuka jalan ke arah planet yang lebih hijau.

Reflektor parabola memfokuskan cahaya matahari ke penerima berhampiran titik fokusnya. Permukaan reflektif, diperbuat daripada logam, kaca, atau plastik untuk mengarahkan cahaya matahari ke kawasan kecil yang dipanggil fokus. Bentuk pemantul adalah idealnya parabola, dan saiznya berbeza-beza berdasarkan ketepatan, pemantulan dan jarak fokus (1). Cahaya matahari dikumpulkan dan ditukar kepada tenaga haba dengan menggabungkan pengumpul haba suria dan tenaga haba ini kemudiannya dihantar ke reaktor pirolisis.

Sisa plastik yang berasal daripada petrokimia dan mempunyai nilai tenaga yang tinggi, boleh ditukar kepada tenaga berguna melalui kaedah seperti pengegasan, pirolisis, pemprosesan plasma dan pembakaran (3).

Pirolisis adalah kaedah pilihan kerana ia mengurangkan jumlah sisa dengan ketara dan memulihkan lebih banyak tenaga. Ini menjadikannya pilihan yang cekap dan menjimatkan untuk mengitar semula sisa plastik (3).

Dengan memanfaatkan sumber matahari yang banyak dan boleh diperbaharui, teknologi terma suria menyokong peralihan ke arah amalan tenaga yang lebih bersih dan mampan.



Gambar 2. Diagram contoh pada Solar Plastic Pyrolyzer (4).

"Melentur Buluh Biarlah Dari Rebungnya"

Generasi muda perlu memainkan peranan penting dalam memacu penyelesaian ekologi inovatif dan kehidupan yang berkelanjutan. Untuk melindungi planet kita dan memastikan kemampuannya untuk dihuni, kita mesti merangkul sumber tenaga boleh diperbaharui seperti tenaga solar dan pirolisis plastik. Dengan menyokong teknologi ini, anda boleh membantu mewujudkan masa depan yang lebih baik di mana kemajuan dan penjagaan alam sekitar berjalan bersama. Masa depan terletak di tangan anda – mari kita jadikan ia cerah dan berkelanjutan.

PENDIDIKAN 5.0
TEKNOLOGI DAN KEMANUSIAAN

Nuraini binti Mohd Rashid

Pendidikan 5.0 merupakan rangka pendidikan yang direka untuk menyokong matlamat untuk mewujudkan *Society 5.0*. Ia merupakan evolusi dalam pendidikan yang menggabungkan pendidikan berteraskan nilai kemanusiaan dengan teknologi canggih seperti AI, robotik dan realiti maya. Pendidikan 5.0 memberi tumpuan untuk melahirkan graduan yang boleh menyesuaikan diri, inovatif dan bertanggungjawab dari segi sosial untuk membina masyarakat yang mampan dan inklusif. Tidak seperti pendidikan tradisional, Pendidikan 5.0 menekankan kreativiti, etika, penyelesaian masalah dan pembelajaran sepanjang hayat.

Sumber : https://social-innovation.hitachi/en-in/knowledge-hub/techverse/society-5-0/

ASPEK UTAMA PENDIDIKAN 5.0

1. Pembelajaran Kendiri

Dalam pendidikan 5.0, pelajar diberikan kebebasan untuk memilih kaedah pembelajaran mengikut keupayaan dan keperluan individu pelajar. Walau bagaimana pun pensyarah memainkan peranan yang penting dalam menentukan isi dan objektif pembelajaran supaya pelajar berada dalam landasan yang betul.

2. Fokus pada Kemahiran Abad Ke-21

Pendidikan 5.0 memfokuskan kepada penguasaan kemahiran abad ke-21 untuk melahirkan pelajar yang berpemikiran kritis, kreatif, cekap menyelesaikan masalah serta mampu bekerjasama secara berkesan. Ia selaras dengan keperluan Industri 5.0 yang menekankan integrasi manusia dan teknologi, sekali gus menyokong aspirasi *Society 5.0*.

3. Pendekatan Kemanusiaan

"Pendidikan 5.0 menekankan keseimbangan diri pelajar dalam aspek teknikal, emosi, dan sosial. Ini bagi melahirkan pelajar yang bertanggungjawab dan prihatin terhadap kesejahteraan masyarakat dan pembangunan negara.

Sumber :https://momenta.vc/industry5.0

4.Mengintegrasi Teknologi dalam Pembelajaran dan Pengajaran

Penggunaan teknologi seperti AI, AR dan IoT dalam pembelajaran dapat meningkatkan motivasi pelajar, menggalakkan pembelajaran kendiri, serta menyokong penguasaan kemahiran abad ke-21 melalui persekitaran pembelajaran yang lebih interaktif dan menarik

5. Kebolehsuaian dan Fleksibiliti

Perkembangan pesat dalam bidang automasi, kecerdasan buatan, dan digitalisasi telah mewujudkan landskap pekerjaan yang sentiasa berubah serta menuntut kemahiran baharu secara berterusan. Justeru itu,adalah amat penting untuk melengkapkan pelajar dengan keupayaan menyesuaikan diri terhadap ketidakpastian dan cabaran masa hadapan melalui laluan pembelajaran yang fleksibel dan peluang pembelajaran sepanjang hayat.

6. Sejajar dengan Industri 5.0

Pendidikan masa kini perlu sejajar dengan tuntutan Industri 5.0 yang menekankan integrasi manusia dan mesin bagi memenuhi keperluan tenaga kerja masa hadapan disamping menyokong Masyarakat 5.0 (Society 5.0)

KESIMPULAN

Pendidikan 5.0 menggabungkan nilai kemanusiaan dengan teknologi canggih untuk melahirkan graduan yang beretika, inovatif dan adaptif. serta menyokong pembinaan masyarakat inklusif dan mampan selaras dengan matlamat *Society 5.0*.

BAKTERIA PEMAKAN PLASTIK: IDEONELLA SAKAIENSIS

Harapan Baru untuk Dunia Tanpa Sampah Plastik

Fazliana Binti Abdullah

Pada tahun 2016, sekumpulan saintis Jepun yang sedang mengkaji tapak pembuangan sampah di Sakai, Osaka menemui bakteria unik yang mampu memecahkan plastik PET (polyethylene terephthalate). Plastik PET ialah bahan utama botol air, bungkusan makanan, dan tekstil (polyester).

Bakteria ini dinamakan Ideonella sakaiensis sempena tempat ia ditemui. Ia menjadi terkenal kerana boleh "makan" plastik dan menjadikannya bahan tidak berbahaya seperti karbon dioksida dan air.

Kenapa Ini Penting?

Plastik PET mengambil ratusan tahun untuk terurai secara semula jadi. Ideonella sakaiensis boleh memecahkan PET dalam enam minggu (di makmal) – satu keajaiban berbanding ratusan tahun! Jika dikembangkan, bakteria ini boleh jadi senjata penting melawan pencemaran plastik global.

Bagaimana Bakteria Ini Bekerja?

1 Ideonella sakaiensis menghasilkan dua enzim penting untuk memecahkan plastik:

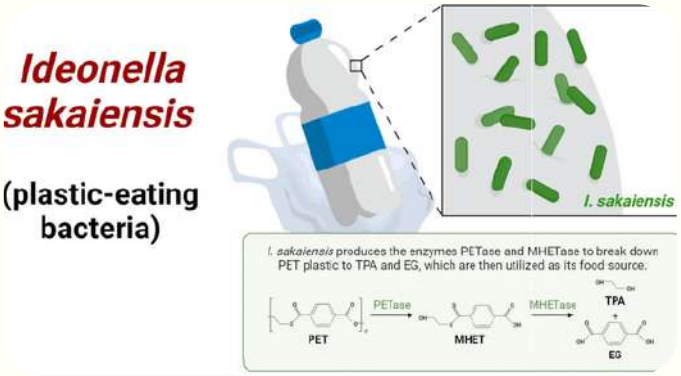
PETase (Polyethylene Terephthalate Hydrolase)

- Memecahkan rantaian panjang PET kepada unit yang lebih kecil: mono(2-hydroxyethyl)terephthalicacid (MHET).

2 MHETase (Mono(2-hydroxyethyl) terephthalic acid Hydrolase)

- Menukarkan MHET kepada asid tereftalik dan etilena glikol — bahan yang lebih mesra alam.

Prosesnya seperti ini: Plastik PET → MHET → Asid Tereftalik + Etilena Glikol → Air + CO_2



Perkembangan Teknologi

- Pada 2018, saintis di University of Portsmouth berjaya mengubahsuai enzim PETase supaya lebih efisien dan cepat memecahkan plastik.
- Sekarang ada usaha mencipta enzim “super PETase” melalui teknik kejuruteraan protein dan AI untuk mempercepat proses degradasi plastik dalam skala industri.

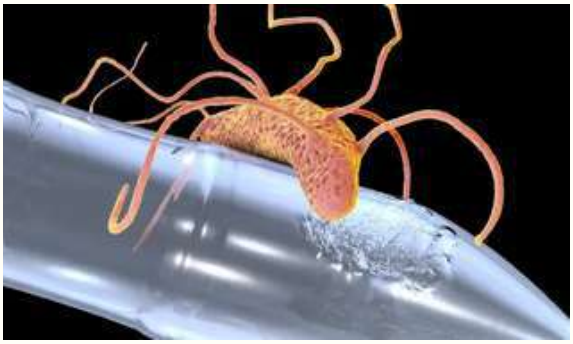
Kelebihan vs Cabaran

Kelebihan

- Menyelesaikan masalah sisa plastik.
- Tidak toksik, mesra alam.
- Boleh digunakan dalam sistem kitar semula.

Cabaran

- Masih perlahan untuk kegunaan komersial.
- Perlu dikawal supaya tidak ganggu ekosistem.
- Kos pembangunan teknologi masih tinggi.



Masa Depan Bakteria Pemakan Plastik

- Bayangkan pusat kitar semula yang menggunakan koloni Ideonella sakaiensis untuk "memakan" gunungan botol plastik.
- Atau enzim PETase disembur terus ke dalam sistem pengolahan air untuk “membersihkan” lautan plastik.
- Malah ada idea untuk menggunakan bakteria ini di stesen angkasa supaya angkasawan boleh mengitar semula plastik dengan bantuan mikroba.

Fun Fact

- Enzim PETase Ideonella lebih suka suhu 30°C – sesuai dengan iklim tropika!
- Proses penguraian bakteria ini tidak menghasilkan gas rumah kaca seperti pembakaran plastik.

Ringkasan

Ideonella sakaiensis ialah “superhero alam sekitar” kecil yang memberi kita harapan untuk masa depan lebih bersih. Dengan bantuan teknologi, ia mungkin jadi pelengkap kepada usaha mengurangkan, mengguna semula, dan mengitar semula plastik.

Si kecil ini mungkin kunci kepada dunia tanpa plastik!

POKOK AREN

SERIBU MANFAAT DARI DESA KE DUNIA

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Pokok Aren: Warisan Alam

Pokok Aren (**Arenga pinnata**) atau lebih dikenali sebagai kabung sinonim dengan gulanya yang manis dan segar. Nira yang ditadah daripada bunganya menjadi minuman tradisi serta manisan warisan turun-temurun. Bukan itu sahaja, buah aren (kolang kaling) juga menjadi kegemaran ramai. Isinya berwarna putih jernih, kenyal, dan sering dijadikan bahan tambahan dalam ais batu campur (ABC) atau dijadikan pemanis mulut. Kehadiran buah aren memberi rasa unik yang menyegarkan, sekali gus menambahkan lagi nilai istimewa pokok ini.

Pokok Aren atau Kabung, khazanah alam yang semakin dilupakan

Potensi Pokok Aren

Di sebalik manisnya gula aren dan keenakan buahnya, batang dan pelepah aren pula menyimpan rahsia sains moden. Seratnya kaya dengan selulosa, bahan asas yang boleh diproses menjadi nanoselulosa – gentian halus bersaiz nanometer yang sangat kuat, ringan, telus dan mesra alam.

Aplikasi Pokok Aren

📦 Pembungkusan makanan mesra alam menggantikan plastik sekali guna

💧 Penapis air untuk merawat pencemaran industri dan domestik.

🧩 Bahan komposit berprestasi tinggi menguatkan plastik, getah, atau polimer untuk kegunaan automotif, pembinaan dan teknologi aeroangkasa.

🩹 Pembalut luka bioaktif boleh mempercepatkan penyembuhan

Penyediaan nanoselulosa daripada pokok Aren ~ membuka jalan kepada produk hijau masa depan

Dari Manisan Kepada Inovasi

Dulu kita hanya mengenali aren atau kabung melalui manisnya gula dan segarnya buah. Hari ini, ia mula dikenali kerana sumbangannya dalam teknologi hijau. Bayangkan satu pokok yang dahulu hanya tumbuh di tepi sawah atau dusun, kini boleh menjadi asas kepada pembalut luka, penapis air atau bateri berteknologi tinggi.

Penghasilan Nanoselulosa Aren

Nanoselulosa daripada pokok aren dihasilkan melalui proses penyingkiran lignin, hemiselulosa dan kekotoran, diikuti rawatan kimia yang membantu meleraikan struktur mikrofibril selulosa. menggunakan teknik pemesinan basah bagi memecahkannya kepada fibril halus berskala nano, biasanya di bawah 100 nm.

Proses ini menghasilkan nanoselulosa yang ringan tetapi sangat kuat, mempunyai luas permukaan tinggi serta kestabilan yang baik dalam suspensi. Dengan ciri-ciri ini, nanoselulosa aren menawarkan potensi besar sebagai bahan penguat dalam komposit, membran rawatan air dan pelbagai aplikasi berasaskan bio, serta memanfaatkan sumber agro-sisa yang murah dan lestari.

Aren ~ Bukan Hanya Sekadar Gula

Pokok kabung sebenarnya lebih daripada sekadar sumber gula. Buahnya menyegarkan, nira menjadi manisan, batang dan pelepahnya menghasilkan nanoselulosa. Malah, sisa-sisanya berpotensi dijadikan baja organik atau tenaga biojisim. Setiap bahagian pokok ini dari akar, batang, pelepah hingga ke buah boleh dimanfaatkan sepenuhnya.

Aren, si kecil desa, kini memikul harapan besar dunia. Dalam era kelestarian dan teknologi hijau, inilah waktunya kita kembali menghargai khazanah yang hampir dilupakan ini.

PRINSIP HUYGIENS

PERUBAHAN GELOMBANG CAHAYA

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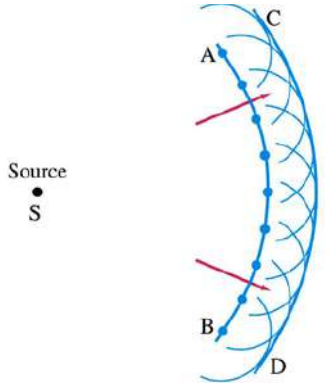
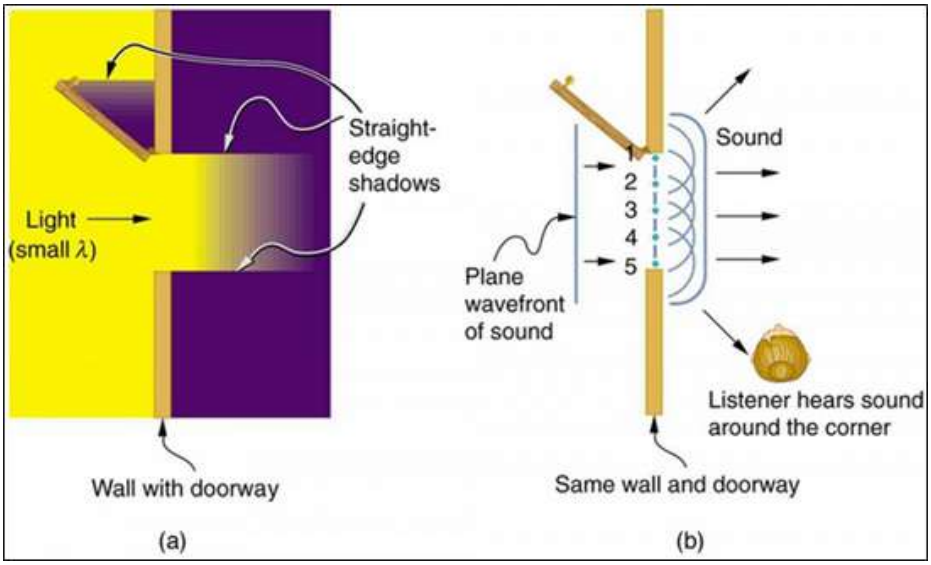
Menurut Prinsip Huygens, setiap titik pada permukaan gelombang bertindak sebagai sumber gelombang sfera kecil sekunder (secondary wavelets) yang menjalar secara seragam ke semua arah pada kelajuan yang sama dengan gelombang asal. Pada masa yang berikutnya, muka gelombang baharu terbentuk sebagai sampul (envelope) kepada semua gelombang sekunder ini. Prinsip ini digunakan untuk menerangkan perambatan gelombang dalam medium homogen serta untuk menjelaskan fenomena seperti pembelauan (diffraction), pembiasan (refraction) dan interferens (interference) secara geometri. Huygens Fresnel Principle, yang merupakan peluasan kepada prinsip asal ini, turut mengambil kira kesan amplitud dan fasa untuk menerangkan intensiti gelombang pada sesuatu titik.





Rajah 1 : Prinsip Huygens digunakan untuk menunjukkan bagaimana hadapan gelombang satah yang mengenai satu bukaan menghasilkan pembelauan. Selepas melalui bukaan, tepi gelombang membengkok membentuk corak pembelauan. Kesan lenturan menjadi lebih ketara apabila saiz bukaan hampir sama dengan panjang gelombang, mencerminkan sifat semula jadi gelombang dalam situasi tersebut.

https://courses.lumenlearning.com/suny-physics/chapter/27-2-huygenss-principle-diffraction/

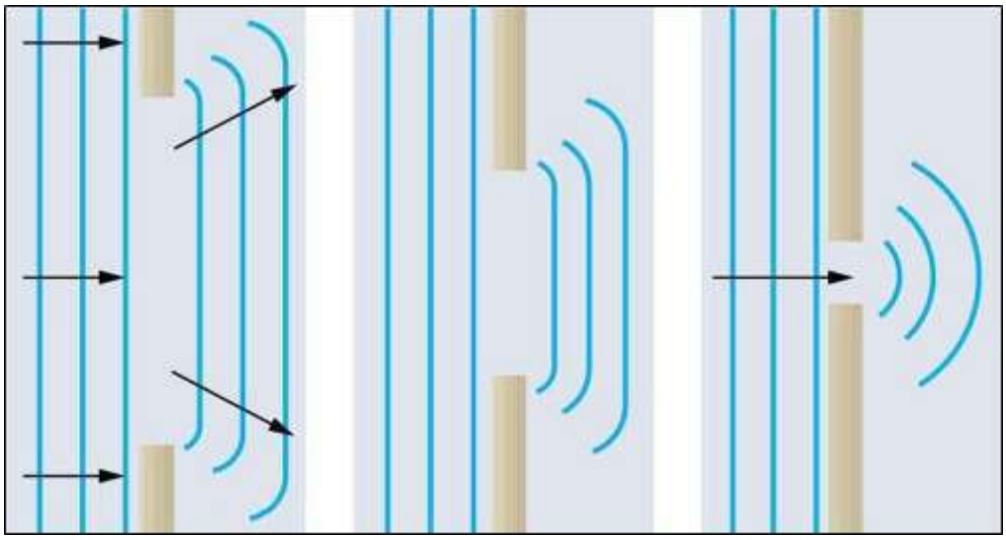
Pembelauan berlaku dengan lebih ketara apabila saiz celah atau halangan menghampiri panjang gelombang cahaya. Prinsip Huygens menjelaskan tingkah laku gelombang dalam situasi ini dan menjadi asas kepada pemahaman dalam optik klasik dan moden.

Cahaya merupakan gelombang elektromagnet yang terdiri daripada medan elektrik dan medan magnet yang berayun serenjang antara satu sama lain serta terhadap arah perambatan gelombang.

Tiga (3) ciri utama gelombang iaitu panjang gelombang (λ), frekuensi (f), dan kelajuan cahaya (c) berkait melalui persamaan, $C = \lambda f$

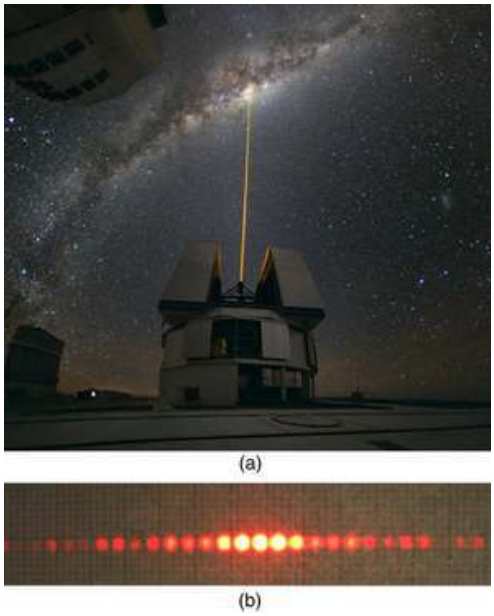
PEMBENTUKAN PEMBELAUAN (DIFFRACTION)

Berdasarkan Rajah 2, apabila cahaya melalui bukaan yang kecil, Prinsip Huygens menerangkan pembelauan cahaya yang berlaku serupa seperti bunyi. Pembelauan ialah fenomena di mana gelombang membengkok apabila melalui tepi halangan atau celah sempit, iaitu suatu ciri asas bagi semua jenis gelombang. Kehadiran pembelauan merupakan bukti sifat gelombang sesuatu fenomena. Oleh itu, pembelokan mendatar pancaran laser selepas melalui celah dalam Rajah 3 mengesahkan bahawa cahaya bersifat gelombang.



Dalam Rajah 2, Prinsip Huygens digunakan untuk menunjukkan bagaimana gelombang lurus yang melalui satu bukaan mengalami pembelauan. Setelah melepasi bukaan, bahagian tepi gelombang membengkok, membentuk corak pembelauan. Semakin kecil saiz bukaan berbanding panjang gelombang, semakin ketara kesan pembelauan yang berlaku. Fenomena ini paling jelas apabila dimensi halangan hampir sama dengan panjang gelombang tersebut.

https://courses.lumenlearning.com/suny-physics/chapter/27-2-huygenss-principle-diffraction/



Perbezaan kecil antara kedudukan minimum dan maksimum boleh dikaitkan dengan ralat pengukuran manual serta ketidakseragaman pada lebar celah. Namun begitu, corak keseluruhan yang diperoleh menunjukkan bahawa model berdasarkan Prinsip Huygens dapat menerangkan pembentukan muka gelombang dan pola pembelauan dengan tepat dari sudut geometri.

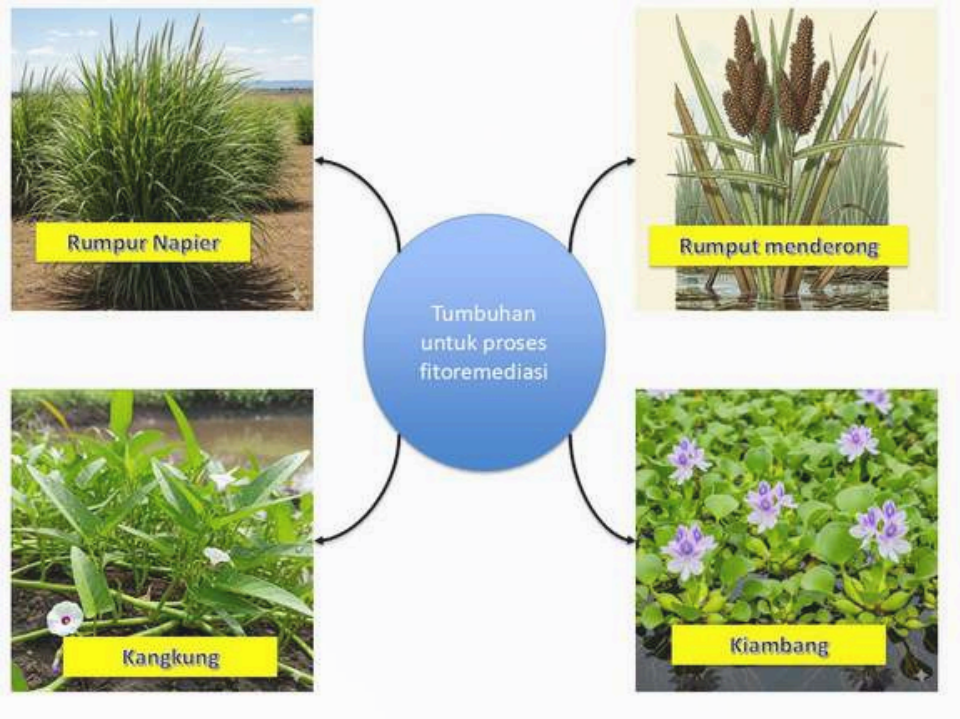
Prinsip Huygens berfungsi sebagai pendekatan yang efektif untuk menerangkan dan memvisualkan fenomena pembelauan gelombang cahaya. Ia sesuai digunakan dalam konteks pendidikan dan penyelidikan asas, terutamanya dalam memahami perambatan gelombang melalui celah sempit serta interaksi dengan halangan.

Rajah 3 :
(a) Pancaran laser dari sebuah balai cerap bergerak secara linear seperti cahaya biasa. Imej ini menunjukkan pancaran laser dari Balai Cerap Paranal, di bawah pengurusan European Southern Observatory.
(Kredit: Yuri Beletsky, European Southern Observatory)

(b) Apabila pancaran laser melalui susunan celah menegak, ia menghasilkan corak gangguan (interferens), yang merupakan bukti sifat gelombang cahaya.
(Kredit: Shim'on dan Slava Rybka, Wikimedia Commons)

FITOREMEDIASI

TUMBUHAN SEBAGAI SENSOR BIOAKTIF



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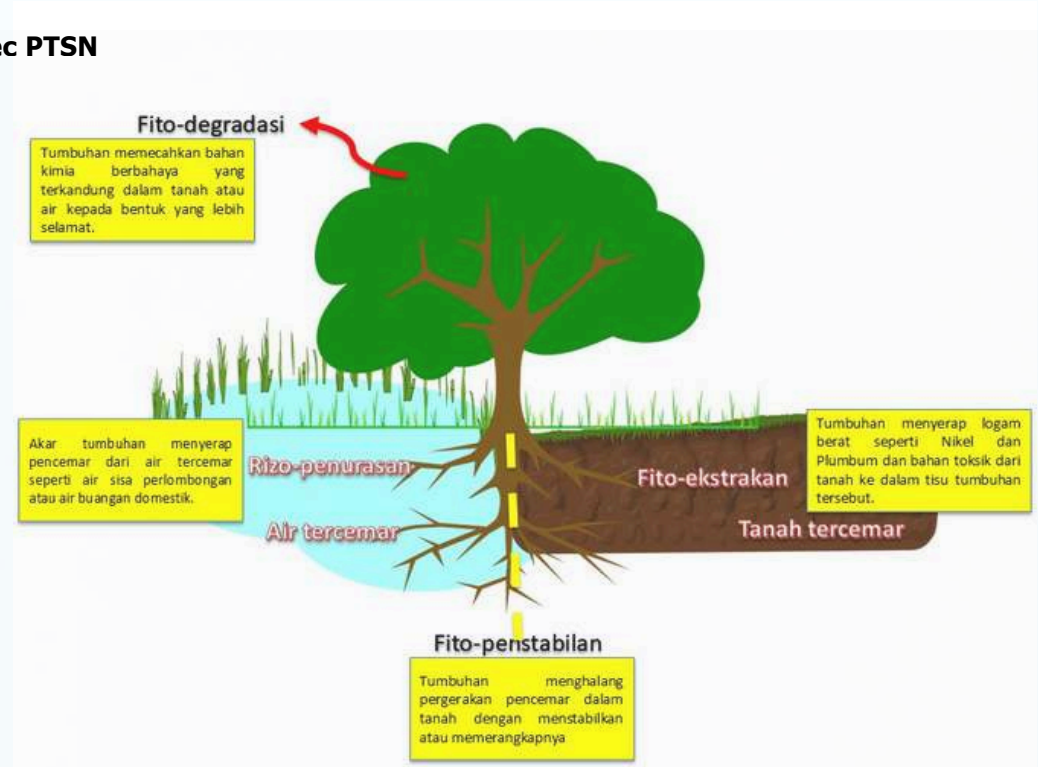
Dengan industri yang semakin berkembang, pencemaran tanah dan air menjadi salah satu cabaran am sekitar yang kritikal. Sisa industri berat,air sisa domestik, dan sisa pertanian seperti racun perosak telah menyumbang kepada kerosakan ekosistem. Rawatan konvensional menggunakan kaedah mekanikal, dan kimia berkesan dalam merawak pencemaran ini, tetapi selalunya mahal, berisiko tinggi, dan tidak mampan dalam jangka panjang. . Di sinilah muncul satu penyelesaian mesra alam yang luar biasa iaitu fitoremediasi, iaitu teknologi menggunakan tumbuhan hidup sebagai agen rawatan dan pemantauan bahan pencemar. Tumbuhan bukan sekadar hijau pada rupa, tetapi juga mampu bertindak sebagai sensor bioaktif yang 'mengesan' dan merawat tanah serta air yang tercemar

APA ITU FITOREMEDIASI

Fitoremediasi merujuk kepada penggunaan tumbuhan untuk mengurangkan, menyahtoksik, menguraikan, atau menstabilkan bahan pencemar daripada alam sekitar. Mekanisme ini bergantung kepada sistem akar dan fisiologi tumbuhan yang unik dalam memproses bahan kimia tertentu secara semula jadi. . Terdapat beberapa mekanisme utama dalam fitoremediasi :

- Fito-pengekstrakan
- Fito-penstabilan
- Fito-degradasi
- Rizo-penurasan



PROSES DALAM FITOREMEDIASI

SENSOR BIOAKTIF: KONSEP & APLIKASI

Menariknya, beberapa tumbuhan bukan sahaja merawat pencemaran dalam alam sekitar tetapi juga sebagai indikator tentang kehadiran bahan toksik. Tumbuhan ini bertindak seperti sensor, yang berubah dari segi warna daun, kadar pertumbuhan, atau pengeluaran sebatian tertentu apabila terdedah kepada logam berat seperti plumbum, kadmium atau arsenik.Sebagai contoh:

- Kangkung dan bayam air digunakan dalam eksperimen rawatan air lombong kerana kadar pertumbuhan tinggi dan sensitiviti terhadap logam
- Rumput dikenali dalam industri kerana akar dalamnya yang tahan dan cekap menstabilkan bahan pencemar.
- Bunga matahari mampu menyerap uranium dan logam berat sambil menunjukkan perubahan morfologi yang boleh dikesan

HAD DAN CABARAN

Walaupun teknologi fitoremediasi adalah lestari, fitoremediasi mempunyai beberapa kekangan. Ia tidak sesuai untuk bahan pencemar yang berada jauh dibawah permukaan tanah, atau untuk bahan kimia kompleks yang kar diuraikan. Prosesnya juga lebih perlahan, biasanya memakan masa antara 3 hingga 10 tahun, bergantung kepada jenis tumbuhan, kepekatan bahan pencemar dan keadaan iklim. Selain itu, tumbuhan yang menyerap logam berat menjadi bahan toksik yang perlu dilupuskan secara khas seperti pembakaran terkawal. Jika tidak diuruskan dengan betul, ia boleh mencemarkan semula alam sekitar.

POTENSI MASA DEPAN DI MALAYSIA

Malaysia, sebagai negara tropika yang kaya dengan biodiversiti tumbuhan, mempunyai kelebihan dalam meneroka kaedah fitoremediasi sebagai satu kaedah penyelesaian mampan.Teknologi ini juga selari dengan konsep TVET hijau, membolehkan pelajar menggabungkan ilmu biologi, kejuruteraan dan teknologi dalam konteks sebenar. Tumbuhan bukan sahaja menghijaukan bumi, tetapi juga berfungsi sebagai sistem rawatan semula jadi yang efisien. Teknologi ini juga selari dengan konsep TVET hijau, membolehkan pelajar menggabungkan ilmu biologi, kejuruteraan dan teknologi dalam konteks sebenar. Tumbuhan bukan sahaja menghijaukan bumi, tetapi juga berfungsi sebagai sistem rawatan semula jadi yang efisien.

KESIMPULAN

Dalam dunia yang semakin mencari penyelesaian lestari, fitoremediasi membuktikan bahawa teknologi tidak semestinya perlu kaedah yang kompleks. Kadangkala cukup sekadar akar yang menjalar dan daun yang memantul cahaya. Tumbuhan, sebagai sensor bioaktif, mengajar kita bahawa alam itu sendiri adalah teknologi terbaik yang pernah wujud.

GARCINIA CAMBOGIA:

Kecil-kecil Buah, Besar Gunanya

Nor Hashina Binti Bahrudin
Nurul Nafisah Binti Nor Amali

PENGENALAN BUAH :

Pernahkah anda terjumpa buah kecil yang bentuknya seakan labu mini tetapi berwarna kehijauan atau kekuningan? Itulah Garcinia cambogia, sejenis buah tropika yang banyak tumbuh di Asia Tenggara. Walaupun saiznya sederhana, buah ini semakin dikenali di seluruh dunia kerana manfaat kesihatan yang dikaitkan dengannya.

RAHSIA KANDUNGAN HCA:

Keistimewaan utama Garcinia cambogia ialah kandungan asid hidroksisitrat (HCA). Ramai yang percaya HCA mampu mengawal selera makan dan membantu proses penurunan berat badan. Bayangkan, rasa kenyang lebih lama dan kurang keinginan untuk snek semuanya datang daripada sebiji buah yang kelihatan biasa-biasa sahaja.

KEGUNAAN TRADISIONAL :

Selain menjadi buah yang popular dalam suplemen moden, Garcinia cambogia juga mempunyai nilai tradisi. Di kampung-kampung, kulit dan daun buah ini digunakan dalam masakan untuk menambah rasa masam yang segar. Malah, masyarakat dahulu menjadikannya ramuan herba untuk melegakan masalah pencernaan.

ALAM SEBAGAI INSPIRASI :

Kisah Garcinia cambogia mengingatkan kita bahawa alam sentiasa penuh dengan penyelesaian semula jadi. Di sebalik saiznya yang kecil, buah ini membawa inspirasi bahawa sesuatu yang sederhana mampu memberi kesan besar. Ia seperti pesanan halus daripada alam jangan pandang rendah pada perkara yang kelihatan biasa.

KESIMPULAN :

Akhirnya, Garcinia cambogia bukan sekadar buah tropika, tetapi simbol keseimbangan antara tradisi dan gaya hidup moden. Sama ada dalam bentuk masakan, herba, atau suplemen, buah kecil ini tetap memberi manfaat kepada tubuh dan minda. Jadi, lain kali jika terdengar nama buah ini, senyum sahaja dan ingat: kadang-kadang yang kecil itulah yang paling berharga.

KEPENTINGAN KROMIUM DALAM KAWALAN DIABETES MELLITUS JENIS 2

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Peranan Kromium dalam Diabetes Mellitus Jenis 2

Diabetes mellitus jenis 2 (DM2) merupakan salah satu penyakit metabolik yang paling lazim di dunia. Penyakit ini sering dikaitkan dengan komplikasi kronik seperti kegagalan jantung, kerosakan buah pinggang, strok, dan masalah penglihatan. Antara faktor utama yang mendorong perkembangan penyakit ini ialah rintangan insulin, iaitu keadaan di mana sel badan tidak lagi memberi tindak balas yang baik terhadap insulin. Apabila ini berlaku, tubuh memerlukan lebih banyak insulin untuk mengawal paras gula darah, dan lama-kelamaan, ia meningkatkan risiko komplikasi. Kajian oleh Fatima Alkhalidi (2023) yang diterbitkan dalam Journal of Medicine and Life telah menunjukkan bahawa kekurangan kromium dalam diet harian boleh memburukkan lagi keadaan ini. Kromium adalah salah satu mikronutrien penting yang walaupun hanya diperlukan dalam jumlah yang kecil, mempunyai kesan besar dalam membantu tubuh mengawal paras glukosa darah dengan lebih baik.

Bentuk dan Keperluan Kromium

Kromium (Cr) wujud dalam beberapa bentuk valens, iaitu Cr^{2+}, Cr^{3+}, dan Cr^{6+}. Antara semua bentuk tersebut, Cr^{3+} (trivalen) dianggap paling stabil serta bermanfaat secara biologi. Keperluan harian kromium untuk manusia sangat kecil, iaitu sekitar 0.005–0.2 mg sehari, dengan paras normal dalam darah berada dalam julat 2.3–40.3 nmol/L.

Menurut kajian oleh Farrokhian (2023), Cr^{3+} boleh ditemui dalam bentuk Glucose Tolerance Factor (GTF) dan Low Molecular Weight Chromium (LMWCr). Kedua-dua bentuk ini berperanan penting dalam meningkatkan keberkesanan insulin, bukan sahaja untuk mengawal glukosa dalam darah tetapi juga membantu dalam metabolisme lipid.

Mekanisme Kromium dalam Mengawal Gula Darah

Kromium berfungsi dengan menstabilkan pengikatan insulin kepada reseptornya di permukaan sel. Apabila hubungan ini stabil, insulin dapat bekerja dengan lebih berkesan untuk membawa glukosa masuk ke dalam sel dan digunakan sebagai tenaga. Hal ini juga mengurangkan masalah rintangan insulin, iaitu punca utama dalam diabetes jenis 2.

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KROMIUM DAN DIABETES

Selain itu, kromium membantu meningkatkan sensitiviti insulin, bermakna tubuh memerlukan insulin dalam jumlah yang lebih sedikit untuk mencapai kesan yang sama. Mekanisme ini penting kerana ia bukan sahaja membantu mengawal paras gula, tetapi juga berpotensi mengurangkan tekanan kepada pankreas yang menghasilkan insulin..

Manfaat Suplemen Kromium

Kajian Farrokhian (2023) turut menekankan bahawa suplemen kromium boleh memberikan manfaat nyata kepada pesakit diabetes jenis 2, terutamanya yang mengalami kekurangan kromium. Antara manfaat yang dilaporkan termasuk:

1. Mengurangkan paras glukosa darah ketika berpuasa.
2. Mengurangkan keperluan insulin eksogen, iaitu suntikan insulin tambahan yang biasanya diberikan kepada pesakit diabetes.
3. Meningkatkan kawalan metabolisme lipid, yang seterusnya membantu mengurangkan risiko komplikasi kardiovaskular.

Kesimpulan

Secara keseluruhannya, kromium memainkan peranan penting dalam membantu keberkesanan insulin dan mengurangkan masalah rintangan insulin yang menjadi asas kepada diabetes jenis 2. Walaupun hanya diperlukan dalam jumlah yang kecil, kekurangan kromium boleh memberi kesan buruk kepada kawalan gula darah. Hasil kajian oleh Alkhalidi (2023) dan Farrokhian (2023) memberikan bukti bahawa kromium, sama ada daripada diet atau suplemen, berpotensi untuk menjadi sebahagian daripada strategi pengurusan diabetes jenis 2, terutamanya bagi pesakit yang mempunyai paras kromium rendah.

Dari Kelas ke Dunia Nyata: Menyemai Budaya Penyelidikan dan Inovasi

"Mencungkil Potensi dan Kreativiti Pelajar Politeknik"

Hasyireen binti Abdul Halim
Siti Nazurah binti Md Zaid

Bayangkan anda seorang pelajar politeknik. Setiap hari anda ke bengkel, makmal, atau kelas teori. Anda belajar cara mengendalikan mesin, memasang litar, membina sistem, dan menyelesaikan tugasan projek. Semua itu penting – tetapi dunia hari ini menuntut lebih daripada sekadar mahir secara teknikal. Dunia hari ini mahukan idea baharu, penyelesaian kreatif, dan keberanian untuk mencuba sesuatu yang lain daripada kebiasaan.

Di sinilah penyelidikan dan inovasi memainkan peranan besar.

Kenapa Penyelidikan Itu Penting??

Penyelidikan bukan hanya tentang menulis laporan tebal atau mencari artikel jurnal yang sukar difahami. Sebenarnya, penyelidikan ialah proses bertanya dan mencari jawapan. Bila pelajar berani bertanya "kenapa mesin ni cepat rosak?" atau "bagaimana nak guna tenaga solar lebih efisien?", mereka sebenarnya sudah mula berfikir seperti seorang penyelidik.

Mengapa Inovasi Jadi Pemangkin?

Kalau penyelidikan ialah bertanya, inovasi pula ialah bertindak mencipta jawapan.

Contohnya, seorang pelajar yang bosan melihat kipas asrama cepat rosak, mencuba hasilkan kipas dengan sistem kawalan automatik yang lebih tahan lama. Atau sekumpulan pelajar elektrik cuba mencipta power bank berasaskan tenaga solar untuk kegunaan kecemasan.

Inovasi melatih pelajar untuk berfikir di luar kotak, berani gagal, dan cuba lagi. Kadang-kadang produk yang dihasilkan bukan sekadar projek akhir semester, namun boleh menjadi benih kepada perniagaan masa hadapan.

Sinergie; Program inovasi tahunan yang dijalankan di Politeknik Tun Syed Nasir Syed Ismail

Penulis bersama pelajar seliaan projek akhir dalam Pertandingan Sinergie

Apa Manfaat Kepada Pelajar?

- Kemahiran insaniah: Apabila bekerja dalam kumpulan projek inovasi, pelajar belajar berkomunikasi, bekerjasama, dan memimpin.
- Akademik lebih bermakna: Penyelidikan menjadikan teori yang dipelajari di kelas lebih hidup kerana diaplikasikan dalam situasi sebenar.
- Kebolehpasaran kerja: Majikan suka graduan yang bukan sahaja tahu "buat kerja", tetapi juga ada kreativiti dan mampu mencari jalan baharu bila berdepan masalah.

Cabaran Yang Wujud

- Namun begitu, jalan ini bukan mudah. Pelajar politeknik kadang-kadang terbeban dengan jadual kelas yang padat. Ada juga yang kurang yakin kerana menyangka penyelidikan hanya untuk pensyarah atau pelajar universiti. Kemudahan dan dana projek yang terhad juga antara penghalang.
- Tetapi, cabaran inilah yang menjadikan perjalanan lebih bermakna. Inovasi yang hebat biasanya lahir dari keterbatasan – apabila pelajar terpaksa berfikir kreatif dengan apa yang ada di tangan.

Bagaimana Nak Kukuhkan Budaya Ini?

- Wujudkan bengkel santai tentang cara mudah membuat penyelidikan dan inovasi.
- Galakkan penyertaan dalam pertandingan inovasi sebagai medan latihan.
- Adakan mentor dalam kalangan pensyarah yang boleh membimbing.
- Libatkan industri supaya projek pelajar lebih realistik dan relevan.

Politeknik Tun Syed Nasir Syed Ismail sendiri telah melaksanakan program Pertandingan Inovasi i-Sinergie 2025 bagi membudayakan inovasi di kalangan pelajar-pelajar.

Penutup

Budaya penyelidikan dan inovasi menjadikan perjalanan pelajar politeknik lebih bermakna. Dari kelas yang penuh teori, mereka bergerak ke dunia nyata yang penuh cabaran. Dari soalan kecil, lahir jawapan besar. Dari idea ringkas, tercipta inovasi yang mungkin mengubah cara kita hidup.

Jika budaya ini disemai sejak awal, politeknik bukan sahaja melahirkan graduan yang mahir teknikal, tetapi juga generasi pencipta, pemikir, dan pemimpin masa depan.

"Dari kelas ke dunia nyata,
Ilmu jadi cahaya,
Penyelidikan membuka minda,
Inovasi mencipta bangsa berjaya."

BITUMEN TERUBAH SUAI POLIMER: MENGATASI KAKISAN PADA PAIP

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Jika anda membiarkan satu batang besi biasa yang tiada salutan terdedah dengan persekitaran hujan dan panas untuk tempoh beberapa hari, apa yang akan anda lihat? Ya anda akan dapati bintik-bintik berwarna coklat seperti jeragat mula timbul pada permukaan besi tersebut. Semakin lama batang besi tersebut terdedah dengan hujan dan panas, bintik-bintik berwarna coklat akan memenuhi permukaan batang besi tersebut. Haa.. bintik-bintik berwarna coklat itulah dipanggil sebagai **KAKISAN!** Musuh senyap ini juga mampu menyerang saluran paip gergasi yang mengalirkan bahan kimia di loji petrokimia yang berpotensi boleh melemahkan struktur paip dan seterusnya berpotensi menjejaskan kelancaran operasi loji.

SALUTAN PAIP DARI BITUMEN TERUBAH SUAI POLIMER

Salutan berperanan sebagai mekanisme pertahanan terhadap ancaman kakisan pada paip. Penggunaan bitumen asas semata-mata yang mempunyai rintangan kimia serta ketahanan mekanikal yang rendah akan menyebabkan salutan kurang berkesan dalam melindungi paip daripada kakisan. Penggabungan sisa buangan plastik Polietilena Tereftalat (PET) ke dalam bitumen terubah suai polimer berpotensi menghasilkan salutan paip yang lebih tahan lama serta memiliki daya tahan kimia yang lebih baik dalam usaha mengurangkan kakisan. Strategi serampang dua mata ini turut berpotensi mengurangkan jumlah sisa PET di tapak pelupusan dalam jangka masa panjang.

BAGAIMANA IA DIBUAT

Bitumen Terubah Suai Polimer

Sisa plastik PET kitar semula dikumpul, dipotong kecil, dibersihkan dengan larutan natrium hidroksida (NaOH) dan dibilas air panas sebelum dikisar halus membentuk serbuk PET siap guna. Bitumen yang di panaskan pada suhu sehingga 240 °C dalam tempoh 60 minit di tambah dengan bahan tambah pengemulsi serta *Styrene Butadiene Styrene* (SBS) dan dikacau selama 15 minit. Serbuk PET siap guna ditambah ke dalam campuran dan proses mengacau diteruskan. Akhir sekali, larutan asid hidroklorik (HCl) dimasukkan untuk melengkapkan prosedur penghasilan bitumen terubah suai polimer.

PENGUJIAN SALUTAN

Pengujian salutan pada paip dibuat dengan merendamkan paip yang telah disalut dengan bitumen terubah suai polimer dalam tiga persekitaran berbeza iaitu larutan berasid, larutan beralkali dan larutan garam. Hasil ujian yang dijalankan menunjukkan paip yang telah disalut dengan bitumen terubah suai polimer mempamerkan kebolehan dalam rintangan kakisan terhadap persekitaran berasid, beralkali dan masin.

Pengujian Salutan Dalam Persekitaran Berasid dan Beralkali

RUMUSAN RINGKAS

Salutan bitumen terubah suai polimer bukan sahaja melindungi paip daripada kakisan, malah mesra alam kerana memanfaatkan sisa plastik PET kitar semula. Hasil pengujian menunjukkan salutan ini tahan dalam persekitaran berasid, beralkali dan masin, berpotensi sebagai salutan alternatif untuk struktur paip yang lebih kukuh dan tahan lama

"MATEMATIK KEJURUTERAAN SEBAGAI SUBJEK YANG DIGERUNI: REALITI ATAU PERSEPSI?"

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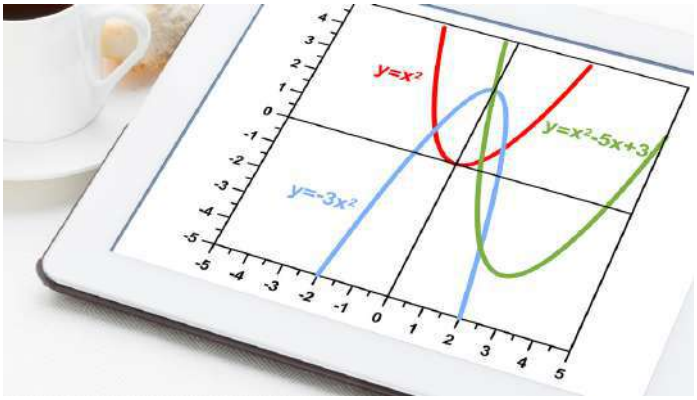
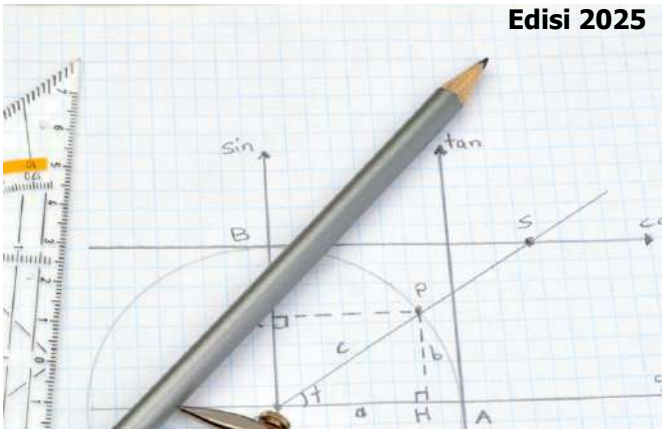
Matematik sering dilabel sebagai subjek yang sukar dikuasai oleh pelajar di pelbagai peringkat pendidikan. Ungkapan seperti "saya lemah Matematik" atau "Matematik menakutkan" seakan sinonim dengan pengalaman kebanyakan pelajar, sehingga wujud tanggapan bahawa matematik adalah halangan besar yang sukar diatasi. Hal ini menimbulkan persoalan sama ada cabaran dalam menguasai matematik benar-benar berpunca daripada tahap kesukarannya atau sekadar persepsi yang terbentuk daripada pengalaman terdahulu.



Di peringkat politeknik khususnya, Matematik Kejuruteraan dianggap sebagai salah satu subjek teras yang amat penting kerana ia menjadi asas kepada kursus teknikal dan amali lain. Namun, hakikatnya masih terdapat sebahagian pelajar yang tidak menunjukkan minat mendalam terhadap subjek ini.



Di Politeknik Tun Syed Nasir (PTSN), Matematik Kejuruteraan dianggap sebagai nadi utama dalam pembentukan graduan jurusan kejuruteraan. Hal ini kerana penguasaan konsep matematik akan menentukan sejauh mana kefahaman pelajar terhadap kursus lain yang melibatkan pengiraan seperti Mekanik Bendalir, Elektronik, atau Termodinamik. Menariknya, terdapat pelajar yang melihat Matematik Kejuruteraan sebagai cabaran yang menyeronokkan, manakala sebahagian yang lain pula menganggapnya sebagai beban yang menghalang pencapaian akademik. Persoalan besar yang sering dibincangkan ialah adakah Matematik Kejuruteraan benar-benar terlalu sukar, atau kesukaran itu hanya terhasil daripada persepsi negatif yang diwarisi sejak zaman persekolahan dan dipengaruhi oleh pendekatan pengajaran yang kurang sesuai.

Dari sudut positif, pelajar yang memiliki minat dan kecenderungan terhadap Matematik Kejuruteraan lazimnya mencapai keputusan akademik yang lebih cemerlang. Mereka lebih gemar menyelesaikan soalan berbentuk aplikasi, berupaya mengaitkan formula dengan situasi sebenar dalam bidang kejuruteraan, serta mempunyai daya tahan yang tinggi untuk berusaha apabila berdepan dengan masalah yang mencabar. Minat yang kukuh terhadap subjek ini bukan sahaja mendorong kecemerlangan akademik, malah memupuk sifat ingin tahu, meningkatkan kreativiti, serta mengukuhkan keyakinan diri pelajar.

Namun begitu, tidak dapat dinafikan wujud juga pelajar yang menghadapi kesukaran menyesuaikan diri dengan keperluan Matematik Kejuruteraan. Antara faktor utama yang menyumbang kepada keadaan ini termasuklah asas matematik yang lemah sejak di sekolah menengah, gaya pengajaran yang terlalu bersifat abstrak, perbezaan gaya pembelajaran, kurangnya keyakinan diri serta persepsi umum bahawa matematik adalah “subjek susah”. Faktor-faktor ini melemahkan motivasi pelajar dan mewujudkan jurang yang ketara antara mereka yang benar-benar berminat dengan yang sekadar berusaha untuk lulus.

Menyedari realiti tersebut, pensyarah politeknik perlu berperanan secara lebih proaktif untuk menanamkan minat pelajar terhadap Matematik Kejuruteraan. Kaedah pengajaran yang lebih dinamik wajar diaplikasikan, antaranya melalui penggunaan perisian simulasi, pembelajaran berasaskan projek, serta aktiviti penyelesaian masalah secara kolaboratif. Dengan mengaitkan matematik kepada aplikasi sebenar dalam bidang kejuruteraan, pelajar akan lebih mudah memahami kepentingannya. Selain itu, sokongan tambahan seperti sesi bimbingan, kelas pengukuhan, serta motivasi daripada pensyarah berupaya membantu meningkatkan keyakinan diri pelajar.

Kesimpulannya, sama ada Matematik Kejuruteraan digeruni kerana realiti atau sekadar persepsi banyak bergantung kepada pengalaman pembelajaran yang dialami pelajar. Minat terhadap subjek ini tidak hadir secara semula jadi, tetapi boleh dipupuk melalui pendekatan pengajaran yang menyeronokkan, bermakna, dan relevan dengan bidang yang diceburi. Apabila minat itu berjaya disemai, pelajar bukan sahaja mampu mencapai kecemerlangan akademik, malah lebih bersedia menghadapi cabaran dunia kejuruteraan sebenar. Justeru, kecenderungan mendalami Matematik Kejuruteraan perlu ditanam sejak awal agar dapat melahirkan graduan yang bukan sahaja mahir dari segi teknikal, tetapi juga memiliki daya analitikal, pemikiran kritis, serta keyakinan tinggi dalam meneroka bidang profesional.

KEPENTINGAN "SOUND ASSESSMENT" DALAM PENDIDIKAN TVET: MENTAKSIR BUKAN MENGHUKUM

Normazita Binti Mat Ali

Bayangkan anda seorang chef yang mahu memasak kari ayam yang sempurna. Anda sudah ada rempah yang terbaik, ayam segar dan api untuk memasak. Tapi, kalau anda tidak merasa kuahnya, mana mungkin anda tahu cukup garam atau tidak? Begitulah juga dalam dunia pendidikan, khususnya Pendidikan dan Latihan Teknikal dan Vokasional (TVET)."Sound assessment" atau pentaksiran yang mantap dan bermakna , ibarat merasa masakan. Tanpanya, kita hanya meneka-neka sejauh mana pelajar benar-benar memahami atau menguasai sesuatu ilmu dan kemahiran.

Pendidikan TVET bukan seperti menghafal sifir atau sejarah. Ia bukan tentang jawapan yang betul di atas kertas semata-mata. Ia tentang tangan yang tahu memegang pemutar skru, telinga yang dapat membezakan bunyi enjin yang sihat dan hati yang tahu tanggungjawab dalam setiap tugas. Maka, menilai pelajar TVET tidak boleh dibuat secara sembarangan. Di sinilah "sound assessment" menjadi nadi penting bukan sekadar menyemak jawapan, tetapi memahami proses pentaksiran yang dibuat oleh pelajar.

Cuba bayangkan, kalau seorang tukang kayu dinilai hanya melalui ujian bertulis tentang teori kayu. Adakah cukup untuk menilai kemahirannya memahat? Tidak! Kita perlukan pentaksiran yang menyeluruh berkenaan teori, amali, sikap, disiplin dan semuanya mesti dicermin dengan jelas. Sound assessment adalah cermin jujur yang tidak menipu, ia menunjukkan kekuatan dan juga ruang penambahbaikan pelajar.

“Pentaksiran Umpama Cermin Jujur”

Dalam konteks Malaysia, kita sedang giat membina generasi TVET yang berdaya saing global. Kita mahu juruteknik, mekanik, chef, juruelektrik, dan pelbagai lagi tenaga mahir yang bukan saja cekap, tapi juga berkualiti tinggi. Tapi bagaimana kita dapat mengetahui mereka betul-betul hebat? Di sinilah pentaksiran yang sahih, adil, dan berasaskan bukti memainkan peranan besar. Sound assessment memastikan pelajar ditaksir secara adil dan objektif , bukan berdasarkan 'main agak-agak'.

Pelajar ibarat pelayar muda, pendidik adalah nakhoda, dan sound assessment adalah kompas yang menunjuk arah. Tanpa kompas, pelajar mungkin hanyut, hilang arah atau sampai lambat ke destinasi. Dengan pentaksiran yang sempurna, pelajar tahu di mana mereka berada, apa yang perlu diperbaiki, dan kemana mereka patut tuju. Ia bukan alat untuk menghukum, tetapi panduan untuk berkembang.

"Umpama Kompas Dalam Pelayaran"

Suara Untuk Masa Depan

TVET adalah laluan masa depan yang penuh harapan. Tetapi masa depan hanya boleh dibina jika kita tahu apa yang sedang berlaku hari ini. Sound assessment memberi suara kepada pelajar. Suara yang membuktikan mereka mampu, suara yang memberi mereka peluang untuk menonjol, bukan tenggelam dalam sistem yang mentaksif tanpa memahami.

Akhir kata, dalam dunia pendidikan TVET, pentaksiran bukan sekadar peperiksaan. Ia adalah seni membaca potensi, sains mengukur kemahiran, dan hati dalam memberi peluang. Jadi, mari kita ubah cara kita melihat pentaksiran. Bukan sebagai penamat, tetapi sebagai permulaan untuk kejayaan sebenar, ini kerana dalam dunia pendidikan TVET, rasa kuah itu penting agar kita tahu, ilmu dan kemahiran itu benar-benar sampai ke hati.

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REUMATOID ARTRITIS: SERANGAN SENYAP PADA SENDI ANDA

Kawal RA, Bina Kehidupan Berkualiti

Norlida binti Shaari
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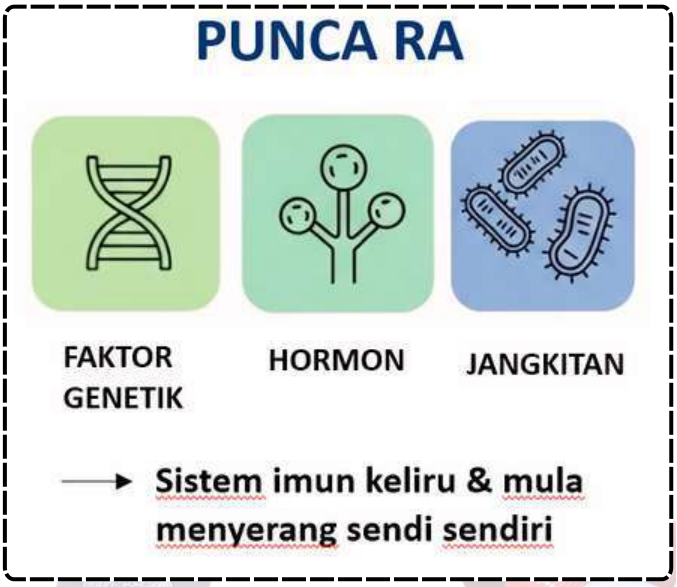
APA ITU PENYAKIT RA?

Rasa ngilu pada sendi? Sukar genggam barang kecil? **Reumatoid Artritis (RA)** adalah **penyakit autoimun** yang **menyerang sendi-sendi** kecil seperti pergelangan tangan, jari, lutut dan pergelangan kaki. **Sistem imun** kita yang sepatutnya menjadi 'askar pertahanan', tiba-tiba **keliru dan mula menyerang sendi sendiri** mengakibatkan lapisan dalam sendi (sinovial) menjadi radang, makin menebal, dan mula merosakkan tulang rawan serta tisu sekeliling. Statistik Kementerian Kesihatan Malaysia (KKM) menunjukkan peningkatan kes RA dalam kalangan individu berusia 30 hingga 50 tahun, terutama wanita.

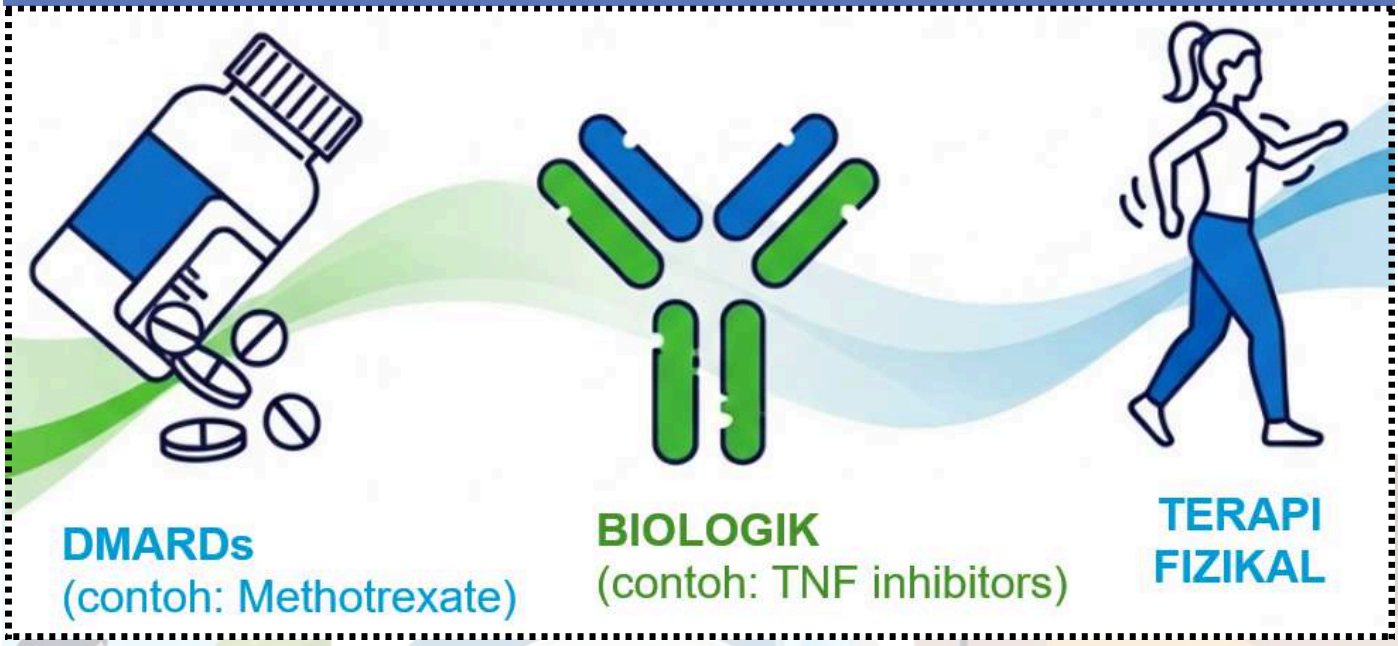
Rajah 1: Sendi Normal vs Sendi RA



PENGESANAN AWAL

- **Ujian darah**: Faktor Reumatoid (RF), Anti-CCP
- **Pemeriksaan imej**: X-ray, MRI

RAWATAN MODEN



GAYA HIDUP SIHAT

- ☑ Senaman ringan seperti (berjalan/ berenang)
- ☑ Pemakanan seimbang dan kaya antioksidan (contohnya ikan, sayuran hijau)
- ☑ Rehat yang mencukupi dan kawal stres

SOKONGAN EMOSI

KESIMPULAN

Peka terhadap isyarat daripada sendi. Jika mula menunjukkan tanda awal, jangan biarkan sehingga fungsi terjejas. Lebih awal RA dikesan, lebih baik peluang rawatannya. Jangan tunggu kesakitan menjadi parah – ambil langkah pencegahan sekarang.

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Ketahui RA lebih lanjut dari laman webKementerian Kesihatan Malaysia. Imbas di sini.

DIET KETO & DIABETES

SOLUSI TERKINI ATAU SEKADAR TREND?

Nur Husna bt Abu Bakar
Politeknik Tun Syed Nasir Syed Ismail

Diet ketogenic (keto) semakin popular sebagai strategi pemakanan dalam pengurusan diabetes jenis 2. Prinsip asasnya ialah pengambilan karbohidrat yang sangat rendah dan peningkatan lemak sihat sebagai sumber tenaga utama. Dengan itu, tubuh memasuki keadaan ketosis, yang dilaporkan dapat menurunkan paras gula darah dan meningkatkan kawalan glisemik. Namun, adakah ia benar-benar sesuai untuk pesakit diabetes pelbagai peringkat umur?

Kajian klinikal terkini menunjukkan bahawa diet keto boleh memberikan manfaat yang jelas, antaranya:

- **HbA1c & Glukosa Darah:** Penurunan HbA1c antara 0.6–1.0% dalam 3–6 bulan pertama.
- **Berat Badan:** Penurunan purata 8–10% selepas 12 bulan berbanding diet biasa.
- **Profil Lipid:** Peningkatan HDL, penurunan trigliserida, walaupun kesan terhadap LDL masih bercampur.

Keberkesanan diet keto terhadap pesakit diabetes:

Ubat Diabetes

40% pesakit dapat mengurangkan atau menghentikan pengambilan ubat diabetes.

Hipoglisemia

Penurunan episod hipoglisemia, iaitu keadaan gula darah terlalu rendah yang berbahaya.

CABARAN & RISIKO

1 KEPATUHAN JANGKA PANJANG

Sukar diamalkan kerana faktor sosial, budaya, dan ekonomi rakyat Malaysia.

2 KESAN SAMPINGAN AWAL

"Keto flu", sembelit dan sakit kepala.

3 RISIKO TERTENTU

Dalam kes terpencil dan jarang berlaku, boleh mencetuskan ketoasidosis, terutama jika ubat insulin tidak dipantau.

PENDEKATAN KEWASPADAAN

Diet keto bukan satu penyelesaian universal. Ia memerlukan:

- Pengawasan doktor atau pakar diet.
- Penyesuaian ubat untuk mengelakkan hipoglisemia.
- Alternatif lain seperti diet Mediterranean atau diet rendah kalori, yang mungkin lebih mudah dipatuhi oleh sesetengah pesakit.

KESIMPULAN

Diet keto memberi potensi besar sebagai pendekatan tambahan dalam pengurusan diabetes jenis 2. Ia mampu menurunkan berat badan, mengawal paras glukosa, dan mengurangkan penggunaan ubat-ubatan. Namun, ia bukanlah untuk semua pesakit.

"*Diet keto boleh memberi manfaat kepada pesakit diabetes, tetapi ia bukan pendekatan satu untuk semua. Pemilihan diet perlu disesuaikan dengan keadaan kesihatan, gaya hidup, dan keperluan individu. Pesakit digalakkan berbincang dengan doktor atau pakar diet sebelum memulakan sebarang bentuk diet ketat.*"

— Prof. Dr. David Ludwig, Endokrinologi Klinikal, Harvard Medical School

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Checklist mode JIMAT!

- Matikan lampu sebelum keluar bilik.
- Tutup aircond selepas guna.
- Cabut pengecas selepas dicas penuh.
- Cabut pengecas selepas dicas penuh.
- Ingatkan rakan tentang amalan jimat tenaga.

AYUH! MULA DENGAN DIRI SENDIRI

Penjimatan elektrik bukan kerja orang atasan atau jabatan teknikal semata-mata. Ia bermula dengan diri kita - dengan satu tindakan kecil seperti mematikan suis atau cabut plug. Kalau bukan kita yang mulakan, siapa lagi?

Dengan mengaktifkan **"Mod JIMAT"** dalam kehidupan seharian, kita bukan sahaja membantu PTSN berjimat, malah menyumbang ke arah kampus yang lebih hijau, lestari dan berintegriti. Tak perlu jadi jurutera untuk faham semua ini, cukup sekadar kita peka dan bertindak.

SCARY story...

1 charger yang bekerja lebih masa...

Pernah satu hari pulang lambat dan ternampak ada *charger* telefon masih terpasang di ruang pejabat – dari pagi sampai malam. Tiada telefon pun yang dicaj. Hanya charger yang setia 'bekerja' tanpa gaji. Walaupun kecil, ia tetap guna elektrik.

Kiraan mudah:

- 1 *charger standby* = 0.0024 kWh sehari
- Sebulan = 0.072 kWh × RM0.50 = RM0.036
- Kalau ada **100 *charger* = RM3.60 sebulan** - tanpa manfaat langsung!

2 Bilik Kuliah Tanpa Penghuni

Suatu hari saya masuk ke bilik kuliah jam 6 petang — semua lampu dan *aircond* masih menyala, walaupun tiada sesiapa. Tiada kuliah, tiada pensyarah, tiada pelajar. Hanya bilik kuliah kosong yang 'berpeluh' kesejukan. Kalau situasi begini berlaku setiap hari, bayangkan berapa ratus ringgit sebenarnya kita 'sedekah' kepada TNB – tanpa sedar.

Kiraan mudah:

- 1 penghawa dingin (1.5HP) = 2.5 kWh sehari × RM0.50/kWh = RM1.25
- 30 hari = RM37.50 untuk satu bilik
- Jika 10 bilik = **RM375 sebulan dibazirkan!**

"MOD JIMAT: KECIL TINDAKANNYA, BESAR KESANNYA."

Mod JIMAT!: Cara Mudah Tapi Efektif untuk Warga PTSN

Bijak Tenaga, Bijak Bertindak – Kita Mulakan dari PTSN

Dr Khairunnisa A Rahman

Pernah tak kita fikir berapa banyak elektrik yang kita bazirkan setiap hari - hanya kerana terlupa tutup suis atau biarkan penghawa dingin berjalan tanpa henti? Dalam kesibukan harian sebagai pensyarah, staf atau pelajar di Politeknik Tun Syed Nasir Syed Ismail (PTSN), kita mungkin tak sedar bahawa tabiat kecil seperti ini memberi kesan besar, bukan sahaja kepada bil elektrik institusi, malah juga kepada alam sekitar.

Di era perubahan iklim dan peningkatan kos operasi, penjimatan tenaga bukan lagi pilihan tetapi ia adalah satu keperluan. Penjimatan ini bukan sahaja membantu PTSN menjadi institusi lebih lestari, malah melatih kita semua menjadi warga yang lebih prihatin terhadap penggunaan sumber. Artikel ini membawakan beberapa langkah mudah tapi berkesan — atau dalam bahasa kita, aktifkan **"Mod JIMAT"!**

*Sumber: https://knowhow.distrelec.com/sustainability/5-ways-to-help-protect-the-earth/

Kenapa Penjimatan Elektrik Penting?

Di PTSN, penggunaan elektrik setiap bulan melibatkan pelbagai peralatan; dari makmal ke bilik pensyarah, dari aircond ke projektor dan pelbagai keperluan lagi. Jika setiap ruang tidak diurus dengan berhemah, kos utiliti boleh melambung. Lebih dari itu, penggunaan elektrik yang berlebihan juga menyumbang kepada peningkatan pelepasan karbon ke atmosfera, seterusnya mempercepatkan pemanasan global.

Fakta menarik: Jika setiap bilik pensyarah mematikan penghawa dingin selama satu jam setiap hari bekerja, PTSN boleh menjimatkan ratusan ringgit sebulan. Bayangkan jika seluruh kampus mengamalkannya. Jadi, jangan pandang rendah kuasa tindakan kecil.

AKTIFKAN "MOD JIMAT" – CARA BIJAK JIMAT ELEKTRIK

Gunakan Cahaya Semula Jadi

Jika bilik/ruang kerja anda terang dengan cahaya matahari, matikan lampu. Selain menjimatkan tenaga, cahaya semula jadi juga baik untuk kesihatan mental dan produktiviti.

Gunakan Mod 'Sleep' untuk Komputer

Kalau tinggalkan meja sebentar, letakkan komputer dalam mod 'sleep' atau 'hibernate' untuk jimat elektrik tanpa tutup sepenuhnya.

Cabut Plug Bila Tak Digunakan

Alat elektrik seperti pengecas, printer atau kettle masih menggunakan tenaga walaupun dalam mod 'standby'. Biasakan diri cabut plug selepas digunakan.

Elak Basuh Alat/Bahan Guna Air Panas Berlebihan

Di makmal atau bengkel, elakkan pemanasan air elektrik kecuali betul-betul perlu. Guna air suhu bilik jika mencukupi.

Sediakan Sudut Kesedaran Penjimatan

Di ruang pejabat, bengkel atau kelas, wujudkan sudut poster atau whiteboard dengan mesej "Mod Jimat Hari Ini" - boleh selang-seli dengan tip mingguan.

Tutup Pintu dan Tingkap Bila Guna Aircond

Pintu terbuka ketika pendingin hawa berfungsi menyebabkan pembaziran tenaga yang besar. Biasakan diri tutup rapat untuk kekalkan suhu dalaman.

Micro-Credential Sebagai Strategi Upskilling dan Reskilling di Era Digital

Ts. RASHIDAH BINTI LIP

Pengenalan

Dalam dunia yang sentiasa berubah, keperluan untuk menguasai kemahiran baharu tidak lagi menjadi pilihan, tetapi satu keperluan. Revolusi Industri 4.0, kecerdasan buatan (AI), automasi, serta ekonomi digital mengubah cara kita bekerja, belajar, dan berinteraksi. Dalam suasana ini, pekerja dan pelajar tidak boleh hanya bergantung kepada pengetahuan sedia ada. Mereka perlu sentiasa menambah ilmu dan kemahiran agar kekal relevan.

Di sinilah peranan Micro-Credential menjadi semakin penting. Ia dilihat sebagai jalan pantas untuk membina kemahiran baharu, menambah nilai diri, dan membuka lebih banyak peluang dalam pasaran kerja yang kompetitif.

Apa itu Micro-Credential?

Micro-Credential ialah bentuk pembelajaran fleksibel Secara mudah, Micro-Credential ialah kursus atau modul pembelajaran berskala kecil yang memberi pengiktirafan rasmi selepas tamat. Ia direka bentuk untuk memberikan ilmu atau kemahiran tertentu dalam tempoh singkat, biasanya dari beberapa jam hingga beberapa minggu.

Berbeza dengan diploma atau ijazah yang mengambil masa bertahun-tahun, Micro-Credential lebih fleksibel dan berfokus. Modul yang diambil bercirikan *stand-alone*, atau boleh digabungkan untuk membentuk kelayakan yang lebih besar. Contohnya, seorang pelajar boleh mengambil Micro-Credential dalam *Data Analytics* atau *Cybersecurity* tanpa perlu menunggu tamat pengajian diploma untuk mendapatkan kemahiran tersebut.

Mengapa Micro-Credential Penting di Era Digital?

1. **Fleksibel** - boleh diikuti secara dalam talian atau bersemuka, mengikut masa dan tempat peserta.
2. **Kos Lebih Rendah** - jauh lebih murah berbanding program akademik penuh.
3. **Segera Relevan** - kandungan dirangka mengikut permintaan industri semasa.
4. **Tingkatkan Kebolehpasaran** - sijil tambahan ini memberi nilai tambah kepada pelajar dan pekerja.
5. **Sokongan kepada Pembelajaran Sepanjang Hayat** - sesuai untuk semua peringkat umur, dari pelajar hingga tenaga kerja berpengalaman.

Upskilling vs Reskilling: Apa Bezanya?

- **Upskilling** → Meningkatkan kemahiran sedia ada agar lebih relevan dengan perubahan teknologi.
  - Contoh: Seorang pensyarah yang sudah mahir mengajar di kelas tradisional, menambah ilmu dengan kursus Micro-Credential dalam E-Learning Tools.
- **Reskilling** → Mempelajari kemahiran baharu untuk menukar bidang atau menyesuaikan diri dengan peranan kerja yang berbeza.
  - Contoh: Seorang juruteknik yang mengikuti kursus Micro-Credential dalam *Cybersecurity* kerana syarikat memerlukan kepakaran baharu.

Cabaran Pelaksanaan Micro-Credential

1. **Kesedaran** - masih ramai pelajar dan tenaga kerja belum memahami nilai sebenar Micro-Credential.
2. **Kualiti Kursus** - perlu dijamin supaya kursus benar-benar menepati keperluan industri.
3. **Pengiktirafan** - walaupun semakin berkembang, masih ada majikan yang belum sepenuhnya mengiktiraf Micro-Credential.
4. **Integrasi dengan Sistem Akademik** - perlu strategi jelas untuk menggabungkan kursus pendek dengan program akademik formal.

Kesimpulan

Micro-Credential ialah jambatan antara dunia akademik dan dunia pekerjaan. Ia menjadi strategi terbaik untuk upskilling dan reskilling, memastikan pelajar, pendidik, dan tenaga kerja sentiasa relevan di era digital. Melalui pendekatan ini, politeknik boleh melahirkan graduan yang bukan sahaja memiliki sijil akademik, tetapi juga portfolio kemahiran yang diiktiraf industri.

Kelebihan dan potensi yang dimiliki, Micro-Credential bukan lagi pilihan sampingan tetapi sudah menjadi arus perdana dalam pendidikan moden. Ia adalah penyelesaian pantas untuk keperluan tenaga kerja masa kini, sekaligus menyokong falsafah pembelajaran sepanjang hayat.

Bagaimana Politeknik Tun Syed Nasir Syed Ismail Boleh Manfaatkan Micro-Credential?

Di Politeknik Tun Syed Nasir (PTSN), Micro-Credential boleh menjadi strategi utama:

- **Pensyarah** → mengikuti kursus terkini untuk pengajaran lebih inovatif.
- **Pelajar** → melengkapkan diri dengan kemahiran tambahan di luar silibus rasmi.
- **Industri** → bekerjasama dengan politeknik untuk menghasilkan kursus berasaskan keperluan semasa.

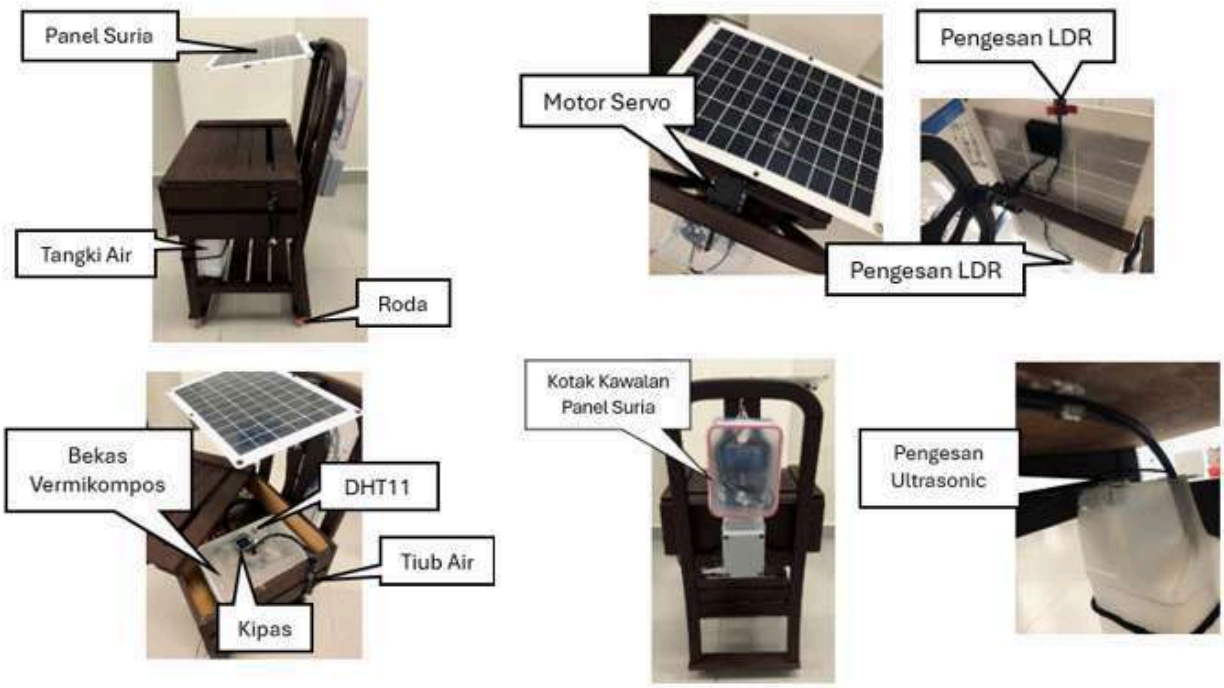
Sebagai contoh, pelajar kejuruteraan bukan sahaja mahir dengan teori mekanikal, tetapi juga boleh mengambil Micro-Credential dalam *Project Management* atau *Digital Communication Skills* sebagai nilai tambah.

Cadangan Penambahbaikan

1. **Promosi dan Kesedaran** - perlu lebih giat memperkenalkan Micro-Credential kepada pelajar, pensyarah, dan masyarakat.
2. **Kerjasama Industri** - kursus yang dibangunkan haruslah berpandukan keperluan sebenar industri.
3. **Platform Digital Bersepadu** - menyediakan sistem dalam talian untuk pendaftaran, pembelajaran, dan rekod pencapaian.
4. **Pembangunan Portfolio Digital** - Menggalakkan pelajar menyimpan semua sijil Micro-Credential mereka dalam bentuk digital untuk rujukan masa depan.
5. **Pengiktirafan Kredit Akademik -** kursus Micro-Credential boleh diiktiraf sebagai sebahagian daripada kredit untuk program diploma atau ijazah.

“The future belongs not to what we know today, but to how fast we adapt and learn tomorrow – with Micro-Credential as the key to success.”

BAJA EMAS HITAM DARIPADA SISA SAYURAN: INOVASI VERMIKOMPOS TENAGA SURIA MENGGUNAKAN CACING TANAH MERAH EISENIA FETIDA



Prototaip Projek Inovasi Vermikompos Tenaga Suria Menggunakan Cacing Tanah Merah EISENIA FETIDA

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Di penjuru laman rumah, terletak sebuah kerusi kayu antik dengan rekabentuk unik mudah alih yang dilengkapi oleh empat roda bagi memudahkan kerusi dipindahkan daripada satu lokasi ke satu lokasi yang lain. Di bahagian atas kerusi, dipasang satu panel solar 12V 100W yang dikawal oleh motor servo bagi kawalan pergerakan panel suria penjejak cahaya matahari yang berfungsi untuk menyerap cahaya matahari dan menyimpan tenaga ke dalam bateri litium-ion dan power bank yang boleh dicas semula [1].

Di bahagian tengah kerusi, terdapat satu kotak ajaib bekas vermikompos (baja tinja cacing) yang berfungsi menukar sisa sayuran menjadi baja emas hitam yang bermanfaat untuk tumbuh-tumbuhan, meningkatkan serta menstabilkan kesuburan tanah. Spesis cacing tanah merah Eisenia Fetida dipilih sebagai agen proses pengomposan kerana kemampuannya yang luar biasa dalam menguraikan bahan organik, mengunyah sisa sayuran sepanjang siang dan malam tanpa rasa jemu, menukarkan sisa sayuran menjadi bahan yang menyuburkan tanah, sekaligus meningkatkan imuniti pokok terhadap serangan serangga perosak dan penyakit, serta memudahkan tumbuhan menyerap nutrien [2-3].

Aplikasi Blynk (a) Pemantauan suhu, kelembapan bekas vermikompos dan paras air dalam tangki; (b) Notifikasi emel

Inovasi Vermikompos ini dikawal secara automatik menggunakan mikropengawal ESP32 yang diletakkan di bahagian belakang kerusi dan diprogramkan menggunakan Arduino IDE bagi memantau suhu dan kelembapan tanah di dalam kotak ajaib bekas vermikompos secara berterusan. Data yang diperoleh akan dihantar ke telefon pintar pengguna melalui aplikasi Blynk, bagi membolehkan pengguna memantau suhu, kelembapan dan paras air secara masa nyata. Sekiranya paras air dalam tangki air yang terletak di bahagian bawah kerusi menurun di bawah paras 3cm, sistem akan menghidupkan lampu LED merah dan menghantar notifikasi emel kepada pengguna. Semua ini berlaku secara automatik tanpa perlu pengawasan berterusan.

Kaedah penghasilan baja emas hitam menggunakan inovasi sistem pintar ini menggunakan campuran yang terdiri daripada 250g sabut kelapa lembap, 300g sisa sayuran dan 20.2g cacing tanah merah yang dimasukkan ke dalam bekas vermikompos. Kain guni digunakan sebagai selimut cacing (worm blanket) bagi memastikan kelembapan yang optimal kekal untuk kesihatan cacing dan proses penguraian yang efektif. Di bawah keadaan optimum dengan kadar kelembapan 76%-95% dan suhu antara 27°C hingga 30°C, cacing ini aktif, sihat dan membiak dengan gembira. Pada hari kelima, didapati hanya berbaki 8g sisa sayuran, dan berat cacing tanah merah meningkat kepada 21.0g.

Baja emas hitam ini kaya dengan nutrien dan mikroorganisma yang baik, memberi manfaat jangka panjang bagi ekosistem dan pertanian lestari yang mengutamakan kelestarian alam sekitar terutama pengurangan sampah serta penghasilan dan penggunaan baja organik. Walaubagaimanapun, baja emas hitam ini hanya boleh dituai selepas dua bulan [4].

Proses penghasilan baja emas hitam (a) Hari pertama; (b) Hari kelima

Projek Inovasi Vermikompos Tenaga Suria menggunakan Cacing Tanah Merah Eisenia Fetida ini merupakan inovasi sistem pintar dan mesra alam menggabungkan teknologi tenaga boleh diperbaharui dan pengurusan pertanian lestari, yang mampu memproses sisa sayuran secara cekap bagi menghasilkan baja emas hitam organik berkualiti tinggi. Inisiatif ini membawa impak positif yang besar terhadap alam sekitar, kesihatan tanah, dan kesedaran masyarakat tentang kitar semula. Hanya bermodalkan sisa sayuran, cacing tanah merah dan tenaga matahari, kita boleh menjadi ejen pertanian Lestari yang bermula dari laman rumah sendiri.

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SETIAP NAFAS ADA CERITA

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MENGAPA UDARA TEMPAT KERJA BUKAN SEKADAR ANGIN LALU

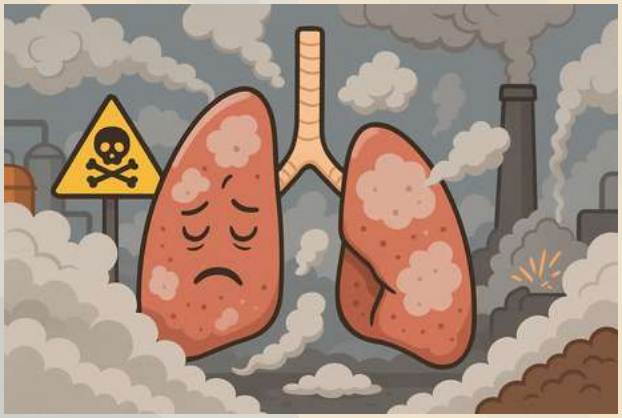
Pernah tak bila masuk ke bengkel atau kilang, tiba-tiba kita terhidu bau pelik macam cat, logam panas, atau bau yang **'tajam'** menusuk hidung?

Biasanya kita cuma kata, **"Ada bau sikit-sikit... biasalah tu."**

Tapi pernah tak kita terfikir... **apa sebenarnya yang kita hidu setiap hari di tempat kerja?** Adakah udara itu selamat, atau sebenarnya mengandungi bahan kimia yang boleh memudaratkan kesihatan tanpa kita sedar?

Tak Nampak, Tapi Ada

Ramai antara kita bekerja di tempat yang mengandungi **bahan kimia bawaan udara** seperti **wap pelarut, asap kimpalan, habuk halus,** atau **gas toksik.** Semua ini tak dapat dilihat dengan mata kasar.



Tapi sebenarnya kita sedut masuk setiap hari.

Zarah-zarah halus ini boleh masuk jauh ke dalam paru-paru dan masuk ke dalam sistem darah. Ada yang akan dikeluarkan oleh tubuh, tapi ada juga yang **terkumpul secara senyap dan perlahan-lahan memberi kesan jangka panjang.**

Bila Deria Kita Hilang Amaran

Pernah tak kita dengar orang kata, **"Dah biasa dah bau ni. Tak rasa apa pun."**

Itu bukan tanda kita tahan, tapi tanda kita mungkin dah **hilang sensitiviti deria bau.** Ia berlaku apabila kita **terdedah terlalu lama** kepada bahan kimia tertentu.

Ada sesetengah bahan seperti **karbon monoksida,** memang tiada bau langsung. Tapi ia boleh menyebabkan pening, sesak nafas, dan dalam kes yang serius, pengsan atau maut.

Sedikit Istilah Yang Penting Kita Tahu

Kita tak perlu jadi pakar keselamatan, tapi kita patut tahu apa yang kita hidu melalui beberapa istilah penting:

- **Pendedahan kimia**: Keadaan apabila kita terhidu, tersentuh, atau termakan bahan kimia secara langsung atau tidak langsung.
- **Penilaian Risiko Kesihatan Kimia (CHRA)**: Kajian yang wajib dilakukan oleh majikan untuk kenal pasti risiko bahan kimia di tempat kerja.
- **Bahan Kimia Berbahaya Kepada Kesihatan (Hazardous Chemicals to Health)**: Termasuk pelarut, logam berat, gas toksik, dan habuk seperti silika.
- **Alat Pelindung Diri (PPE)**: Topeng pernafasan, sarung tangan, pakaian khas yang direka untuk mengurangkan pendedahan kepada bahan berbahaya.

Jadi, Apa Kita Boleh Buat?

Kita bukan saintis makmal, tapi kita masih boleh buat sesuatu:

- **Kenal pasti** bau atau keadaan yang luar biasa di tempat kerja.
- **Laporkan** kepada penyelia jika rasa pening, loya, atau sukar bernafas.
- **Gunakan PPE dengan betul** seperti topeng habuk N95, penutup muka, atau sistem ventilasi yang baik.
- **Tanya dan minta maklumat:** Majikan wajib berkongsi maklumat keselamatan melalui **SDS (Safety Data Sheet)** dan latihan berkala

Nafas Kita, Tanggungjawab Kita

Udara yang kita hidu setiap hari akan jadi sebahagian daripada kita. Kita tak boleh "pilih" udara di tempat kerja, tapi **kita boleh pilih untuk ambil tahu dan lindungi diri.**

Jangan biarkan benda yang kita tak nampak menjadi sebab kesihatan kita merosot nanti.

Penutup

"Kalau saya tahu dulu, saya akan lebih berhati-hati..."

Itu ayat yang kita tak mahu sebut kemudian hari.

Jadi hari ini, sedut nafas perlahan-lahan. Rasai udara di sekeliling. Tanya diri:
"Adakah udara tempat kerja saya benar-benar selamat?"

Kalau anda tak pasti, anda berhak untuk bertanya. Sebab **keselamatan dan kesihatan pekerjaan bukan isu teknikal semata-mata, ia isu manusia, dan isu kehidupan.**

"Apa yang kita tidak nampak atau tidak hidu, tidak bermakna ia tidak berbahaya."

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MENGHIDUPKAN WARISAN MELALUI TEKNOLOGI: PAMERAN VIRTUAL

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1. PENGENALAN

Gambus merupakan salah satu alat muzik tradisional yang mempunyai sejarah panjang dalam perkembangan budaya di rantau ini. Berasal dari Timur Tengah dan dibawa masuk melalui jaringan perdagangan serta penyebaran Islam, gambus akhirnya berakar dalam masyarakat Melayu, khususnya di Johor. Bagi masyarakat Johor, gambus bukan sekadar alat muzik iringan, tetapi juga lambang identiti budaya yang mencerminkan nilai seni, semangat dan sosial. Ia sering dimainkan dalam majlis keramaian, persembahan zapin, serta menjadi sebahagian daripada naratif sejarah negeri. Penganjuran karnival atau pameran gambus secara fizikal adalah antara cara dalam mengekalkan dan membudayakan element ini dalam masyarakat di Malaysia.

Gambar 1: Pameran Gambus secara fizikal

2. PERYATAAN MASALAH

Namun, seperti banyak seni tradisional lain, gambus berdepan cabaran kelestarian apabila generasi muda semakin jauh daripada warisan budaya mereka. Di sinilah perpustakaan memainkan peranan penting. Perpustakaan Tunku Tun Aminah (PTTA), Universiti Tun Hussein Onn Malaysia (UTHM), tampil bukan hanya sebagai pusat ilmu, tetapi juga sebagai penjaga khazanah warisan. Dengan menganjurkan Pameran Virtual Gambus Johor, PTTA mampu menghubungkan semula pelajar dan masyarakat dengan warisan muzik ini melalui medium digital yang lebih dekat dengan gaya hidup semasa.

3. METODOLOGI

Pameran Virtual Gambus ini dibangunkan melalui integrasi teknologi digital interaktif yang membolehkan pengguna meneroka keseluruhan seksyen galeri secara maya. Antara ciri utama ialah paparan informasi koleksi gambus, tontonan video eksklusif, serta penggunaan Aplikasi AR-Galeri PTTA yang boleh diakses melalui peranti digital. Selain itu, elemen interaktif seperti lawatan maya 360° dan sokongan AR digunakan bagi memberikan pengalaman pembelajaran yang lebih mendalam. Kaedah ini bukan sahaja memperkayakan persembahan maklumat tentang gambus, tetapi juga memastikan pameran lebih mudah dicapai oleh semua pengguna. Capaian boleh di buat di https://ptta.uthm.edu.my/gambus-ptta.html

Gambar 2: Pameran Gambus secara virtual

4. DAPATAN KAJIAN

- Akses yang lebih luas.

Pelajar dan masyarakat dapat mengakses pameran ini tanpa had lokasi atau masa, sama ada untuk tujuan akademik, penyelidikan atau sekadar minat umum.

- Peningkatan interaksi pengguna.

Elemen AR, VR, lawatan maya 360° dan video eksklusif menjadikan pengalaman lebih menarik berbanding pameran fizikal yang terhad. Pengguna bukan sekadar membaca, tetapi turut meneroka dan berinteraksi dengan koleksi gambus.

- Menarik minat generasi muda.

Pendekatan digital yang lebih “immersive” berjaya menjadikan seni tradisional ini lebih dekat dengan gaya hidup generasi muda, sekali gus meningkatkan kesedaran terhadap warisan budaya Johor.

- Pemeliharaan warisan secara berterusan.

Dokumentasi digital memastikan koleksi dan maklumat tentang gambus dapat disimpan, dikongsi, dan digunakan untuk rujukan masa hadapan walaupun pameran fizikal telah tamat.

5. KESIMPULAN

Pameran Virtual Gambus yang dianjurkan oleh Perpustakaan Tunku Tun Aminah (PTTA), UTHM membuktikan bahawa teknologi digital mampu menghidupkan semula warisan budaya dalam bentuk yang lebih segar dan mudah diakses. Melalui aplikasi interaktif seperti AR dan lawatan maya, masyarakat dapat mengenali gambus secara lebih dekat tanpa terikat kepada masa dan tempat. Inisiatif ini mengatasi kekangan pameran fizikal, di samping mengukuhkan peranan perpustakaan sebagai pusat ilmu yang inovatif dan pemelihara warisan budaya untuk generasi akan datang.

Gambar 3: Pelancaran Pameran Virtual di Gema Budaya Festival 2025

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