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CAWANGAN NEGERI SEMBILAN
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Edisi ini

Making Research Work in Practice

SYAZUANI MOHD SHARIFF

UiTM CAWANGAN NEGERI SEMBILAN KAMPUS KUALA PILAH

Environmental problems are becoming more complex and difficult to manage. Issues such as flooding, water pollution, and climate change continue to affect many countries, regardless of their level of development. These challenges have been studied for many years, and a large amount of scientific knowledge already exists. However, despite this progress, the same problems continue and are sometimes becoming more severe. This shows that the main issue is not a lack of research but rather a failure to implement solutions effectively. Environmental damage continues, and societies are forced to deal with the consequences. Therefore, research only becomes meaningful when it is translated into action. Wetland ecosystems clearly reflect this issue, as their benefits are well known but often ignored (Zedler & Kercher, 2005; Davidson, 2014).

Wetlands are areas of land that are covered with water either permanently or seasonally (Mitsch & Gosselink, 2015). They include mangroves, peat swamps, marshes, and floodplains. These ecosystems are highly productive and support a wide range of plant and animal species (Junk et al., 2013). In addition, they regulate water flow by absorbing excess rainfall and releasing it slowly, thus reducing the risk of flooding (Mitsch & Gosselink, 2015). At the same time, wetlands improve water quality by filtering pollutants through soil and vegetation. Harmful substances, including nutrients and heavy metals, are removed, resulting in cleaner water (Shutes, 2001). Furthermore, wetlands play a role in climate regulation; for instance, peatlands store large amounts of carbon, which helps reduce greenhouse gas emissions (Mitsch et al., 2013).



Despite strong scientific evidence, wetlands continue to be degraded or destroyed. This highlights the gap between research and real-world application, which can motivate policymakers and stakeholders to prioritise effective implementation (Davidson, 2014). In many cases, wetlands are converted into land for development due to economic pressure. Short-term benefits are often prioritised over long-term sustainability (Costanza et al., 1997). In addition, weak policy enforcement allows environmental damage to continue. Another

issue is the lack of awareness among stakeholders. Some decision-makers and communities do not fully understand the value of wetlands or the importance of research findings (Barbier et al., 2011). As a result, scientific knowledge is not used effectively in planning and management.

This is important because damage to the wetland ecosystem could have serious consequences. Firstly, flood risks increase as natural water absorption systems are lost (Mitsch & Gosselink, 2015). This results in greater damage to infrastructure and communities. Secondly, water quality declines because pollutants are no longer naturally filtered (Shutes, 2001). This affects both human health and aquatic ecosystems. In addition, biodiversity declines as many species lose their habitats (Junk et al., 2013). This weakens ecosystems and reduces their resilience. Moreover, climate change intensifies when wetlands are destroyed, as stored carbon is released into the atmosphere (Mitsch



et al., 2013). There are also economic impacts. Governments must spend more on disaster recovery and water treatment rather than on prevention (Costanza et al., 1997). Therefore, implementing the research findings could minimise environmental harm and avoid increased long-term costs.

In a nutshell, wetlands demonstrate the importance of applying research findings to address real-world challenges. Scientific studies have already provided valuable insights into how natural systems can reduce environmental risks and support sustainability (Barbier et al., 2011). However, the impact of these findings depends on how they are translated into practical ideas and actions. By integrating wetlands into planning, management, and policy, research can move beyond theory and create meaningful change. This approach not only enhances environmental protection but also supports long-term resilience for communities. Finally, the connection between research and action enables ideas to generate real-world impact.

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Aligning Student USR Initiatives with Sustainable Development Goals: Evidence of *Kayuhan Kayak Persisiran Pantai Port Dickson*

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UiTM CAWANGAN NEGERI SEMBILAN KAMPUS SEREMBAN

University Social Responsibility (USR) and service-learning are now more deeply integrated into higher education as methods for developing socially responsible graduates and encouraging community involvement. Universities are now expected to expand their roles beyond knowledge transmission to actively contribute to societal development by fostering structured student involvement in USR and community-based initiatives. A study by Asrar-ul-Haq, Raza, and Akhtar (2025) indicates that university social responsibility initiatives significantly enhance student engagement, social behaviour, and value formation, highlighting their importance in shaping responsible citizenship. Student participation in service-learning and community engagement activities contributes positively to the development of social skills, civic responsibility, and critical awareness of societal issues (Azmina & Nasreen, 2020). Previous literature reviews further confirm that such initiatives facilitate the development of transferable skills, including communication, teamwork, and problem-solving, while simultaneously strengthening university-community partnerships (Margarita et al., 2024).

A group of students from the Faculty of Sports Science and Recreation (FSR), UiTM Cawangan Negeri Sembilan, Kampus Seremban, participated in the *Kayuhan Kayak Persisiran Pantai Port Dickson* in 2025. By applying academic knowledge in real-world settings, students help enhance community awareness, skills, and problem-solving capabilities. This program provides significant benefits to communities through knowledge transfer, capacity building, and social intervention initiatives.

Benefits of Student USR Initiatives

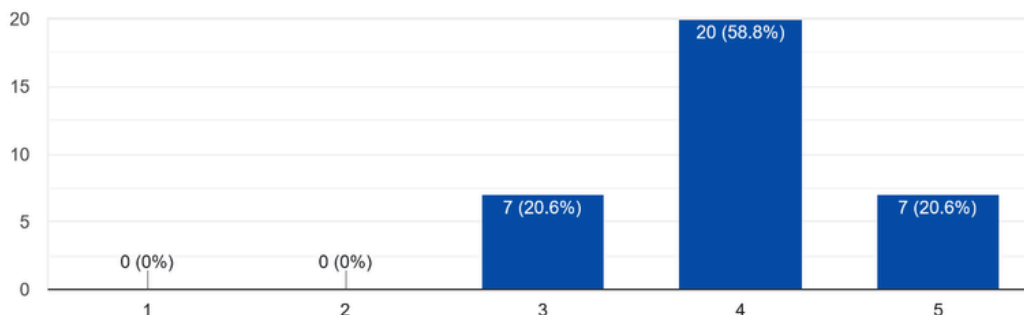
1. Problem-solving.

Problem-solving is a critical competency in implementing USR programmes involving university students, as it enables the identification and resolution of complex, real-world community issues. *Kayuhan Kayak Persisiran Pantai Port Dickson* has benefited the group of students, participants, and the local community by raising awareness and a sense of responsibility for environmental cleanliness, which is the main attraction for tourism to Pantai Port Dickson, Negeri Sembilan. It provides participants with exposure to the real situation along the coastline, which is littered with garbage due to the irresponsible actions of a few individuals. Indirectly, this programme helps restore the scenery and supports the sustainability of local tourism. This programme is a small initiative to promote domestic tourism and support Visit Malaysia Year (TMM) 2026. Consequently, problem-solving not only strengthens the impact of USR programmes but also promotes sustainable community development and empowerment.

Regarding problem identification and analysis, the majority of students rated it as "good" (score of 4), accounting for 58.8% ($n = 20$) of the sample. The remaining responses showed a symmetrical distribution, with 20.6% ($n = 7$) of participants selecting a score of 3 ("satisfactory") and 20.6% ($n = 7$) selecting a score of 5 ("excellent"). This shows that the programme helps students improve their abilities in critical situations.

Saya berkebolehan mengenal pasti dan menganalisis masalah dalam situasi kompleks dan kabur, serta membuat penilaian yang berjustifikasi

34 responses



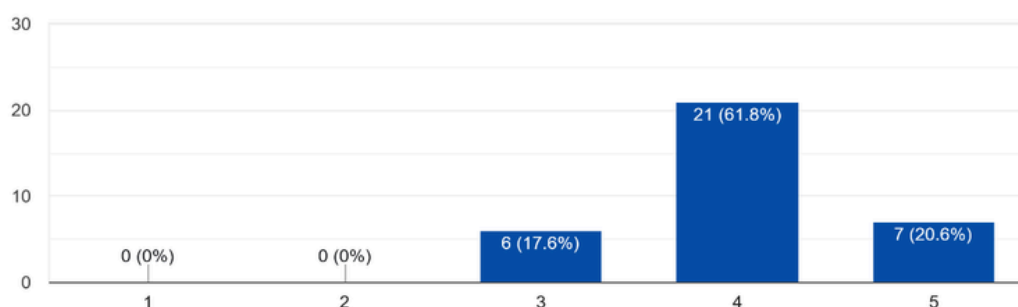
2. Thinking skills.

USR programmes serve as experiential learning platforms that significantly contribute to the development of students' thinking skills. Through direct engagement with real-world community issues, students are required to apply critical and analytical thinking to assess needs, interpret data, and identify underlying problems. Designing and implementing USR initiatives further develops students' creativity and problem-solving skills by requiring them to create practical, context-specific solutions.

This is supported by findings indicating a high level of skill acquisition in the sample: 61.8% (n=21) of students scored 4 (good), followed by 20.6% (n=7) who scored 5 (very good). The lowest level of successful acquisition was reported by 17.6% (n=6) of respondents, who rated it 3 (satisfactory). This suggests that the majority of students can develop and improve their thinking skills through the academic programmes delivered.

Saya berkebolehan mengembang dan membaiki kemahiran berfikir seperti menjelaskan, menganalisis dan menilai perbincangan

34 responses

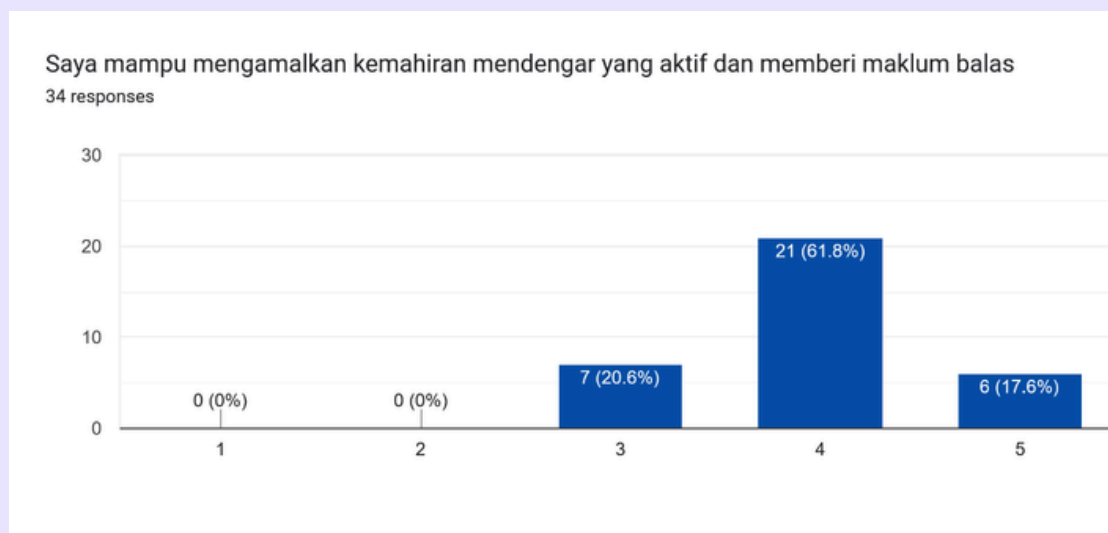


3. Active listening and immediate feedback.

Active listening and immediate feedback are essential communication competencies for implementing USR programmes involving university students. Active listening enables students to accurately understand community needs, build trust, and ensure culturally sensitive engagement, thereby reducing the risk of misaligned interventions. It also facilitates collaborative problem-solving, enabling communities to actively co-create sustainable solutions. Meanwhile, immediate feedback plays a crucial role in enhancing the effectiveness of USR initiatives by enabling real-time evaluation and timely

adjustments to program implementation. This dynamic interaction not only improves project outcomes but also strengthens community engagement and student learning. Collectively, these communication practices ensure that USR programmes are responsive, inclusive, and impactful in addressing real-world challenges.

The table below indicates that the USR programme helps students improve their active listening skills and provides immediate feedback. This is evidenced by the data layout, in which the largest proportion of participants (61.8%, $n = 21$) rated component 4 (good). This was supplemented by 20.6% ($n = 7$) who assigned a score of 3 (satisfactory) and 17.6% ($n = 6$) who assigned a score of 5 (excellent).



In conclusion, USR programmes have significant potential to enhance student development and community well-being. To realise this, universities should prioritise needs-based, community-driven initiatives, underpinned by active listening and continuous feedback, to ensure relevance and inclusivity. Integrating USR into academic curricula through service-learning can further strengthen students' critical thinking, communication, and problem-solving skills while generating meaningful real-world outcomes. Finally, implementing structured monitoring and evaluation frameworks is essential for measuring impact, improving programme effectiveness, and ensuring that USR initiatives remain responsive, evidence-based, and beneficial to both students and society.

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From Insight to Impact

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In today's complex and rapidly evolving world, the value of research lies not only in generating knowledge. Instead, research is expected to drive meaningful, measurable, and sustainable impact for individuals, communities, industries, and policymakers. Increasingly, research is recognised as a tool that connects knowledge with action, such as helping to improve lives, inform decisions, and influence societal change (Hu, 2022). This aligns with Dwivedi et al.'s (2024) findings, which indicate that research impact extends beyond academia to encompass economic, social, and policy-related benefits that contribute to the overall quality of life.

At the foundation of impactful research is insight, where a deep, evidence-based understanding is derived from rigorous inquiry. However, insight alone is insufficient unless it is grounded in relevance. Research gains significance when it addresses real-world challenges, such as employability, financial literacy, and workforce readiness. These challenges highlight the importance of access to relevant and context-rich information. The growing use of real-world data enables researchers to better understand complex phenomena, although such data require careful interpretation due to their scale and variability (Liu & Panagiotakos, 2022).

Importantly, research impact is not a linear outcome but a complex and multifaceted process. It involves translating academic knowledge into practical applications that benefit stakeholders such as industry, policymakers, and communities. However, a persistent gap exists between academic research and real-world practice, often due to differences in priorities, communication barriers, and limited collaboration between academia and external stakeholders (Dwivedi et al., 2024). Addressing this gap requires aligning research design, delivery, dissemination, and demonstration processes with stakeholder needs, as highlighted

in structured approaches to achieving real impact.



Bridging the gap between insight and impact, therefore, requires an application-oriented mindset and strong cross-disciplinary and cross-sector collaboration. University-industry collaborations, for example, have been shown to generate multiple forms of impact, including knowledge creation, economic benefits, and social improvements, demonstrating that research can simultaneously contribute to innovation and societal development (Rossi et al., 2024). Beyond collaboration, achieving such impact also depends on using advanced analytical approaches to translate complex data into actionable insights. In this context, machine learning is a prominent analytical approach, as evidenced by Sarker (2021), who demonstrates its capacity to analyse complex datasets and develop intelligent, data-driven solutions applicable across sectors.

Methodological rigour remains essential in ensuring that research findings are credible and actionable. The use of advanced analytical approaches strengthens the reliability of research outcomes (Sarker, 2021). At the same time, trustworthiness must be ensured, particularly when working with qualitative or real-world data. Principles such as credibility, transferability, dependability, and neutrality are critical in enhancing the validity and applicability of research findings (Kakar et al., 2023).

Collectively, these elements reinforce the overall robustness of the research design and strengthen confidence in empirical evidence.

In addition to rigour, ethical responsibility is increasingly recognised as a core component of impactful research. Efforts to generate societal impact often involve engagement with policymakers, industries, and communities, which may introduce ethical challenges related to fairness, transparency, and accountability. Researchers must therefore ensure that their work maximises benefits while minimising potential harm, particularly for vulnerable or marginalised groups (Jensen et al., 2025). This highlights the importance of responsible research practices in achieving sustainable and inclusive impact.



Technological advancements further enhance the potential for research impact. For instance, edge computing enables real-time data processing, supporting faster and more efficient decision-making in various applications (Bablu & Rashid, 2025). These developments demonstrate how technology can facilitate the translation of research into practical and timely solutions. In addition, the increasing reliance on real-world data highlights the importance of integrating diverse data sources to support evidence-based decision-making (Liu & Panagiotakos, 2022).

Educational institutions play a vital role in fostering an impact-oriented research culture. By integrating real-world challenges into teaching and research, universities can develop graduates who are not only analytically competent but also capable of applying their knowledge to solve practical problems. Developing research literacy is equally important, as it enables individuals to understand and utilise research findings effectively in their professional contexts (Hu, 2022).

The transition from research findings to tangible outcomes also depends on effective dissemination and stakeholder engagement. Research must be communicated in accessible and relevant formats to ensure it reaches and benefits intended users. Engaging stakeholders throughout the research process enhances relevance, usability, and long-term impact, particularly when collaborations are designed to generate multiple types of outcomes such as knowledge, economic, and social impact (Maurer et al., 2022).

In conclusion, the journey from insight to impact requires intentional effort, collaboration, and a commitment to relevance and responsibility. Research achieves its highest purpose when it informs decisions, shapes policies, and improves lives. By integrating methodological rigour, ethical responsibility, stakeholder engagement, and practical application, researchers can ensure that their work contributes to meaningful and lasting change.

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The Soil Glow-Up: Turning Agricultural "Trash" into Organic Gold

SITI NORAZURA JAMAL, MASILAH MOHAMAD, SAZLIN SUHALMIE MOHD SHARIFF, & MUMTAZ AHMAD

UiTM CAWANGAN NEGERI SEMBILAN KAMPUS KUALA PILAH

The Problem: Chemical Fatigue

Today's agriculture is facing increasing environmental sustainability challenges. Excessive reliance on chemical fertilisers has caused environmental degradation for decades, including nutrient leaching, soil acidification, and a colossal decline in microbial biodiversity (Kumar et al., 2022). To address these environmental problems, researchers have developed biofertilizers as sustainable substitutes to chemical fertilisers (Zhao et al., 2024). Although chemical fertilisers support crop productivity, excessive dependence may degrade soil health. Meanwhile, the mushroom production industry produces enormous amounts of spent mushroom waste (SMW) and agricultural residues that are underutilised despite their potential as sustainable agricultural substrates (Maurya et al., 2020).

BioRhizo Brick and SMartGro BioBoost Innovations

To address this issue, we designed and implemented two award-winning innovations to support a circular economy: BioRhizo Brick and SmartGro BioBoost. Through aerobic fermentation, we converted SMW and agricultural residues such as banana leaves and coconut husks into high-value bio-inputs. Both products are enriched with native *Rhizobium* strains, which act as Plant Growth-Promoting Rhizobacteria (PGPR) crucial for sustainable agricultural production (de Andrade et al., 2023; Fasusi & Babalola, 2021).

The beneficial microbes were derived from the rhizosphere of healthy plants at a local farm in Kampung Buyau, Seri Menanti, Negeri Sembilan. We designed two delivery systems tailored to different farming lifestyles: a) BioRhizo Brick (Solid-State) a compressed, odorless and lightweight slow-release block formulation that is designed for home gardens and smallholder farmers who want the benefit of long-term soil health with minimal effort, and b) SMartGro BioBoost (Liquid-State) is a formulation for speed that can be diluted and used as a foliar spray or soil drench, providing farmers with flexibility in providing a stimulus for plant growth during crucial periods of development. The development of both solid and liquid delivery formats mirrors global best practices in biofertilizer design, which emphasise the need to adapt formulations to diverse agro-ecological contexts and end-user capabilities.

Award-Winning Real-World Impact

These innovations are not merely laboratory experiments; they are real-world solutions that have been tested and validated for their effectiveness in practice. BioRhizo Brick and SMartGro BioBoost competed for and won awards for the real-world impact on sustainable agriculture. Given that the majority of smallholder farmers in Malaysia and across Southeast Asia are engaged in agriculture, it is particularly crucial to provide soil amendments that are cost-effective, efficient, and easy to utilise.

Chemical fertilisers may be suitable for crop productivity but are more expensive and have long-term environmental implications, including impacts on groundwater and greenhouse gas emissions (Kumar et al., 2022). In contrast, these new biofertilizers are locally available at a lower cost, enabling rural areas to enrich their lands without overharvesting natural resources. Furthermore, the native

Rhizobium strains are isolated directly from local farm soil and are therefore ecologically well-suited, adapted to the regional climate and climate-specific crop types; this greatly improves the field performance of the bacteria compared with standard commercial strains (de Andrade et al., 2023).

In addition, the circular economy rationale of both products, by transforming farmland and waste from mushroom cultivation into value-added inputs, addresses two issues in parallel: the burden of SMW on landfills and the restoration of soil health (Maurya et al., 2020). This dual role is particularly relevant for rural agro-industrial communities, where mushroom cultivation and small-scale farming activities coexist.

Figure 1
Gold & Silver Awards for Introducing Biofertilizer Innovations



Note. Gold Award for BioRhizo Brick and Silver Award for SMartGro BioBoost at the 2nd SDG Innovation on 20 September 2025. Images from the authors' personal collection.

Figure 2
Final Innovations: BioRhizo Brick and SMartGro BioBoost



Note. The compressed solid-state BioRhizo Brick and the concentrated liquid SMartGro BioBoost are ready for field application. Images from the authors' personal collection.

To validate their effectiveness, we conducted extensive laboratory bioassays using mung beans as the test crop. The results showed significant improvements over untreated controls, which confirmed the dual power of nutrient enrichment and active microbial metabolites (Fasusi & Babalola, 2021).

a) Outstanding Seedling Fierceness and Growth: Both formulations markedly improved early development of the plant. For the liquid SMartGro BioBoost, we achieved an impressive Germination Index (GI) of 126.4%, indicating no toxicity and very high stimulation of seedling growth. Similarly, BioRhizo Brick was able to germinate seeds at above 90% GR, with similar rates observed. Treated seedlings have significantly longer root systems and far more resistant, greener shoots visually than the control groups. In addition, the bricks-treated soil contained significantly higher concentrations of nitrogen (N), phosphorus (P), and potassium (K),

b) Resilient microbial life-span: In order to make any commercial biofertilizer, the actual task is to maintain the health of the beneficial bacteria that should be on the biofertilizer at all times during packaging and storage. Our processing methods successfully preserved microbial activity. Despite filtration of fermented waste to obtain a concentrated liquid or sun-drying and compressing it into solid bricks, the organic matter and the Rhizobium populations remained very abundant and viable. Plate count analysis showed a total viable cell count of 1,000,000+ CFU/g (CFU/mL) of both products post-processing (Islam et al., 2023). This ensures that the "living" biological engine of the fertiliser remains engaged and ready to colonise plant roots the moment it is introduced into the soil.

Conclusion: One Crop, One Time, Save the Planet.

By transforming waste into valuable biofertilisers, these innovations are regarded as eco-friendly solutions for nutrient recycling and environmental sustainability. They directly contribute to the United Nations Sustainable Development Goals, including Zero Hunger (SDG 2), Responsible Consumption and Production (SDG 12), and Climate Action (SDG 13). In practical terms, BioRhizo Brick and SMartGro BioBoost have the potential to be scaled beyond the laboratory and into the hands of farmers across Malaysia and the region. With further field trials, partnerships with agricultural agencies, and policy support, these biofertilizers can serve as model innovations demonstrating how university research translates into tangible community benefit. As biofertiliser adoption has grown globally over the past four decades (Zhao et al., 2024), our locally derived, waste-valorising products stand at the frontier of this movement. Selecting biofertilisers isn't merely a trend; it's also a much-needed step toward a future of sustainable food production, one that treats the earth as seriously as the harvest it yields.

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Bridging Efficiency and Sustainability in Local Public Services: Insights from Malaysia

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Sustainable service delivery in Malaysian local government refers to the provision of public services that are efficient, equitable, and environmentally responsible, while ensuring long-term societal well-being (PLANMalaysia, 2021; Ministry of Economy Malaysia, 2025). However, rapid urbanisation and increasing public expectations have intensified pressures on local authorities to enhance service delivery systems (Khairin Nazry Karim, 2021). This study examines how selected Malaysian local governments implement sustainable service delivery practices through digitalisation, environmental initiatives, and a smart governance system.

Sustainable Service Delivery in Malaysia

Despite sustainability commitments, several operational challenges continue to affect the delivery systems. In Putrajaya, manual administrative processes have led to delays and inefficiencies, particularly in licensing and enforcement, resulting in long queues and public dissatisfaction (see Figure 1). According to Zaini (2023), illegal waste disposal and low recycling participation in Melaka contribute to environmental degradation (see Figure 2). While in Shah Alam, recurring floods are linked to delayed drainage maintenance and reactive service systems (see Figure 3)

Figure 1: Delayed action. Figure 2: Illegal Waste Sites. Figure 3: Floods.



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Case Study Initiative

Majlis Bandaraya Melaka Bersejarah (MBMB): Trash to Cash Program

The Trash to Cash initiative encourages recycling by allowing residents to exchange recyclable materials for rewards, thereby incentivising the public to recycle. This initiative helps reduce waste sent to landfills, promotes recycling practices, and increases environmental awareness among residents. The Trash to Cash program supports SDG 11 by improving urban waste management and SDG 13 by reducing pollution and environmental impact.

Figure 4: Trash to Cash Program Implemented by MBMB



(Note: Reprinted from BERNAMA)

Perbadanan Putrajaya (PPJ): Smart and Digital Service Delivery

Perbadanan Putrajaya emphasises smart and digital service delivery as part of its vision to develop Putrajaya into a smart and sustainable city. The use of digital platforms for public services, information dissemination, and administrative processes improves efficiency and transparency. Digital service delivery reduces dependency on paper-based systems and physical visits, contributing to environmental goals and promoting economic growth through innovation and sustainability. These initiatives align with SDG 11 by improving urban service efficiency by implementing smart waste management and green mobility, such as electric buses and e-scooters, and they also align with SDG 13 by supporting low-carbon governance by providing energy-efficient buildings and renewable energy integration in public facilities

Figure 5: Smart licensing system and Smart Street LED Lighting



(Note: Reprinted from Perbadanan Putrajaya website.)

Majlis Bandaraya Shah Alam (MBSA): SmartQ Digital System

Majlis Bandaraya Shah Alam (MBSA) has developed a digital queue management system that is developed to improve the efficiency and quality of public service delivery as part of its sustainable service delivery strategy. This management system is to make the city council better at monitoring, maintaining the schedule, and collecting resident reports. This is to make sure the maintenance of the neglected infrastructure, drainage system, and drains is in good condition. This can enhance public safety by reducing the risk of accidents. The management system supports SDG 11 by ensuring the city grows, promoting equality, and improving the quality of life for all residents.

Figure 6: Digitalisation using SmartQ System



(Note: Reprinted from The Star)

The study shows that Malaysian local governments are improving sustainable services through digital systems and waste management programs. Although they face challenges related to finance, institutions, and technical skills, these efforts continue to improve public services, support SDG goals, and enhance the quality of life.

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River Pollution in Malaysia: Assessment of Environmental Protection Measures and Sustainable Strategies

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River pollution in Malaysia is a serious environmental and socioeconomic issue, as water quality continues to decline despite government efforts. Although most rivers are still classified as “clean,” according to the Department of Environment (DoE), about 28% are considered slightly polluted or polluted. The main causes of pollution are human activities, especially industrial discharge, agricultural runoff, and illegal dumping. Incidents such as the chemical pollution of Sungai Kim Kim in Johor and the degradation of Sungai Raja Hitam in Perak highlight weaknesses in the current system, including poor coordination among agencies and inadequate enforcement of the law.

Figure 1: Raja Hitam River before pollution



Figure 2: Raja Hitam River after pollution



Note. Reprinted from Sinar Harian

Analysis of Critical Pollution Incidents

The study indicates that human activities are the primary drivers of river pollution in Malaysia. Industrial operations frequently discharge untreated or poorly treated waste into rivers, while agricultural practices contribute to chemical runoff. Additionally, domestic and commercial waste disposal further exacerbates water contamination (Department of Environment Malaysia, 2023). Besides that, weak enforcement mechanisms and insufficient penalties allow such practices to persist (Ibrahim et al., 2021).

This study also contributes to achieving SDG 6 (Clean Water and Sanitation) by addressing stream pollution in Malaysia through integrated, sustainable approaches. It aims to enhance public awareness and community participation by assessing levels of knowledge, attitudes, and behaviours related to stream pollution, and by disseminating information that encourages collective responsibility in protecting freshwater ecosystems.

Figure 3: Site inspections and cleanup at Sungai Kim Kim and Sungai Raja Hitam



Note. Reprinted from Berita Harian

Effective monitoring and enforcement are important for reducing river pollution. Regular inspections help detect pollution early and ensure compliance with environmental regulations (Department of Environment Malaysia, 2023). Although laws such as the Environmental Quality Act 1974 are in place, there are still challenges in implementation. Therefore, better coordination among government agencies is needed to minimise delays and improve responses to environmental incidents (Adnan, 2024).

River restoration involves several key steps that combine technical and practical measures. First, pollutant removal focuses on clearing chemical waste, plastics, and heavy metals from rivers. Second, sediment cleaning involves methods such as dredging and filtration to remove toxins that settle on riverbeds. Finally, water treatment employs mobile treatment systems and biological processes to improve water quality and ensure compliance with safety standards.

Figure 5. Rehabilitation of Sungai Kim Kim and Sungai Raja Hitam



Note. Reprinted from Utusan

River pollution has severe environmental and public health consequences, particularly among vulnerable populations such as school children. Contaminated water disrupts aquatic ecosystems, leading to biodiversity loss and fish mortality. Human exposure to polluted water and toxic gases can result in respiratory issues, skin irritation, and long-term health risks, including neurological damage (Ibrahim et al., 2021).

Conclusion

River restoration is crucial for repairing damage from pollution and human activities, allowing rivers to return to safe, healthy conditions. Rivers provide freshwater and support biodiversity, agriculture, and local communities, but they are often polluted by industrial waste, illegal dumping, and urban runoff. Restoration efforts typically involve removing pollutants such as chemicals, plastics, and heavy metals, followed by cleaning contaminated sediments that can release toxins over time. Water treatment is then applied to ensure safety standards are met.

However, effective restoration also requires continuous monitoring and strong community involvement to prevent further pollution. Collaborative efforts, as seen in the Kim Kim River and Sungai Raja Hitam initiatives, demonstrate that integrated approaches that combine technical solutions with public participation can significantly improve water quality. Ultimately, river restoration not only improves water quality but also protects ecosystems, public health, and long-term sustainability.

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Psychological Research: Nurturing Global Mental Well-Being

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Introduction

Mental health has become a defining issue of the 21st century, influencing not only individual well-being but also the stability of communities and the productivity of nations. Psychological research plays a pivotal role in understanding, addressing, and nurturing mental health across diverse cultural and social contexts (Magomedova & Fatima, 2025). This article explores how psychological research contributes to global mental well-being, highlighting its relevance, applications, and future directions.

The Global Relevance of Mental Health

Mental well-being is increasingly recognized as a cornerstone of sustainable development (Votruba et al., 2016). The World Health Organization emphasizes that mental health is integral to overall health, economic growth, and social cohesion (Funk et al., 2026). Psychological research provides the evidence base for interventions that reduce stigma, promote resilience, and improve quality of life worldwide.

Evidence-Based Interventions

One of the most significant contributions of psychological research is the development of evidence-based interventions (Cook et al., 2017). Cognitive-behavioral therapy (CBT), mindfulness practices, and positive psychology approaches have demonstrated effectiveness in diverse populations (Hofmann et al., 2012). These interventions are adaptable, scalable, and effective for both preventive and therapeutic needs.

Cross-Cultural Perspectives

Global mental well-being requires sensitivity to cultural differences. Psychological research highlights the importance of tailoring interventions to local contexts, respecting cultural values, and integrating indigenous practices (Snijders et al., 2025). Comparative studies show that culturally adapted interventions are more effective and sustainable, ensuring inclusivity in mental health promotion.

Policy and Institutional Impact

Research findings inform public health policies, workplace practices, and educational frameworks. Governments and institutions increasingly rely on psychological evidence to design programs that foster resilience, reduce workplace stress, and support student well-being (Chaudhry et al., 2024). By bridging research and policy, psychology contributes to systemic change.

Emerging Directions

The future of psychological research is marked by innovation. Digital mental health tools, artificial intelligence-driven diagnostics, and integrative approaches combining psychology with neuroscience and public health are expanding



the reach of mental health support (Anser et al., 2025). These advancements promise greater accessibility, personalization, and effectiveness.

Conclusion

Psychological research extends beyond laboratories or academic journals; it is a dynamic force shaping lives and societies. By nurturing global mental well-being, psychology contributes to healthier individuals, stronger communities, and more resilient nations. The integration of scientific evidence into practice and policy underscores psychology's transformative potential in addressing one of the most pressing challenges of our time.



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ChatGPT, My AI Friend: Humanising AI for Real-World Impact

SOO KUM YOKE & WAN ADMIZA WAN HASSAN

UiTM CAWANGAN NEGERI SEMBILAN KAMPUS REMBAU

TUAN SARIFAH AINI SYED AHMAD

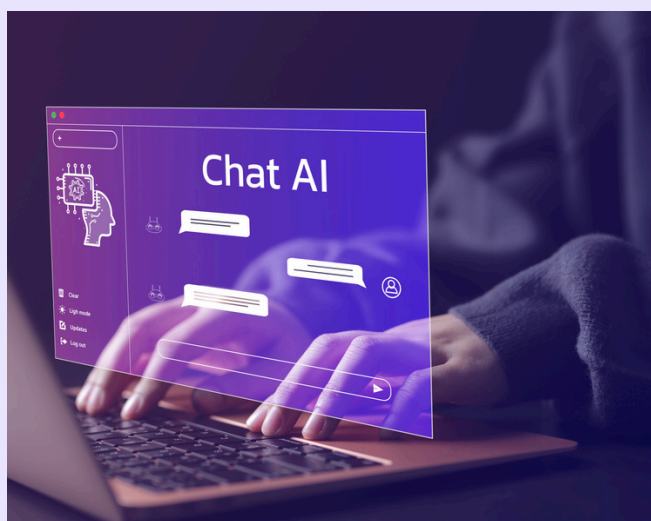
UiTM CAWANGAN NEGERI SEMBILAN KAMPUS SEREMBAN

Do we remember when we used to talk to our pets or even our phones? Today, many of us are talking to ChatGPT, and some even give it a name. My friend calls hers “Ami,” turning a line of code into something that feels like a companion. While this may seem playful, it reflects a growing area of research: how humans form social-like connections with artificial intelligence and what this means for real-world impact.

Initially, ChatGPT functions as a tool for checking grammar, brainstorming ideas, or explaining concepts. However, repeated interaction often leads to subtle behavioural shifts. Users begin to greet the AI, express gratitude, and personalise their engagement. Naming the system further enhances this effect, transforming it into a perceived social presence.

This behaviour is supported by research in human-computer interaction. The Computers Are Social Actors (CASA) paradigm suggests that people naturally apply social rules to technology when it demonstrates human-like communication (Reeves & Nass, 1996). Even when users know they are interacting with a machine, they still respond socially.

Several factors explain why these interactions feel personal. First, adaptive responsiveness allows AI to mirror tone and intent, creating a sense of being understood. Second, psychological safety enables users to ask questions or express ideas without fear of judgment. Third, constant availability fosters familiarity, which is key to relationship-building behaviours. Research on social chatbots further shows that users may develop emotional engagement due to perceived responsiveness and companionship (Følstad et al., 2018).

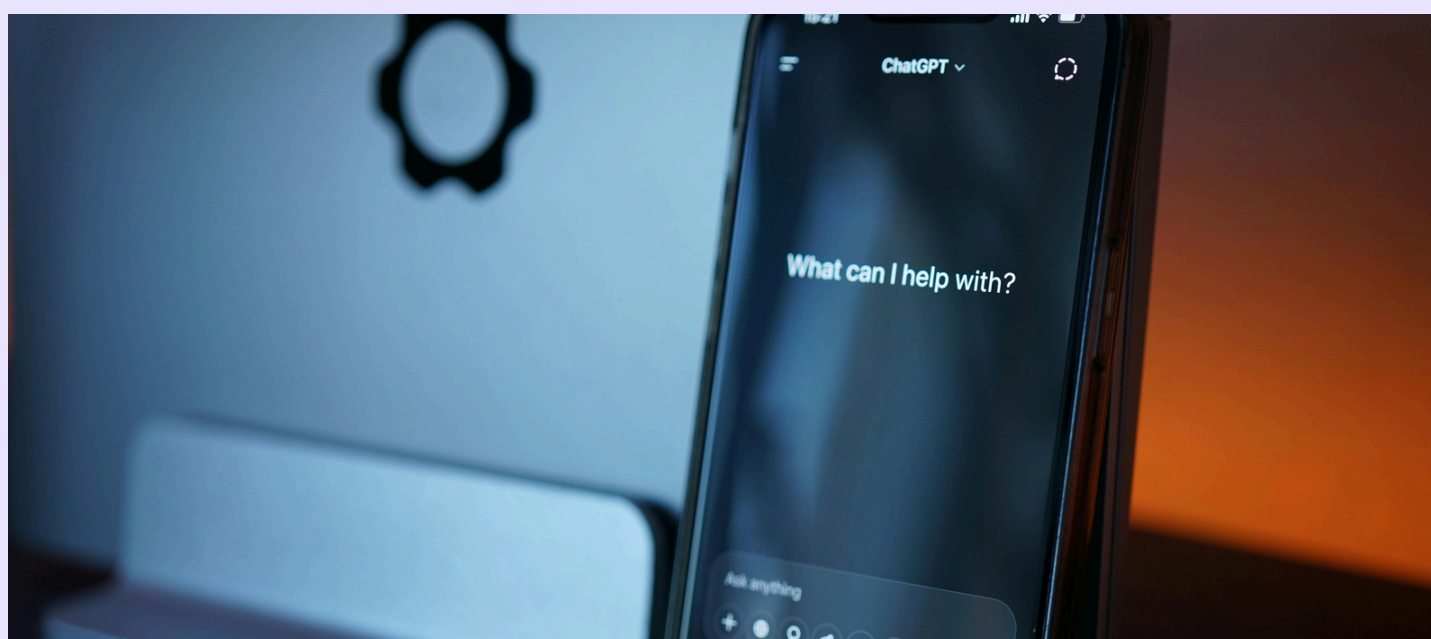


Understanding these dynamics opens up important opportunities for real-world application. In education, AI can function as a low-risk conversational partner. Students, especially language learners or those lacking confidence, can practise communication without anxiety. Studies suggest that such environments can enhance participation and reduce fear of negative evaluation (Warschauer, 1996). For teachers, AI can support lesson planning, idea generation, and differentiated instruction. It can also serve as a reflective tool, allowing educators to simulate interactions or test explanations.

In terms of mental well-being, while AI should not replace professional support, it can offer an immediate space for reflection, helping users organise thoughts or rehearse difficult conversations. Research indicates that conversational agents can provide perceived emotional support, though ethical boundaries remain important (Shum et al., 2018).

At the same time, these developments highlight the need for AI literacy. As users increasingly humanise AI, they must also understand its limitations. AI does not possess emotions, intentions, or consciousness. Without this awareness, there is a risk of over-reliance or misunderstanding. Ultimately, the sense of “connection” users feel may reveal more about humans than machines. The act of naming, thanking, or chatting with AI reflects fundamental human tendencies toward social interaction. In this sense, AI acts as a mirror, reflecting our need for communication, affirmation, and understanding.

The bottom line is that ChatGPT is not a person. Yet, the way people interact with it offers valuable insights for research and practice. By understanding these behaviours, we can design more effective educational tools, support systems, and digital environments. What may seem like a simple “Good night, Ami” is, in fact, a small but meaningful example of how humans adapt to technology and how that adaptation can be harnessed for real-world impact.



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Zinc Oxide Nanoparticles in Food Technology

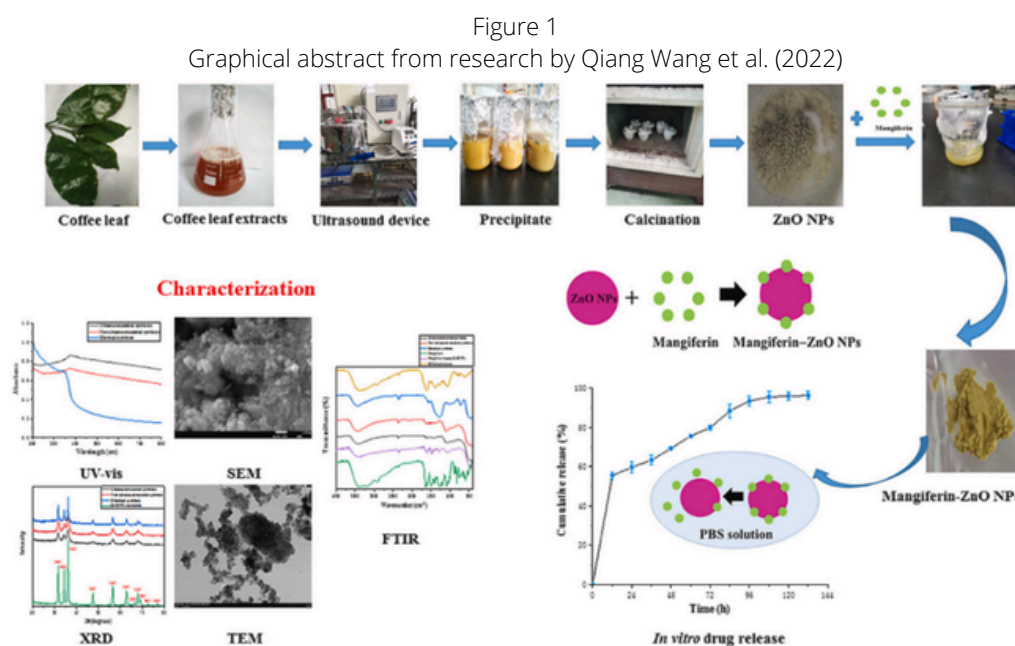
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In modern food systems, maintaining quality, safety, and nutritional value remains a major challenge. Conventional preservation methods often rely on synthetic additives, raising concerns over health and environmental sustainability. As a result, research is increasingly focused on translating scientific innovation into practical solutions that deliver real-world impact. One promising advancement is the use of zinc oxide nanoparticles (ZnO NPs), which offer multifunctional properties applicable across food preservation, packaging, and nutrition. Notably, ZnO NPs can be biosynthesized directly from sustainable biomaterials.

In fruit preservation, the key application of ZnO NPs lies in their antimicrobial activity. Mechanistically, they generate reactive oxygen species (ROS), including hydroxyl radicals and superoxide ions, which damage microbial lipids, proteins, and DNA. Additionally, ZnO NPs disrupt cell membrane integrity and release Zn^{2+} ions that interfere with the enzymatic processes of the fruit. These combined effects make them highly effective against foodborne pathogens (Ahmad & Sarbon, 2021). For example, ZnO NP coatings applied to harvested strawberries have been shown to inhibit microbial growth and significantly delay spoilage (Sani et al., 2025). ZnO NPs also function as antioxidants, particularly in lipid-rich foods where oxidation leads to rancidity. By scavenging free radicals and inhibiting lipid peroxidation, they help preserve flavour, aroma, and nutritional quality (Mohammed et al., 2025). This is especially relevant in edible oils and snack products, where ZnO incorporation can slow oxidative degradation and extend shelf stability during storage.

In active packaging systems, ZnO NPs are incorporated into polymer matrices to create functional films and coatings (Lubis et al., 2020). These films/coatings can interact with gases such as ethylene and carbon dioxide to slow fruit ripening. Furthermore, their nanoscale structure enhances barrier properties against oxygen and moisture. ZnO-infused packaging films/coatings have been used for harvested bananas and tomatoes (Santhosh & Sarkar, 2022) to reduce microbial contamination and prolong shelf life during distribution (La et al., 2021).

ZnO NPs are also utilised in nutrient delivery systems, where they serve as carriers for bioactive compounds. Through nanoencapsulation, sensitive nutrients such as fat-soluble vitamins are protected from degradation. Their small size increases surface area and solubility, improving bioavailability and absorption in the gastrointestinal tract (Wang et al., 2022). A practical example is fortified beverages, in which nano-delivery systems enhance the stability and uptake of vitamin D. As a zinc-fortification agent, ZnO NPs provide an efficient means of addressing micronutrient deficiencies (Chen et al., 2025). The nanoscale form enhances dissolution rate and intestinal uptake compared to conventional zinc sources. This approach has been applied in fortified flour and dairy-based drinks to improve dietary zinc intake. An overview of the synthesis and characterization of these nanoparticles is illustrated in Figure 1.



Note. Retrieved from "Zinc oxide nanoparticles synthesized using coffee leaf extract assisted with ultrasound as nanocarriers for mangiferin" by Qiang Wang et al., 2022, *Current Research in Food Science*, 5, 868-877. Copyright 2022 Elsevier.

In terms of the physical quality of food, ZnO NPs contribute to the stabilisation of colour and texture (Souza et al., 2020). Their antioxidant properties reduce pigment oxidation, while their interaction with food macromolecules strengthens structural integrity. For example, ZnO-based coatings on fresh-cut apples can reduce enzymatic browning and maintain firmness during storage (Maringgal et al., 2020). In dairy systems, ZnO NPs provide dual functionality by enhancing microbial safety and nutritional value. They interact with milk proteins such as casein while inhibiting the growth of spoilage microorganisms. ZnO incorporation in yogurt can extend shelf life while increasing zinc content without significantly affecting taste or texture.

ZnO NPs also play an important role in Pickering emulsions, where they act as solid stabilisers at oil-water interfaces (Roy et al., 2022). By forming a robust physical barrier around droplets, they prevent coalescence and improve emulsion stability. This is useful in products such as salad dressings and sauces, where ZnO-stabilised emulsions enhance texture while providing antimicrobial and antioxidant protection. Overall, ZnO NPs exemplify how research-driven ideas can be translated into impactful, real-world applications. Their multifunctionality offers significant potential to improve food safety, quality, and nutrition, while supporting more sustainable and innovative food systems.

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Turning Assignments into Income: A New Model of Student Entrepreneurship

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The idea of transforming students' assignments into income-generating opportunities offers a practical way to bridge academic learning with real-world entrepreneurship. In many cases, students produce quality work that ends at submission and is rarely developed into outputs with real value. As a result, learning becomes disconnected from opportunities for innovation and income generation. This raises an important question: can assignments be redesigned not only as assessment tools but also as platforms for value creation? Integrating entrepreneurial elements into education enables students to apply their knowledge in meaningful ways while strengthening their employability and financial independence. The Earn-to-Learn model highlights how collaboration between universities, industries, and governments can provide students with paid, real-world experiences (Herbert, 2018), while experiential learning approaches further support student engagement with real challenges beyond the classroom (De Souza-Daw et al., 2022).



However, traditional assignments present clear limitations. They are often designed for grading rather than for value creation, leading students to prioritise marks over meaningful application and to reduce creativity and critical thinking (Agrawal, 2025). In addition, assignments are rarely utilised beyond submission, even when they contain valuable ideas (Winfield, 2023). More importantly, they offer limited exposure to real markets, preventing students from understanding how their work performs in actual business environments and weakening the link between education and employability (Arend & Carlson, 2023). These challenges highlight the need for more practical and application-driven learning approaches.

In response, the "Assignment to Income" concept introduces a value-driven perspective on student work. Assignments can be reframed as potential products, services, or business ideas rather than tasks to be completed. This aligns with entrepreneurial-minded learning, where students are encouraged to solve real-world problems and focus on value creation (Han et al., 2021). At the same time, collaborative environments that connect students with educators and industry practitioners can foster innovation and experimentation. This approach shifts the focus from task completion to value creation, encouraging students to evaluate whether their outputs can address real needs and generate meaningful impact (Du Toit, 2023), while still preserving the broader aims of education.

Importantly, this model is highly practical across disciplines. Business plan assignments can evolve into real startups, allowing students to test and launch ideas. Marketing assignments can involve selling actual products, giving students hands-on experience in customer engagement and financial management (Agustin et al., 2024). Design projects can be transformed into digital products or freelance services, while event assignments can be implemented as real events. These approaches demonstrate that assignments can move beyond theory and become viable tools for entrepreneurship.

For this transformation to succeed, educators play a central role. Assignments must be designed with real-world application and monetisation potential, encouraging students to think beyond submission and towards value creation (De Souza-Daw et al., 2022). Educators can also promote entrepreneurial thinking by guiding students to identify real problems and propose practical solutions, while collaboration with industry partners provides mentorship and exposure to market realities. Pitching platforms and showcase opportunities can further enhance this process by allowing students to present ideas, receive feedback, and explore real opportunities.

Beyond the classroom, a supportive ecosystem is essential. Universities can establish entrepreneurship units and student clubs that provide training, resources, and structured support (Matt & Schaeffer, 2018). Access to selling spaces such as booths or kiosks allows students to test their ideas in real-world market environments, while mentorship and networking opportunities help strengthen their confidence and capabilities. In addition, incubators and accelerators can provide funding, training, and infrastructure to support student ventures (Breznitz & Zhang, 2019). These elements collectively create an environment where assignments can realistically be transformed into income-generating activities.



The implementation of the Earn-to-Learn model has a significant impact on students. They gain opportunities to earn income while studying, reducing financial pressure and making learning more meaningful (Al-Zekri et al., 2024). At the same time, they develop an entrepreneurial mindset characterised by adaptability, initiative, and self-efficacy, along with practical skills such as problem-solving and communication (Shaw & Perez, 2023). These experiences build confidence and reduce reliance on traditional employment pathways, as students become more capable of creating their own opportunities.

In conclusion, turning assignments into income represents a meaningful shift in higher education, where learning extends beyond submission into real-world application and value creation. The concept of “learning by earning” reflects a more applied and student-centred approach (Herbert, 2018). With thoughtful design, strong institutional support, and effective collaboration, assignments can become not only tools for assessment but also starting points for entrepreneurship and future success.

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Books to Bytes: Transforming Students into Digital Creators

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In today's fast-evolving digital landscape, education is no longer confined to textbooks and lecture halls. The rise of social media platforms, content creation tools, and digital entrepreneurship has reshaped how knowledge is shared, consumed, and applied, implying new modes of digital engagement in education (Benchebkroun, Boucher, & Mebarki, 2024). As a result, students are no longer just learners—they are potential digital creators, innovators, and entrepreneurs.

The transition from books to bytes reflects a broader shift in education, where traditional learning must integrate digital competencies relevant to real-world demands. While theoretical knowledge remains essential, it is no longer sufficient on its own. Students today must be equipped with practical digital skills such as content creation, social media marketing, and personal branding. Academic research supports this shift. Studies indicate that while students actively use social media, many remain passive consumers rather than active creators, highlighting the need for structured learning approaches that encourage content production and digital engagement (Sharma, 2025). Similarly, digital marketing research shows that effective content creation requires not only creativity but also a strategic understanding of audience behaviour and engagement patterns (Tafesse, 2023).

In Malaysia, this transformation is no longer theoretical—it is already happening. A compelling example is Khairul Aming, a well-known digital content creator who successfully turned simple cooking videos into a thriving business empire. His journey from sharing short recipe videos online to building a multimillion-ringgit brand demonstrates how digital content creation can translate into real economic value. According to a report by Malay Mail (2025, October 7), Khairul Aming's success has inspired many young Malaysians to pursue entrepreneurship rather than traditional salaried careers. His innovative content, consistency, and ability to engage audiences have positioned him as a role model for the younger generation.

Further reinforcing his impact, coverage in The Star (2025, March 25) highlighted how his social media content—such as sharing appreciation for his employees—quickly gained millions of views, demonstrating the power of authentic digital storytelling to build strong audience connections. These real-world examples illustrate an important point: digital platforms are no longer just tools for entertainment but powerful channels for branding, communication, and business growth.

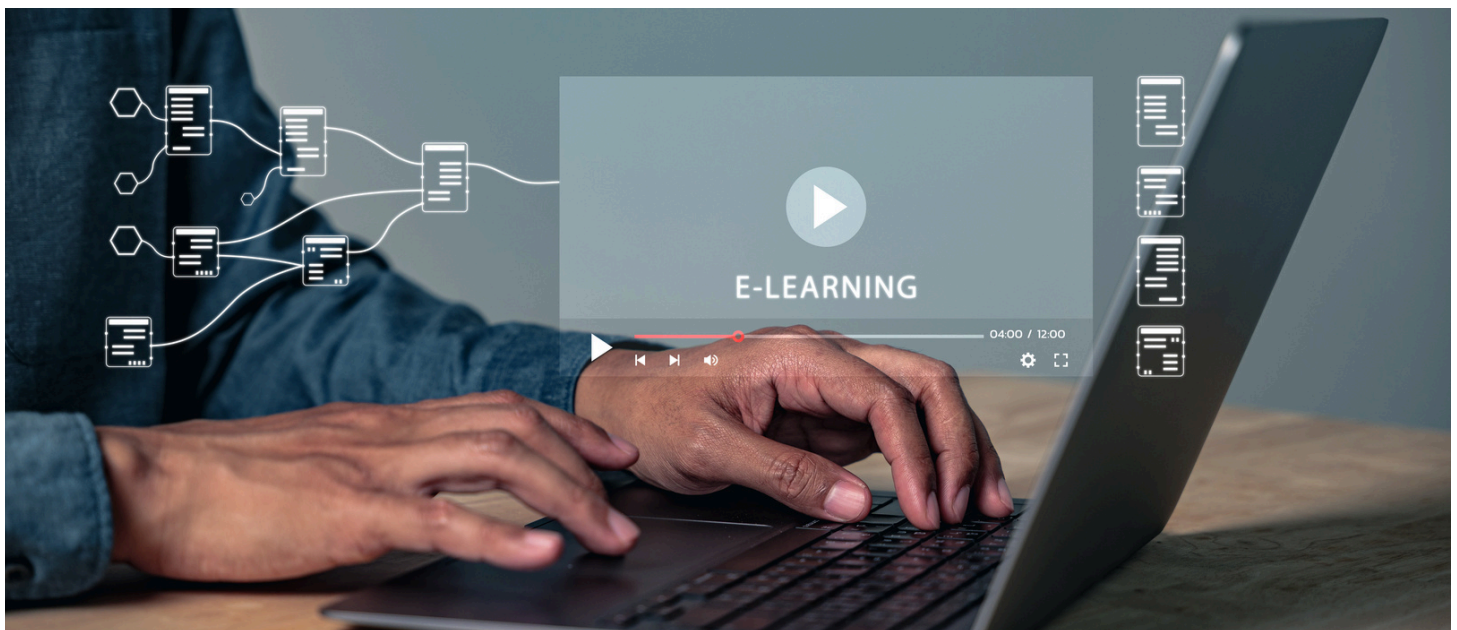
For educational institutions, this presents both a challenge and an opportunity. Universities must move beyond traditional teaching approaches and adopt experiential learning strategies that encourage students to create, experiment, and engage with digital tools. Traditional three-year degree programs are increasingly seen as insufficient in the rapidly evolving digital landscape, underscoring the urgent need for new mechanisms to build industry-ready tech talent quickly (Chang, 2024). For instance, assignments that require students to produce short videos, design social media campaigns, or build personal brands can significantly enhance their learning experience.



Such approaches not only develop technical skills but also nurture creativity, critical thinking, and communication abilities. More importantly, they help students translate theoretical knowledge into practical outcomes—an essential requirement in today's competitive job market, encouraging a shift from passive consumption to active digital creation (Sharma, 2025).

However, as students transition into digital creators, they must also be guided on ethical and responsible content creation. Issues such as misinformation, authenticity, and digital credibility are increasingly important in a world where online content can influence public perception and consumer behaviour, creating new ethical challenges (Trisettiando & Ridwan, 2025). This emphasis on digital literacy is further echoed in Malaysia's National 4IR Policy, which prioritizes safeguarding society from the irresponsible use of technology by establishing robust ethical frameworks (Economic Planning Unit, 2021).

In the broader Malaysian context, this shift aligns with national aspirations to strengthen the digital economy and produce future-ready graduates. Initiatives such as the Malaysia Digital Economy Blueprint (MyDIGITAL) highlight the need to nurture a future-ready workforce to transform Malaysia into a digitally enabled, high-income nation (MyDIGITAL, 2021). Furthermore, recent government strategies, such as those outlined in Budget 2026, emphasize expanding digital and artificial intelligence skills through technical and vocational education to sustain competitiveness in a technology-driven economy (MyDIGITAL Corporation, 2025). Students who can create meaningful content, engage audiences, and leverage digital platforms effectively will have a significant advantage—not only as job seekers but also as entrepreneurs.



Ultimately, transforming students into digital creators is not about replacing traditional education but enhancing it by fostering new forms of interaction and learning (Bencheckroun, Boucher, & Mebarki, 2024). It is about bridging the gap between theory and practice, ensuring that students are not only academically competent but also digitally capable. The journey from books to bytes is no longer optional—it is essential. By embracing this transformation, educators can empower students to become not just consumers of content but creators of value in the digital age.

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Translanguaging: Why Bahasa Rojak is The Secret to Mastering English

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For decades, the sound of "*Bahasa Rojak*," or code-mixing, in a Malaysian classroom has been met with a teacher's frown or a sharp "English only!" rule. Traditionally, we have been taught that mixing languages in the learning process is a sign of a weak mind. Nevertheless, as we conclude the Malaysia Education Blueprint 2013-2025 (Ministry of Education [MOE], 2013), a revolutionary research trend is turning this old taboo into a pedagogical term called **Translanguaging**. Translanguaging can be defined as the fluid use of speakers' full language repertoire to learn and make meaning, as well as a pedagogical approach to teaching in which educators support this ability, which has gained the interest of various scholars (Cummins, 2019; Canagarajah, 2011; Creese & Blackledge, 2010; García & Wei, 2014). It suggests that our national habit of "mixing" might actually be the key to producing the most fluent English speakers Malaysia has ever seen (García & Wei, 2014).

The Silent Classroom Crisis

If we enter any rural secondary school during an English lesson, we will often find a silent classroom. Students sit with heads bowed, terrified of making a grammatical mistake or being teased or mocked for speaking in broken English. When we force these students into a strict English-Only zone, we are not just teaching a language, but we are unintentionally shutting down their ability to think. According to the Affective Filter Hypothesis, high anxiety and fear of failure act as a mental block that prevents students from absorbing new information (Krashen, 1982). Banning their first language appears to remove the only means they have to connect to their second language.

Introducing: The "Brain Bridge" Strategy

To help students utilise both languages in effective language learning, there is a concept known as Pedagogical Translanguaging. We can think of it as a scaffold in building a house. As Baker and Wright (2021) explain, the bilingual brain does not function as two separate compartments but as one integrated system. So, to build a tall, sturdy English "house," we need the scaffolding of one's native language to reach the high points. Once the house is finished, one can take down the scaffolding. However, if you try to build the roof without any support, the whole structure collapses.

How a "Translingual" Classroom works:

Stage	Focus	Process	Goal
1. The Spark	Native Language (L1)	Students discuss complex topics (e.g., climate change and social ethics) in their most comfortable language.	To unlock high-level creative and critical thinking without linguistic barriers.
2. The Bridge	Linguistic Mix	Students draft outlines and main points using a strategic mix of languages to ensure logical flow (Wei, 2018).	To organise thoughts and bridge the gap between conceptual understanding and English expression.
3. The Polish	Target Language (English)	With teacher scaffolding, students "translate" and refine their mixed-language drafts into formal, English-only outputs.	To produce high-quality, academic English essays ready for assessment or the SPM.

Lessons from the 2025 SPM Results

The data from the recent **SPM 2025** examinations tells a compelling story. In schools where teachers allowed strategic language mixing during the learning phase, the National Average Grade (GPN) showed a significant improvement (MOE, 2025). So instead of struggling to find basic words, these students used their bilingual brains to compare meanings and find synonyms. This approach aligns with the **CEFR Companion Volume**, which now recognises "plurilingual competence"—the ability to call upon multiple languages to solve a problem—as a core 21st-century skill (Council of Europe, 2020).

A Call to Action for 2026 and Beyond

As the Ministry of Education (MOE) begins drafting the next phase of national education policy, the focus must shift from "English Monolingualism" to **"Malaysian Multilingualism."** We must stop shaming students for their code mixing or *Bahasa Rojak* and start teaching them how to use it as a professional tool. The "Brain Bridge" strategy can offer a path toward an inclusive, high-achieving future where every Malaysian student can succeed on the global stage. For future researchers, it is hoped that they will explore the use of translanguaging strategies in language learning to make a real impact in the world.



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When Federalism Meets Reality: The 20-Point Agreement, Sabah Politics, and Its Real-World Impact

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Introduction

Malaysia's formation in 1963 marked a significant milestone in its political development. Central to Sabah's entry into the Federation was the **20-Point Agreement**, which guaranteed autonomy and safeguarded the state's rights and interests. Over the decades, debates surrounding its implementation have continued to shape Sabah's political landscape and influence federal-state relations. An analysis of Sabah's political dynamics during the 2018–2020 administration of the Sabah Heritage Party (WARISAN) provided valuable insights into governance, autonomy, and national integration. These issues remain highly relevant today, as reflected in the most recent Sabah State Election (PRN-17 Sabah).

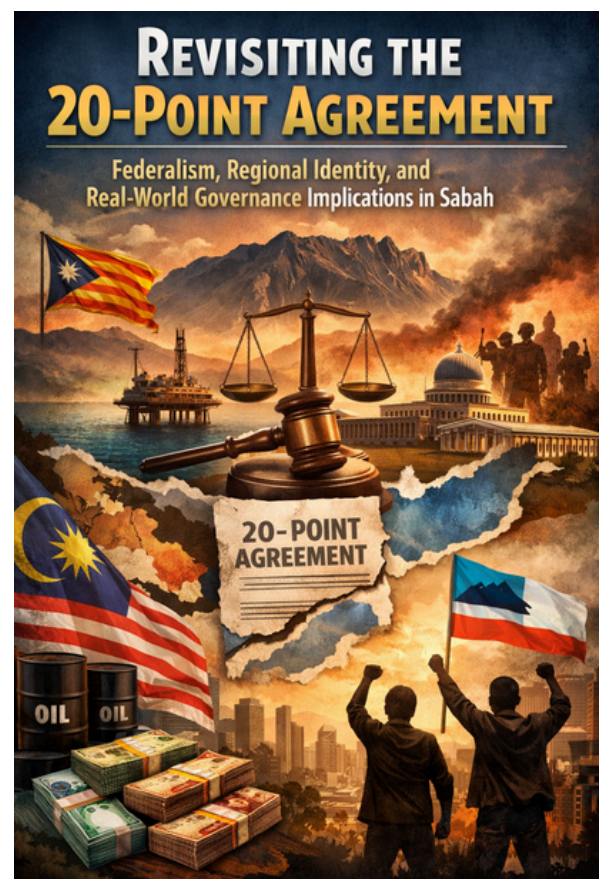
The Malaysia Agreement 1963 (MA63) and the 20-Point Agreement served as constitutional safeguards to protect Sabah's autonomy upon joining Malaysia. These provisions cover key areas, such as immigration, religion, language, finance, and administrative authority. Despite their significance, disputes over their implementation have remained a recurring issue in Sabah's political discourse. Unmet expectations regarding these provisions contributed to public dissatisfaction and shaped federal-state relations.

Federalism in Practice

Federalism, as defined by Wheare (1967), refers to the constitutional division of power between central and regional governments, with each level ideally operating independently within its jurisdiction. In practice, however, many federations, including Malaysia, adopt a form of **asymmetrical federalism**, where certain regions are granted special privileges due to historical, cultural, or political considerations. In the case of Sabah, this asymmetry is reflected in its greater autonomy over matters such as immigration, language, and administrative matters. However, perceptions that these rights have been increasingly encroached upon have contributed to tensions between the federal and state governments.

Key Issues in the Implementation of the 20-Point Agreement

Five key issues shaped political debates during the WARISAN administration regarding the implementation of the 20-Point Agreement. These include long-standing demands for a 20% oil royalty, concerns over financial allocation and fiscal autonomy despite Sabah's resource wealth, and



persistent inter-regional inequalities between Peninsular Malaysia and East Malaysia that have contributed to feelings of marginalisation. Debates surrounding Sabah's constitutional status, particularly efforts to restore its position as an equal partner in the federation, also remained central. In addition, the issue of Borneonisation calls for greater representation of Sabahans in the civil service and key institutions to ensure that governance reflects local aspirations and participation. Collectively, these issues remain integral to Sabah's political identity and continue to shape its relationship with the federal government (Abdullah & Mulia, 2018; Chin, 2019).

Impact on Malaysian Federalism

Unresolved issues have contributed to strained relations between the federal and state governments, reflecting ongoing tensions in governance and policy implementation. At the same time, socio-economic disparities have fostered distrust and feelings of marginalisation among certain communities, leading to the emergence of xenophobic sentiments. These conditions have also contributed to rising anti-federal sentiments, where dissatisfaction with perceived injustices has encouraged demands for greater autonomy. Furthermore, persistent grievances pose challenges to national integration by weakening unity and social cohesion. In some cases, competition for resources and political influence has also intensified ethnic and political tensions. Collectively, these impacts underscore the importance of inclusive governance and effective policy implementation in maintaining national stability (Chin, 2019; Wheare, 1967; Yusoff & Agustino, 2011).

Global Perspectives: Lessons from Other Countries

The dynamics observed in Sabah reflect broader patterns in federal systems worldwide, where tensions often emerge when regional autonomy is perceived to be undermined. In Spain, Catalonia's dissatisfaction with fiscal policies and perceived cultural marginalisation contributed to a strong independence movement, with the 2017 referendum highlighting how unresolved grievances can threaten national unity (Troitino & Kerikmae, 2021). Similarly, in India, the revocation of Article 370 in Jammu and Kashmir, which previously granted special autonomy, led to political unrest and heightened tensions between the central and regional authorities, demonstrating how constitutional changes can reshape federal relations. In Nigeria, disputes over oil revenue distribution in the Niger Delta have long fuelled regional discontent and militancy, reflecting the consequences of inequitable resource allocation. In Pakistan, feelings of political and economic marginalisation in Balochistan have contributed to separatist sentiments, illustrating the risks of centralised governance in diverse federations. Meanwhile, Quebec's pursuit of cultural and linguistic autonomy in Canada has led to referendums on independence, underscoring the importance of negotiation and accommodation within the federal system. These international cases collectively illustrate that unresolved issues related to autonomy, economic inequality, and identity can intensify anti-federal sentiments, reinforcing the relevance of Sabah's experience in global federalism discourse (Troitino & Kerikmae, 2021; Wheare, 1967).

Policy Implications and Real-World Significance

The cases above highlight the need to enhance dialogue and collaboration between central and regional governments to ensure more effective and inclusive governance. Promoting equitable development is important for reducing regional disparities and fostering balanced growth. Additionally, the findings reinforce the need to uphold constitutional commitments, such as the Malaysia Agreement 1963 (MA63), to build trust and legitimacy in the federation. Efforts to strengthen national unity involve addressing grievances that may fuel division and dissatisfaction.

Conclusion

The 20-Point Agreement remains a cornerstone of Sabah's political identity and a defining element of Malaysian federalism. Its implementation continues to influence federal-state relations, regional development, and national integration. Addressing longstanding grievances through inclusive governance and policy reform is essential for strengthening the federation.

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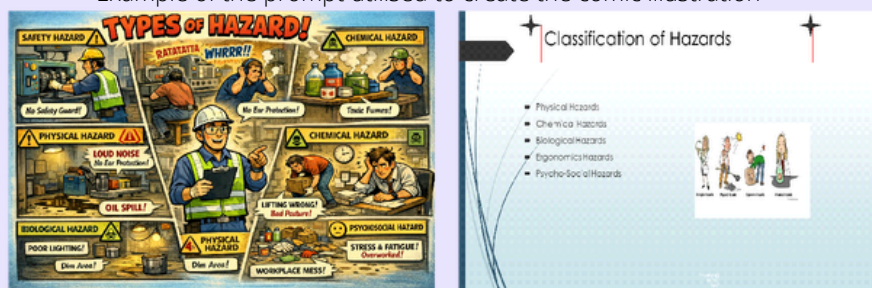
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Occupational safety and health (OSH) education is crucial for providing university students with the necessary skills to identify, evaluate, and manage workplace hazards. The OSH component encompasses Malaysian acts, regulatory compliance, and legislative frameworks, which pose significant challenges to promoting student engagement with both lectures and the course as a whole. Conventional lecture-based approaches often constrain students' ability to visualise OSH topics effectively, particularly when the material is grounded in regulatory frameworks. Consequently, students encounter challenges in comprehending practical OSH knowledge in their future careers. To address this issue, incorporating AI into OSH education appears to be a promising strategy for improving the effectiveness of teaching and learning.

Artificial intelligence (AI) has profoundly transformed higher education, particularly in improving teaching and learning experiences (Chen et al., 2020; Zawacki-Richter et al., 2019). In the context of OSH education, AI provides innovative approaches to enhance students' comprehension and engagement with safety concepts, risk assessment, and real-world risk management. Currently, the use of AI-powered tools such as ChatGPT, Gemini, and Perplexity provides more engaging and meaningful teaching and learning experiences. From an educational perspective, the integration of AI appears to be advantageous in supporting students' comprehension of topics addressed in OSH courses (Holmes et al., 2019). In our recent classroom activity, AI was employed to create comic-style illustrations based on specific instructions. As a result, students effectively used AI to create cartoons, thereby enhancing their understanding of the OSH curriculum.

Figures 1(a) and 1(b) present a comparison between an AI-generated comic illustration and a conventional slide-based lecture on a specific OSH topic. These findings suggest that AI-assisted visualisation improves student engagement and fosters a deeper understanding of the subject matter (Chen et al., 2020). The use of visual scenario elements facilitates students' understanding of abstract concepts and their application in real-world workplace safety contexts. Additionally, as illustrated in Figure 1(c), the students were instructed to produce comic illustrations using specified commands. This activity enhances their conceptual understanding and fosters active learning, creativity, and higher-order thinking skills by translating theoretical knowledge into practical visual representations (Zawacki-Richter et al., 2019).

Example of the prompt utilised to create the comic illustration



Please generate a comic illustration about "Types of Hazard" using workplace situation: Manufacturing Workshop. The character is a safety inspector that notify some unsafe act and unsafe condition as follows:

- A worker is operating a machine without any safety guard in place
- Oil is spilled on the floor near the machine
- Another worker is lifting a heavy box with a bent back posture
- There is loud noise from machines, and workers are not wearing ear protection
- Chemical containers are left open, releasing strong fumes
- Poor lighting in one corner of the workshop
- A worker looks stressed due to long working hours and tight deadlines
- Used gloves and waste materials are scattered around

Based on this situation, generate a comic illustration to emphasize on Types of Hazards.

Effectiveness of AI in OSH Education

The classroom activity demonstrated that AI integration in OSH can be understood through three primary dimensions: increased interactivity and student engagement, enhanced visualisation of safety concepts, and strengthened support for constructive learning. Table 1 summarises these three dimensions in terms of their impact on learning and provides examples derived from classroom practice.

Table 1: Summary of AI effectiveness in OSH education across three key dimensions.

Dimension	Description	Impact on Student Learning	Example from Practice
Interactivity and Engagement	AI tools facilitate active engagement through content production and exploration rather than passive learning.	Increased motivation, attention, and participation in class activities.	Students use ChatGPT or Gemini to develop comic scripts and scenarios.
Visualization of Safety Concepts	Complex OSH regulations and hazard scenarios are translated into graphic representations.	Improved understanding and retention of abstract or text-dense materials.	Comic illustrations depict unsafe acts, hazards, and preventive measures.
Constructive Learning Support	AI serves as a framework to assist students with idea generation, enhance comprehension, and obtain feedback.	Encourages critical thinking, creativity, and self-directed learning.	Students refine AI outputs, rectify inaccuracies, and present their interpretations.

Conclusion

Artificial intelligence has the potential to significantly improve instruction and comprehension in occupational safety and health by making content more interactive, visible, and meaningful. By promoting interactivity and visualisation, AI enhances the effectiveness of OSH education, improving learning outcomes and facilitating practical applications in real-world contexts. As higher education evolves, integrating AI into educational methods is essential for preparing competent graduates.

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Impact of Social Media on Youth Culture, Attention and Mental Health in Malaysia

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In Malaysia, social media has become a central part of everyday life, particularly among young people. With widespread smartphone use and accessible internet services, platforms such as Instagram, YouTube, and WhatsApp are frequently used for communication, entertainment, and learning. According to the Malaysian Communications and Multimedia Commission (2023), more than 96% of Malaysian internet users actively engage with social media, with the highest usage among individuals aged 16 to 24.

For many students, social media is not just a tool but a daily routine. It shapes how they interact with others, consume information, and build their identities. Despite its benefits in connecting people and increasing access to information, growing concerns have emerged regarding its impact on mental health. Researchers are increasingly examining the impact of constant exposure to online content on how young people think, feel, and behave. Issues such as shorter attention spans, unrealistic beauty standards, and emotional well-being are increasingly being discussed in Malaysia, with recent studies highlighting rising mental health concerns among youth (Ahlam et al., 2024).

Social Media and Youth Culture

Social media has significantly reshaped youth culture in Malaysia. In the past, young people's lifestyles and values were influenced mainly by family, school, and local communities. Today, digital platforms expose them to global trends, ideas, and lifestyles. One of the most noticeable changes is how easily young people can express themselves online. Social media provides a space for them to share their experiences, talents, and opinions while also connecting with others who share similar interests and perspectives. This sense of interaction and participation can foster a

sense of belonging and help adolescents feel connected to a larger community. In the Malaysian context, social media has also been found to encourage youth engagement and identity formation, particularly among adolescents who actively participate in online communities (Lee & Zhooriyati, 2022).



Figure SEQ Figure * ARABIC 1: The younger generation stays connected to share similar interests and voice opinions.

Social media also helps build supportive communities. Students who feel isolated in real life can connect with others online who share similar interests and challenges. This can reduce feelings of loneliness and provide emotional support. Similarly, Malaysian research highlights that social media can improve mental health awareness and encourage help-seeking behaviour among youth (Mohamad & Abd Mubin, 2023). However, there are also negative aspects, as social media often encourages comparisons regarding success, beauty, and lifestyle. This can create pressure to meet unrealistic expectations. The desire for validation through likes and comments may also affect one's self-esteem and emotional well-being. Social Media and Attention Spans

The impact of social media on attention issues is increasingly evident among Malaysian students. Many young people spend hours on their

devices, constantly switching between various types of content. According to the Malaysian Communications and Multimedia Commission (2023), Malaysians frequently access the internet multiple times per hour, reflecting high levels of digital engagement. This constant exposure to fast-paced content may affect students' ability to concentrate on academic tasks, a concern also reflected in Malaysian studies linking excessive social media use to behavioural and cognitive changes among university students (Ahlam et al., 2024). Students may find it harder to focus on lectures, reading materials, or assignments that require sustained attention.

From a psychological perspective, this pattern is linked to the brain's preference for instant enjoyment. Social media provides quick rewards, making slower and more demanding tasks less engaging. However, social media is not entirely harmful. Many Malaysian students use it for educational purposes, such as watching tutorials or accessing study resources. Research suggests that the impact on attention depends on how social media is used, with active and purposeful engagement being less harmful than passive scrolling.

Social Media and Mental Health

The combined influence of social media on youth culture and attention-getters has significant implications for mental health. On the positive side, social media provides access to information, support networks, and platforms for self-expression. In Malaysia, social media has been shown to promote mental health awareness and reduce stigma among young people. However, excessive use can lead to stress, anxiety, and emotional fatigue. The pressure to stay connected and maintain an online presence can be overwhelming for students. Additionally, exposure to negative or misleading content can worsen emotional well-being. Recent Malaysian systematic reviews have confirmed that while social media enhances connectivity, its overuse is closely linked to declining psychological health (Norasid & Ashaari, 2024). It is important to recognise that social media does not affect everyone equally. Students with strong support systems may experience fewer negative effects, whereas those with existing mental health challenges may be more vulnerable.

In conclusion, social media plays a significant and complex role in shaping youth culture and influencing how young people interact, learn, and express themselves. While it provides meaningful opportunities for connection and personal development, it also presents risks that can affect well-being. For this reason, a balanced and responsible approach to social media use is essential. With proper guidance, digital awareness, and self-regulation, young individuals can benefit from social media while reducing its negative impact.

For Malaysian youth, developing digital literacy is crucial. This includes managing screen time, critically evaluating content, and maintaining a healthy relationship with technology. Educational institutions such as UiTM can play an important role in promoting awareness and responsible use through their syllabus and students' activities. Ultimately, social media is not inherently harmful but must be used wisely. With the right balance, social media can become a tool that supports rather than harms youth's mental health.



Figure : Excessive use of social media can impact your mental health.

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Navigating AI Responsibly: Ethical Information Practices for University Students

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Artificial Intelligence (AI) is now part of everyday student life. Many university students use AI tools to search for information, summarise articles, generate ideas, and even draft assignments. These tools can make academic work faster and more efficient. However, their convenience also comes with ethical responsibilities, especially when dealing with information. Students in any field, particularly those related to information management, should understand how to use AI ethically.

Information management refers to the processes by which information is collected, organised, stored, and used. As students, this includes managing lecture notes, research data, and academic assignments. According to UNESCO (2023), students need to be careful about what they share online, avoid using AI platforms for confidential information, and choose tools that comply with proper data protection standards. This practice reflects the core principle of information management: protecting the integrity and confidentiality of data.



One of the most important ethical concerns is protecting personal and sensitive information. Many students may not realise that when they input data into AI tools, that information could be stored or processed externally. This becomes risky when it involves personal details, student records, or confidential research data.

From an ethical perspective, students should avoid sharing sensitive information on AI platforms and should always be aware of privacy policies. In Malaysia, this responsibility is reinforced by the Personal Data Protection Act (PDPA), which highlights the importance of safeguarding personal data. Protecting data is not just about following the law, but it is also about respecting the privacy of oneself and others.

Another key guideline is ensuring the accuracy of information. AI tools are powerful, but they are not perfect. They can sometimes produce incorrect or outdated information. If students rely entirely on AI without checking the content, they risk submitting inaccurate work. This can affect both academic performance and credibility. To avoid this, students should always verify AI-generated information using trusted academic sources such as journals, books, and university databases. In information management, accuracy is a fundamental principle because reliable information leads to better understanding and decision-making.



Figure : Making sure AI-generated data is accurate requires careful checking and ongoing monitoring.

In addition to accuracy, students must also be aware of bias in AI systems, including bias in the data or the algorithms themselves. AI tools are trained on large datasets, which may contain hidden biases.

As a result, the content generated may unintentionally reflect stereotypes or one-sided perspectives. Algorithmic bias remains a significant challenge in AI systems, affecting how information is presented and interpreted (Anika, 2025). To solve this, students should approach AI-generated content with a critical mindset, comparing multiple sources and considering different perspectives.

Academic integrity is another major concern when using AI. While it is acceptable to use AI as a support tool, relying on it too heavily can lead to plagiarism or misconduct. Some students may be tempted to copy and paste AI-generated answers directly into their assignments. Studies have shown that AI-generated content may appear convincing but still contain factual errors, making critical evaluation essential (Dwivedi et al., 2023). However, this practice is unethical and violates university guidelines. Proper citation and acknowledgement are also important when using external sources. As a result, maintaining academic integrity helps build trust and credibility, both in university and in future professional settings.



Figure: Always give proper credit to the original creators of the work you use to prevent copyright infringement.

Closely related to this is the concept of responsibility and accountability. Even when AI is used, students remain fully responsible for the content they submit. AI should not be treated as an authority that guarantees correct answers. Instead, students must review, edit, and verify all information before using it in their work. It is more important for students to understand authorship and ownership in digital environments (Chisunka, 2025). Taking responsibility also means being honest about the use of AI when required by lecturers or university policies. This awareness helps students become responsible users and creators of information.

Transparency is another important ethical guideline. Students should be open about how they use AI, especially in academic work. Some universities now require students to declare whether they used AI tools to complete assignments. Being transparent does not weaken a student's work; instead, it demonstrates honesty and ethical awareness. Understanding how AI tools function, at least at a basic level, will help students use them more responsibly.

Respecting intellectual property is another key guideline for students. AI tools can generate content influenced by existing works, raising questions about originality and ownership. Although AI can generate content quickly, this does not mean that the content is entirely original or free from ethical concerns. Existing materials, including copyrighted works, may influence AI outputs. Students must therefore be careful not to present AI-generated ideas as completely their own. Giving proper credit and following citation rules are essential practices.

Good information management habits also play a role in ethical AI use. Students should learn to organise their files, keep track of their sources, and store information securely. For example, maintaining a clear record of references makes it easier to verify information and avoid plagiarism. Using reliable platforms for storing academic materials also reduces the risk of data loss or misuse. These habits not only improve academic performance but also prepare students for professional environments where information handling is critical.

Universities themselves also have a role in promoting ethical AI use. Many institutions are now developing policies and guidelines to help students understand how AI should be used in academic work. Workshops, courses, and awareness programs on digital ethics are becoming more common. Students should take advantage of these opportunities to strengthen their understanding of AI ethics.

In conclusion, AI is a powerful tool that can greatly support students in managing information, but it must be used with care. Ethical issues such as data privacy, accuracy, bias, academic integrity, transparency, and intellectual property should always be considered. As technology advances, students will face increasingly complex ethical challenges in managing information. Those who develop strong ethical habits now will be better prepared for future careers. In many professions, especially those related to information management, the ability to handle data responsibly and ethically is highly valued.

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Digital Divide in the 21st Century: Rising Research Need for All to Address

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Historically, the term 'digital divide' was widely used in the mid-1990s to describe the disparity between those with access to the Internet and those without (Pierce, 2018). Subsequently, the digital divide was defined as the gap or inequality in a community's access to Information and Communication Technologies (ICTs), including inadequate internet access, insufficient equipment, and limited skills to use the technology effectively. It is about the gap between different demographic or socioeconomic groups in accessing, using, and deriving benefits from digital technology or ICTs. Badiuzzaman (2024) defines the digital divide as the uneven distribution of access, skills, and usage, as well as the effects of digital technology and ICT, among individuals, organisations, or countries. Therefore, the digital divide is considered dynamic and requires constant redefinition, given its widespread use.

The digital divide is one of the areas of study that requires continuous attention, as the gap varies with new technologies introduced to the world and how people interact with them. This is supported by Gomez-Barroso et al. (2026), who argue that the digital divide is an emerging area of study because parts of the population lack the basic technological skills to use new ICTs effectively. This behaviour can be justified because people are naturally fascinated by new technology, even if they are not prepared for it. This is because technology offers numerous benefits. For example, ICTs enhance communication and collaboration, which contribute to the digital economy. Furthermore, ICTs support sustainable development, which is useful for handling crises and keeping the organisation going, as technology facilitates rapid recovery.

Therefore, the exponential growth of artificial intelligence (AI) as an advanced component of

ICTs has widened the digital divide among communities. The Microsoft AI Economy Institute (2026) confirms that AI is one of the fastest diffusing technologies in modern days, where AI global adoption has grown rapidly by the 2nd half of 2025, and pointed out that 16.3 percent of the world population, or about one in six people globally, had used a generative AI tool. The widespread adoption of AI globally and across sectors underscores the need for a new research area: the AI digital divide. UNESCO (2025) highlighted the AI digital divide, focusing on the unequal access to, benefits from, and opportunities offered by AI across regions, communities, and socioeconomic groups, which marginalises these communities. Similarly, Hanan (2026) indicated that AI use is spreading rapidly, and access to and benefits from it are uneven, potentially widening gaps based on income, geography, and opportunity.



The AI digital divide is widening, deepening the gap between people who benefit from technology and those who don't. Richer communities have better access to AI, while poorer communities might be left behind. Powerful AI tools are expensive, so only big companies and wealthy communities can use them. This leaves some groups out of AI opportunities. Hanan (2026) argues that AI is creating digital inequality that risks deepening existing social and economic gaps, especially for children and vulnerable communities. Not only



that, but people who are not using AI will also be affected by it. It is not simply about having technology; AI can influence a country's decisions on education, healthcare, welfare, economic development, and overall performance.

Countries that invested early in digital infrastructure will benefit more from AI. Microsoft AI Economy Institute (2026) indicated a significant widening gap between high-income countries such as the United States, Canada, and Western Europe, with 2 per cent AI adoption, and low- and middle-income countries such as Sub-Saharan Africa, Latin America, Southeast Asia, and Singapore, with 1 per cent AI adoption. These statistics suggest that AI adoption is accelerating globally, but its benefits are unevenly distributed. National policy, digital competencies, language localisation, and reasonable pricing strongly influence AI adoption.

Reducing the AI digital divide is fundamental to ensuring that all individuals, regardless of their geographic and economic backgrounds, can access AI technology and its benefits. Here are the four key reasons why we need to reduce the AI digital divide:

Access to Information and Technology: Ensuring everyone has access to AI tools, as it facilitates participation in the digital economy, AI can improve access to information, which is crucial for quality education and skills development.

Digital Inclusion: Ensuring everyone has access to and can use digital technology effectively and can gain benefits from AI.

Social inclusion: Ensuring and promoting equity for all individuals in society, where everyone has equal access and opportunity to participate in and lead in AI, enabling them to achieve their potential. Focus on using AI for inclusion, not exclusion.

Economic inclusion: Ensuring AI can reduce economic gaps by providing access to new job opportunities and services, making it a competitive advantage rather than a disadvantage

More research on the AI digital divide at the national level, especially in the education, economic, and social sectors, is crucial. This is because the research findings will help identify strategies and national policies to reduce the gap and eventually close the AI digital divide in communities so that everyone can benefit from AI. It is also particularly important, as it helps identify those already excluded from the digital economy, especially marginalised communities. It can also help a nation be better prepared through AI adoption and by mitigating the negative impacts of AI on communities.

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Agro-industrial Waste Valorisation

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Agriculture and food processing industries globally generate 1.3 billion tonnes of waste annually, accounting for about one-third of total global food production (Prado-Acebo et al., 2024; Rojas et al., 2022). Traditionally, this immense volume of waste, ranging from agricultural waste such as stalks and leaves to food industry waste such as peels, pomace, and spent grounds, has been disposed of through incineration or landfilling (Prado-Acebo et al., 2024). This linear "take-make-dispose" model poses severe environmental threats, contributing to greenhouse gas emissions and atmospheric pollution and wasting massive economic potential (Prado-Acebo et al., 2024; Sarangi et al., 2022).

However, this paradigm is shifting toward agro-based waste valorisation, a transformative strategy that converts organic residues into high-value products, fuels, and chemicals (Sarangi et al., 2022; Prado-Acebo et al., 2024). This practice goes far beyond mere waste management; it is a fundamental driver reshaping the food industry, fortifying global food security, and establishing a sustainability-focused circular bioeconomy (Rojas et al., 2022; Sarangi et al., 2022).



The impact of waste valorisation on the food industry is incredibly profound, shifting operations from high-disposal-cost centers to highly profitable, sustainability-driven closed-loop systems (Rojas et al., 2022). Industrial food processing generates significant concentrated waste streams, such as spent coffee grounds, olive pomace, and grape stalks, which retain high concentrations of valuable biomolecules (Prado-Acebo et al., 2024). Through targeted extraction techniques like pressurised liquid extraction or enzymatic hydrolysis, the food industry can recover highly sought-after bioactive compounds, including antioxidants, phenolics, functional proteins, and pectin (Rojas et al., 2022).

For instance, grape seeds and skins left over from winemaking are processed to extract anthocyanins and tannins, which are then reintegrated into the market as functional food ingredients, nutraceuticals, and natural cosmetics (Rojas et al., 2022; Prado-Acebo et al., 2024). Similarly, cocoa pod husks and coffee peels are transformed into dietary fibres and sugars for the food industry (Rojas et al., 2022).

Furthermore, agri-food waste serves as an excellent, cost-effective substrate for microbial bioconversion to produce crucial industrial enzymes. Fungal and bacterial cultures grown on residues such as coffee peel or wheat bran can secrete pectinases, proteases, and lipases, which are subsequently reutilised in the food industry to further process materials and enhance product quality (Rojas et al., 2022). By capturing these high-value components before utilising the remaining biomass for bioenergy, the food industry maximises its biovalue, eliminates waste management costs, and generates entirely new revenue streams (Prado-Acebo et al., 2024; Rojas et al., 2022).

Equally significant is the role of agro-waste valorisation in addressing critical challenges in global food security, serving as a crucial component of global sustainability efforts (Prado-Acebo et al., 2024).

A prominent concern in the modern bioeconomy is the "food-fuel conflict," in which arable land and edible crops (such as corn or sugarcane) are diverted from food markets to produce biofuels, threatening food availability and driving up prices (Prado-Acebo et al., 2024).

By establishing second-generation biorefineries that rely exclusively on agricultural residues and non-edible byproducts, the energy sector can produce vital biofuels without competing for the fertile land needed to feed a growing population (Prado-Acebo et al., 2024; Sarangi et al., 2022). Beyond mitigating this conflict, valorisation directly contributes to agricultural productivity (Prado-Acebo et al., 2024). The solid organic residues that remain after the extraction of carbohydrates or biofuel fermentation can be transformed into nutrient-enriched bio-fertilisers and biomanure (Prado-Acebo et al., 2024; Sarangi et al., 2022). Applying these organic bio-fertilisers back to croplands enhances soil fertility, promotes healthy plant growth, and increases agricultural yields without the toxic runoff associated with synthetic chemical fertilisers (Prado-Acebo et al., 2024).



Additionally, some extraction processes focus on recovering low-molecular-weight peptides from by-products such as bovine bones, thereby introducing novel, sustainable protein sources into the animal feed and human nutrition supply chains (Rojas et al., 2022). By improving soil health and optimising nutrient extraction, the valorisation loop provides a robust defense against food

scarcity and directly supports the United Nations' Zero Hunger sustainability objective (Prado-Acebo et al., 2024). Ultimately, these advancements lead to the transition toward a circular bioeconomy, which serves as the key framework for long-term sustainability (Prado-Acebo et al., 2024; Sarangi et al., 2022). This framework replaces the traditional "take-make-dispose" concept with the "5R" principles: reduce, reuse, recycle, recover, and restore (Rojas et al., 2022).

Instead of viewing biomass as refuse, advanced multi-product biorefineries utilise it as a versatile feedstock, fractionating its primary lignocellulosic components such as cellulose, hemicellulose, and lignin to extract maximum value in a zero-waste approach (Prado-Acebo et al., 2024). Industrial symbiosis is a critical enabler in this ecosystem, allowing traditionally separate industries to form collaborative networks in which the waste or by-products of one facility become essential raw materials for another (Salomone et al., 2020). For example, residues from food processing can be diverted to produce bioethanol, biomaterials, or even bio-based building products, thereby decoupling economic growth from the extraction of virgin fossil resources and severely limiting environmental degradation (Salomone et al., 2020; Sarangi et al., 2022). By integrating thermal, chemical, and biological conversion technologies, these systems transform an environmental liability into a localised engine for sustainable economic development (Prado-Acebo et al., 2024; Sarangi et al., 2022). Collaborative mechanisms, such as establishing ecologically equipped industrial areas or utilising shared infrastructure, ensure that the geographic proximity of these industries maximises resource efficiency (Salomone et al., 2020).

In conclusion, the integral multi-valorisation of agro-industrial wastes is a basis for modern sustainability and development (Prado-Acebo et al., 2024). The remarkable capability to transform crop stalks, fruit peels, and processing effluents into bio-based chemicals, functional ingredients, and organic fertilisers proves that agricultural waste is simply a misplaced resource (Sarangi et al., 2022; Rojas et al., 2022). To fully unleash the potential of these innovations, the food industry

must adopt targeted extraction to maximise profitability, champion food security through non-competing biofuels and bio-fertilisers, and forge a circular bioeconomy through deep industrial symbiosis and integrated multi-product biorefineries (Prado-Acebo et al., 2024; Salomone et al., 2020). As these sectors aggressively adopt these closed-loop pathways, they will drastically reduce their environmental footprint, pioneer resilient economic opportunities, and safeguard the planet for generations to come (Prado-Acebo et al., 2024; Rojas et al., 2022).

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Using Social Simulation Games to Foster Confident English Speakers

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Language learning thrives when anxiety is replaced by curiosity, yet the fear of making mistakes in front of peers can be a significant barrier for many English as a Second Language (ESL) students. A growing body of research suggests that social simulation games such as “The Sims” (2000) offer a compelling solution. By stepping into the shoes of a character within a low-stakes, interactive world, learners are motivated to use English creatively. According to Professor Jonathan Reinhardt of the University of Arizona College of Information Science (2024), students reported that they have been learning English continuously while playing The Sims.

Classroom-based studies further demonstrate the practical value of this approach. An exploratory experiment that integrated The Sims 4 into a vocabulary-focused curriculum found that teacher instruction and structured in-class activities effectively fostered vocabulary acquisition, transforming screen time into a productive, goal-oriented learning experience (Wang, 2024). This shift from rote memorization to meaningful, playful interaction directly addresses the affective filter hypothesis, which holds that students learn best in a relaxed environment.

The positive impact on students’ motivation and emotional engagement is also well-documented. A comprehensive review of digital simulation games in language classrooms confirmed that such platforms consistently enhance not only vocabulary knowledge and retention but also a

range of positive affective factors that support learning (Digital simulation games in CALL, 2023). When classrooms combine the immersive pull of a simulation with deliberate instruction, they do more than teach English—they cultivate self-assurance.

Quantitative evidence from a study by Zadylska et al. (2024) further underlines the quantifiable gains that simulation games can yield in communicative competence. They tracked the progress of an experimental group of foreign language students who learned through simulation games, compared with a traditional control group. The results showed that the experimental group not only progressed to a B2 proficiency level (with an average score increase of 1.76 compared to the control group's 0.57) but also demonstrated substantial improvements in interview-based speaking tasks, outperforming the control group by 46% in this area.

Most strikingly, self-reported confidence in communication surged to 81% among the game-based learners, up from 50% in the traditional group, providing a direct statistical link between digital simulation and learner self-assurance.



In parallel, a focus on the psychological dimension of speaking is critical to understanding why these games build confidence. The landmark study “Can I Say Something? The Effects of Digital Game Play on Willingness to Communicate” (Reinders & Wattana, 2014) directly examined learners’ readiness to enter discourse at a particular time with a specific person or persons, using a L2.

30 Thai university students of English as a foreign language participated in six 90-minute sessions playing "Ragnarok Online," a massively multiplayer online role-playing game. Before the gaming sessions, the students reported low confidence, high anxiety, low perceived competence, and low willingness to communicate. After the six-game intervention, the same measures showed a marked and significant improvement: participants felt more confident, less anxious, more competent, and notably more willing to use English in conversation. This shift in disposition is a core prerequisite for authentic language use, demonstrating that social simulation gaming can lower the psychological barriers that often inhibit spoken English.

Looking beyond willingness to the actual mechanics of speech, longitudinal research has traced tangible improvements in the linguistic building blocks of spoken fluency. A mixed-methods case study published by Jabbari & Peterson (2023) measured the speaking performance of six English as a foreign language (EFL) gamers over a six-month period while they played commercial massively multiplayer online games, using English as the main medium of communication. The participants were divided into two groups based on proficiency level: low-intermediate and high-intermediate. Each group collaborated with a native English speaker within the game environment. The findings revealed that the gamers' speaking performance improved in half of the measured indices of complexity, accuracy, and fluency (CAF). The researchers linked these gains to the socio-affective environment of games, where communication is play-driven and collaborative. This suggests that pressure-free, frequent interactions are key drivers of oral language development. It also provides a clear, longitudinal link between in-game speaking practice and the development of confident, fluent English production.

Ultimately, harnessing the joy of social gaming transforms the language classroom into a safe space for growth, equipping students with the communicative courage to succeed beyond its walls. Educators who choose to incorporate these tools are not merely providing entertainment; they are strategically activating proven mechanisms that reduce anxiety, increase willingness to speak, and improve their students' underlying fluency. As the evidence from these studies collectively suggests, the path to confident English speakers may well be paved with virtual worlds and player-driven communication

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Menelusuri Jejak Linguistik: Peranan Bahasa Arab sebagai Pasak Budaya Malaysia-Dunia Arab

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UiTM CAWANGAN NEGERI SEMBILAN KAMPUS SEREMBAN

Kedudukan bahasa Arab di Malaysia kini telah berkembang melampaui fungsi tradisinya yang sering dikaitkan dengan ritual keagamaan semata-mata. Dinamika sosioekonomi semasa menyaksikan bahasa ini merentasi pelbagai aspek kehidupan, termasuk bidang pendidikan, ekonomi dan sektor pelancongan negara. Penggunaan yang semakin meluas ini membuktikan bahawa bahasa Arab berfungsi sebagai medium yang signifikan dalam interaksi sosial dan profesional. Khususnya bagi masyarakat Melayu-Muslim, bahasa Arab bertindak sebagai jambatan penghubung budaya yang utama dengan dunia Arab. Peranan strategik ini bukan sahaja memperkukuh identiti keislaman tempatan, malah memudahkan jalinan interaksi rentas budaya serta menyumbang kepada pembangunan sosial dan ekonomi negara.

Menelusuri sejarah, hubungan antara Nusantara dan dunia Arab telah lama terjalin sejak era kedatangan Islam ke rantau ini. Proses Islamisasi bukan sekadar membawa ajaran akidah dan syariah, tetapi turut memperkenalkan bahasa Arab sebagai medium utama dalam penyebaran ilmu dan komunikasi. Impak paling ketara daripada interaksi ini dapat dilihat melalui penyerapan sejumlah besar kosakata Arab ke dalam struktur bahasa Melayu, terutamanya untuk melambangkan konsep dalam bidang agama, undang-undang dan falsafah (Harun, 2019). Perkataan harian seperti iman, adil, hakim dan ibadah kini menjadi sebahagian daripada leksikal harian masyarakat Melayu. Integrasi mendalam ini mencerminkan bahawa penyerapan tersebut tidak hanya berlaku pada peringkat linguistik luaran, malah turut mempengaruhi cara berfikir serta norma sosial masyarakat tempatan secara menyeluruh.

Selain pengaruh kosakata, penggunaan sistem tulisan Jawi yang berasaskan abjad Arab turut memainkan peranan kritikal dalam memperkukuh hubungan tamadun Melayu dengan dunia Arab (Harun, 2019). Pada masa lalu, tulisan ini memegang status sebagai sistem tulisan utama dalam urusan pentadbiran, kesusasteraan dan sistem pendidikan di Alam Melayu. Meskipun penggunaannya kini semakin berkurangan, tulisan Jawi tetap dipertahankan sebagai simbol warisan budaya Melayu dan identiti Islam (Abdullahi et al., 2023). Melalui perkongsian simbol ini, bahasa Arab bertindak sebagai agen penyatuan umat Islam pada peringkat global.

Dari dimensi ritual dan ibadah pula, umat Islam di Malaysia berkongsi amalan yang selari dengan masyarakat Arab, seperti pelaksanaan solat, ibadah haji dan bacaan doa dalam bahasa Arab (al Yamin, 2023). Keseragaman linguistik dalam aspek spiritual ini mewujudkan rasa kesatuan ummah yang merentas sempadan geografi. Malah, penggunaan istilah ilmiah dan sastera Arab dalam pengajian Islam serta penulisan akademik turut memperkasakan hubungan intelektual antara kedua-dua wilayah.



Sektor pelancongan di Malaysia merupakan antara bukti nyata bagaimana bahasa Arab berfungsi secara praktikal sebagai perantara budaya dan pemacu ekonomi. Malaysia kekal menjadi destinasi pilihan utama bagi pelawat dari Timur Tengah disebabkan oleh faktor keselamatan, kemudahan akses makanan halal serta keserasian dengan budaya Islam yang diamalkan majoriti penduduk. Bagi memenuhi keperluan pasaran ini, pelbagai inisiatif telah dilaksanakan, seperti penyediaan brosur pelancongan, papan tanda bermaklumat serta perkhidmatan dalam bahasa Arab. Langkah proaktif ini bukan sahaja meningkatkan daya tarikan pelancong, malah membuka peluang kerjaya yang luas kepada masyarakat tempatan yang menguasai bahasa Arab. Pada masa yang sama, interaksi harian antara pelancong Arab dengan komuniti setempat menyumbang kepada pertukaran budaya yang lebih dinamik dan bermakna (Zin et al., 2013).

Namun demikian, peranan bahasa Arab sebagai penghubung budaya ini tidak terlepas daripada mendepani cabaran. Antara isu utama ialah perubahan makna dalam proses meminjaman kata. Sesetengah perkataan Arab yang diserap ke dalam bahasa Melayu mengalami pergeseran semantik, yang berisiko menimbulkan salah faham, terutamanya dalam konteks keagamaan atau akademik (Abas et al., 2021). Perbezaan ini menuntut kepekaan linguistik dan pemahaman mendalam terhadap kedua-dua bahasa. Tanpa penguasaan yang utuh, risiko salah tafsir terhadap teks atau konsep tertentu boleh menjejaskan keberkesanan komunikasi dan pemahaman silang budaya.

Kesimpulannya, bahasa Arab memegang peranan yang amat signifikan sebagai instrumen penghubung budaya antara Malaysia dan dunia Arab. Melalui rentetan sejarah, perkongsian kosakata, penggunaan tulisan Jawi, keseragaman keagamaan serta pemantapan sektor pelancongan, bahasa ini kekal sebagai jambatan penting yang menghubungkan dua dunia yang berbeza. Walau bagaimanapun, demi memastikan keberkesanan medium komunikasi ini, segala cabaran berbentuk linguistik dan pedagogi mestilah ditangani berdasarkan kerangka ilmu yang sahih.

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The Ghost in The Machine: Can We Still Tell Who's Writing?

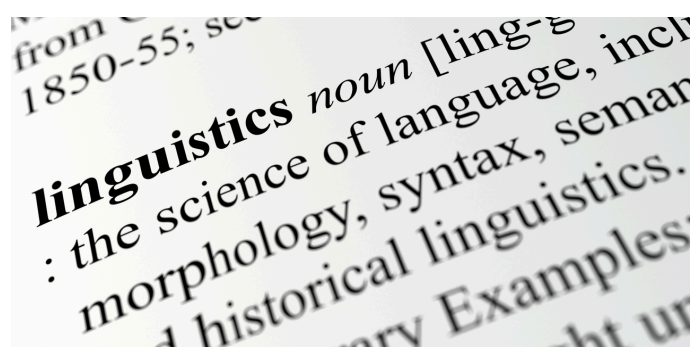
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UiTM CAWANGAN NEGERI SEMBILAN KAMPUS SEREMBAN

As we navigate 2026, the challenge is not about *'Did a bot write this?'* but more about *'How much of a human touch is left after a bot edited it?'* The line between what people write and what Artificial Intelligence (AI) creates is getting blurry. We are now seeing a mix of both rather than one or the other. In the world of language science, experts are increasingly turning to **stylometry**, which uses math to track a person's unique writing style. Even though AI is built to polish and "beautify" our writing, researchers want to know one thing: Does your personal writing DNA stay visible after an AI has edited your work?

The Hidden Fingerprint: Why AI Can't Hide Your Writing Style

The way we write is much more than just a choice of words. It is a subconscious reflection of our identity. At the core of *forensic stylometry*, the science of identifying authorship through language, lies the idea that every person has a "*linguistic fingerprint*." This fingerprint is made up of unique habits we are not even aware of, such as how we use punctuation, the rhythm of our sentences, and how often we use small, functional words like "and" or "with" (Chaski, 2021). Experts believe these patterns are as distinct as a physical thumbprint.



In the modern world, many people use AI to polish or rewrite their work. When an AI tool edits a draft, it acts as a statistical filter. Its goal is to take a person's unique, sometimes messy writing and pull it toward a communicative mean, essentially making the text sound like a polished,

average version of professional English. As AI is trained on massive amounts of data, it tends to smooth out the quirks that make a person's writing stand out.

However, hiding your identity behind an AI is harder than it seems. Recent research suggests that while AI is excellent at changing the surface of a text by improving vocabulary and fixing grammar, it struggles to overwrite the deeper architecture of a person's writing (Tyo et al., 2022). Like a fresh coat of paint on a house, the AI changes the look, but the underlying structure remains the same.

These traits include how a writer embeds clauses within sentences and their error profile, the specific, consistent types of mistakes they tend to make. Even after an AI has finished its rewrite, these structural habits often remain. In legal disputes or cases of academic misconduct, forensic investigators look for these leftover markers. By identifying the persistent DNA of a person's original style within an AI-polished document, experts can still determine who truly wrote the words, proving that our subconscious habits are far more powerful than a digital filter.

The "Smoothing" Effect and the Loss of Burstiness

For advanced readers, AI-generated text often falls into a linguistic "uncanny valley": grammatically impeccable yet eerily monotonous. This phenomenon is largely attributed to a lack of burstiness, the human tendency to fluctuate between various sentence lengths and structures based on cognitive load and emotional intent. As noted by Mitchell et al. (2023), LLMs are trained to predict the "most likely" next token, which inherently favors a balanced, predictable rhythm. Human prose, by contrast, is characterised by its irregularity. This lack of variance has become a primary forensic

indicator; a document that is too perfect in its rhythm often signals a lack of human cognitive spontaneity.

The Socio-Legal Implications of Digital Attribution

The ability to identify a human author behind AI-filtered text is not merely an academic exercise; it has a profound real-world impact. In the legal field, the concept of *intermodal attribution* (identifying a source across different modes of generation) is becoming a cornerstone of digital forensics.

Juola (2021) emphasises that as AI impersonation becomes more sophisticated, the forensic linguist's role shifts from simple detection to *style-crawling*. This involves comparing the suspected AI-hybrid text against a known corpus of the individual's previous human-only writings. If the specific collocational signatures (words that an individual uniquely pairs) remain consistent, the probability of human authorship remains high despite AI intervention. This evidence is crucial in 2026 for verifying whistleblowers' authenticity or protecting intellectual property in an era when style theft via AI is increasingly common.

Conclusion: Embracing Human Imperfection

As we continue to utilise AI to enhance our communication, the field of forensic linguistics reminds us that our flaws are what make us identifiable. From a pedagogical perspective, particularly for those working with multilingual learners, a student's unique L1 interference is not just an obstacle to be clarified by AI; it is evidence of their emerging identity. In the forensic battle between the ghost and the machine, it is our subconscious irregularities that ultimately prove we were there.

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Step into The Conversation Using 360° Video to Build Students' Communication Confidence

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In some of the educational spaces we find ourselves in, there's an event that seems all too familiar. Students understand what we have taught them. They can describe how to organise a presentation, recognise what should occur during a meeting, and successfully complete the assignments given to them. However, once students are required to communicate verbally, react, or engage in a real-time exchange, many continue to hold back. It isn't a matter of their lack of knowledge but of something else. Students are predominantly task-focused and less likely to participate in real-time communication. While this indicates the issue extends beyond simply educating students on content, it also highlights the need for approaches that support students in becoming active participants in relevant situations (Katlen et al., 2022; Salim et al., 2025a). It is not limited to one class or school. Language education research has repeatedly demonstrated that students face challenges communicating in real life because they lack meaningful exposure and opportunities to practice communication in realistic conditions. As stated by Foster et al. (2021), when students immerse themselves in the learning process through interactive experiences, they tend to retain information more effectively than those who learn only through passive instruction. In terms of communication education, this is especially true because communication cannot be explained solely. It has to be lived.



To help bridge this gap, various efforts have explored ways to introduce more "reality" into the classroom. Traditional role-plays and discussions remain valid methods for teaching students to communicate. However, they are often structured. Students are aware of their turn to talk, what to say, and when the exercise will finish. Communication in the workplace is typically unplanned, often messy, and frequently unpredictable. Additionally, communication in a work setting includes managing tone and responding to others in real time.

This can be seen in various studies that emphasise the importance of introducing students to authentic forms of communication, such as meetings, professional etiquette, and real-time communication interactions (Salim et al., 2025b; Ponomarenko et al., 2024; Siddiqui, 2024). One method that has demonstrated significant effectiveness in bridging this gap is the utilization of 360-degree video. On the surface, it appears similar to other instructional technologies, yet the experience it provides is significantly different. Rather than viewing the scene from a fixed point, students can navigate the space, observe various speakers interact, and follow conversations from multiple viewpoints. Essentially, students are not merely watching the conversation; they are immersing themselves in it. According to Radianti et al. (2020), immersive technologies enable learners to experience reality more realistically, leading to greater engagement and understanding. This approach is further supported by the work titled "Immersive Vocabulary Learning with Step Into Vocabulary (S.I.V.)" (Salim et al., 2025c), which used a 360-degree video to create contextualised learning

environments. The findings indicated that learners became more engaged and confident and, more importantly, were able to connect language to real-world situations rather than relying solely on memorisation. When applied to communication education, the effects become even more pronounced.

Students who view discussions or meetings via 360° video will be able to identify factors they would otherwise never have seen. The students can see what starts the dialogue, how one participant reacts to another, and how the ideas develop. While viewing these dialogues, students are also becoming increasingly aware of nonverbal communication, such as facial expressions, posture, eye contact, and tone. This is an area that cannot be taught directly; however, it is an important factor in effective communication. A study by Shah et al. (2026) on the influence of Immersive 360 Degree Video on Oral Communication found that students' performance in discussing topics improved with exposure to immersive experiences. What makes using 360° video exciting is that it fits well with the evolving trends in second language education. The integration of 360° videos in various technological tools, such as chatbots and social media, allows students to practice their communicative abilities in low-risk situations and obtain instant feedback without being evaluated or judged by others (Salim et al., 2026; Shah et al., 2025; Malik & Qureshi, 2024).

Ultimately, utilising 360° video represents a larger paradigm shift in education: rather than teaching students simply about the "what" of communication, we are now emphasising the experiential nature of learning. Regardless of whether that occurs through an immersive video experience, interactive chatbots, or online platforms, our overall objective has remained consistent: to assist students in moving beyond knowledge of how to communicate effectively to the ability to apply such communication skills in practical settings. Perhaps what students need is not mere explanation, but more opportunities to experience communication as it happens. When they are given the chance to step into these situations, through a screen, the learning goes beyond knowing what to say to having the confidence to say it.

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Developing Communication Skills Through Project-Based Tasks

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Project-based learning (PBL) has been identified as a potential method for closing the gap between classroom instruction and real-world application. PBL involves students being placed in the role of learners, active participants in their own learning experience. The focus of PBL is on providing students with a direct, hands-on learning experience. In other words, instead of merely delivering content to students, PBL provides students with opportunities to develop knowledge and skills through real-world experiences. Experiential learning theory is consistent with the nature of PBL. Hguyen and Tuoang (2024) cited Kolb and Fry's work on this issue: "Experiential learning is the process whereby knowledge is created through the transformation of experience." Experiential learning occurs when individuals are actively engaged in the learning process. This type of learning is very applicable to communication studies. Communication is not a theoretical skill; rather, it is a practical skill that is developed through the act of communicating. Therefore, providing students with an opportunity to develop their communication skills in a real-world setting will help them improve their communication skills.

In addition to developing their communication skills, students gain additional benefits from participating in project-based learning. One benefit is developing teamwork communication. Teamwork communication is a critical component of any successful team effort.

Salim et al. (2025) state that, regardless of whether you work individually or collaboratively with others, your ability to communicate effectively is a key factor in success. As mentioned earlier, students will develop their communication skills through participation in group-based projects. In addition, they will also develop the skills needed to function successfully as members of a team. These include: (1) expressing themselves clearly, (2) listening to others, (3) managing disagreement and conflict, and (4) working together to achieve a common goal. While students can develop some of those skills through individualised tasks, developing all these skills will likely occur through participation in group-based projects (Salim et al., 2024). Furthermore, research indicates that creating structured collaborative learning environments increases student engagement and adaptation (Adnan et al., 2024).

Finally, another advantage of project-based learning is that it provides students with the opportunity to develop their communication skills in a variety of ways. Too frequently, classroom communication activities are limited to academic settings and do not provide sufficient opportunities for students to apply what they have learned in real-world contexts. By framing the project in a realistic, relevant context, PBL enables students to apply the concepts they have studied in their coursework. For example, students could be required to create multimedia presentations using digital tools, develop websites, or even run product or service campaigns. Research demonstrates that when students are given direction and appropriate digital tools for a project-based task, they produce more effective communication outputs (Krisnan et al., 2022).

There is evidence that providing students with flexible learning options enables them to engage

in more open and creative learning environments, thereby increasing motivation and participation in learning (Wan Mustapha et al., 2019). This provides further support for incorporating PBL into post-secondary education. Additionally, PBL offers researchers opportunities to investigate student engagement, communication confidence, teamwork dynamics, and the transfer of real-world skills. Furthermore, the effect of PBL can be observed in students' academic performance and in their preparedness to communicate in real-life contexts. This corresponds to current trends in higher education, emphasising the production of graduates who are competent in both knowledge and application.

Overall, incorporating PBL into communication courses represents a significant move towards more relevant and meaningful teaching practices. PBL transforms learning from passive understanding to active involvement. When students are given the opportunity to learn through action, communication is not something they simply study; rather, they continually practice and develop it.



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The Multimodal Metaverse: Real-life Language Practice in Feigned Virtual Horizon

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Language education has undergone rapid evolution following the shift from a print-based paradigm to a digital milieu. The application of the metaverse directs language learning toward more robust concepts of digital, interpersonal, and multimodal communication. The metaverse refers to a space that integrates virtual reality, including augmented reality and various immersive technologies (Tyagi et al., 2023). With the transformation of language learning, the incorporation of multimodal technologies becomes central. These multimodal technologies integrate the use of haptics, which activate the touch and motion senses in replicating the real direct interactions through operations or activities remotely. This approach also nurtures multimodality among learners, which Garcia (2026) defines as the ability to convey meaning through diverse modes, such as words and gestures, that underpin information exchange. The adoption of the multimodal metaverse is gaining traction in ASEAN, especially in Malaysia. These seamless technologies not only provide more convenient platforms for learning languages in higher institutions but also offer ideas for delivering effective lessons, such as two-way simulations and collaborative tasks that reinforce understanding and participation among learners.

Learning Journey with Gusto

Integrating education with metaverse technology enables learners to immerse themselves in an exciting and memorable learning environment. Imagine having to choose among various themes and settings, with a touch of gamification, in a language class; for example, exploring a virtual sphere where learners practice vocabulary in the Shakespearean era or take part in a negotiation with the characters to reach a ceasefire agreement.



Learners, especially the young ones, will find it thrilling every time a lesson is taught. As a result, students eagerly anticipate each class, making learning something they look forward to rather than miss. Not only does it create a stimulating learning environment for students, but it also accommodates learners' individual learning paces, which is crucial for instilling interactive and positive learning. Pujari et al. (2024) support the idea that metaverse users benefit from greater flexibility and independence in intercommunication. In addition, instructors need not worry, as the metaverse creates new opportunities for creativity by allowing users to design, experiment with, and share original virtual experiences (Riedl, 2019). This interactive environment encourages innovative thinking and creative expression, enabling individuals to explore ideas in ways that are not possible in physical settings.

New Dimension of Vocabulary and Communication Escapade

Learners often thirst for genuine, immediate practice in interaction and obtaining this experience is challenging in a physical language-learning environment. However, the use of the metaverse in language education bridges the existing gap. The metaverse creates simulated environments for lessons, where practicing target languages is possible in lifelike settings. As Çelik and Baturay (2024)

describe, it is possible for an L2 instructor to teach students vocabulary related to sea creatures, but the metaverse can bring the ocean world into the classroom, allowing students to explore. This unique academic dimension paves the way for research on the processes involved in language development. For instance, studies prove that incorporating the metaverse into language teaching substantially enhances second language (L2) vocabulary acquisition, long-term retention, and students' sense of community (Çelik & Baturay, 2024). The 3D environments and virtual spaces via avatars become platforms on which learners can place abstract language forms in meaningful contexts. This interactive approach helps learners process vocabulary more effectively and keep it longer than traditional text-based memorisation. Moreover, applying the metaverse to learning integrates both direct and delayed forms of social communication, despite the geographical setting (Li & Yu, 2023). This method involves learners engaging in activities such as role-plays and collaborative searches with little or no consequence; they are inspired by trial and error and experience less pressure. Thus, this virtual exercise helps not only in building vocabulary competence but also in developing speaking ability for real-life communication.

Cultivating Positive Mental Well-being

In learning languages, learners often face strains in achieving certain levels of proficiency. This phenomenon is due to the fear of making mistakes and of facing embarrassment in front of others. Engaging in the metaverse allows students to explore topics that spark fascination, interest, and amusement, motivating them to learn the intended language (Pujasari et al., 2024). Hwang et al. (2023) highlight that learners' motivation coexists with active participation and effects from using the metaverse in learning. By employing the metaverse, learners have the opportunity to choose their personalised avatar. This mask of anonymity provides space for learners to adjust themselves in conversing and applying the language on the virtual platform. It lessens the anxiety of being evaluated and having performance fright. Not only that, but since the contexts in the metaverse follow learners' preferences and levels of proficiency, instructors can develop specific learning environments to support emotional stability and neutralise fear stemming from real-life hurdles. Pradana and Elisa (2023) believe that these circumstances in metaverse learning should be observed to fathom the long-term effects and scrutinise the correlations among performance, motivation, and participation in learning.

Conclusion

The use of the metaverse in tertiary-level classrooms has been shown to have positive impacts on learners (Pujasari et al., 2024). The implementation of a multimodal metaverse in language education opens opportunities for educators to broaden effective approaches in virtual classrooms. Besides, it provides platforms for learners to experience a more interactive and engaging learning environment. However, such an initiative requires proper planning and consideration from all academic stakeholders to ensure a more productive outcome.

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Comparing Alerters in English and Malay Workplace Requests

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In the modern professional landscape, making a request is a complex social act that requires more than clear instructions. In the Malaysian workplace, where English and Malay often coexist, the way colleagues ask for assistance reveals significant cultural differences. A key element of these requests is the use of alerters - linguistic devices placed at the start of an interaction to capture the listener's attention and establish a social relationship. While English-language requests among colleagues often use alerters to promote efficiency and equality, Malay-language requests use them to signal respect and maintain social harmony. This essay examines these differences, focusing on how peer-to-peer requests are structured through various politeness strategies.

English Requests: Efficiency and Attention-Getting

In English workplace communication, which is typically viewed as "low-context", requests are designed to be functional and time-sensitive. In this context, alerters primarily serve to grab attention and establish a friendly, collaborative tone. Most English-speaking professionals frequently use "first-name alerters" to initiate a request among peers.



- **Attention-getter:** A colleague might begin with "Hi, Sarah" or "Excuse me, David", followed immediately by the request. This minimizes the time spent on social preliminaries.
- **Conditional Structures:** According to Idris and Ismail (2023), once attention is secured, the request usually follows a direct path, using modal verbs such as "Could you..." or "Would you mind..."
- **Title/Role:** In professional English contexts, using a title such as "Professor" or "Doctor" to address someone is a common way to draw attention by emphasizing their professional role. This practice is common in goal-driven professional environments, where it optimizes operational efficiency and preserves the distinct boundaries of functional roles.

Malay Requests: Phatic Communication and Social Alignment

In contrast to English, Malay workplace requests follow a "high-context" model in which the relationship between colleagues takes precedence over the task itself. This approach prioritizes social harmony to avoid appearing overly demanding. Central to this dynamic is the use of "alerters," which play a crucial sociolinguistic role by capturing the listener's attention prior to issuing a request. The specific form of these alerters is determined by social variables such as age, status, and professional distance. This aligns with Purdy's (2023) concept of phatic communication, which focuses on sustaining social bonds through routine interactions such as greetings or small talk, to ensure the request is well received.

- **Honorific Alerters:** Even among colleagues of similar age, Malay speakers may use titles such as "*Encik*" (Mister) or "*Cik*" (Miss) as alerters to maintain professional distance and show respect.
- **The Apology Alerters:** It is common for a Malay request to begin with an apology, such as "*Minta maaf mengganggu*" (Sorry for disturbing). This alerter acknowledges that the request intrudes on the colleague's autonomy.
- **Greetings:** According to Maros and Halim (2018), initiating a request with "*Hai*" or "*Selamat pagi*" instead of a direct command helps preserve a colleague's "face." This polite approach ensures tasks are completed while maintaining a harmonious office atmosphere.

The Impact of Pragmatic Differences

The intersection of these two distinct styles often leads to "pragmatic failure" in multicultural teams. An English speaker might view the long, apologetic alerters of a Malay colleague as a sign of hesitation or lack of confidence. Conversely, a Malay colleague might perceive the brief, first-name alerters of an English speaker as rude or overly aggressive. However, many Malaysian professionals now demonstrate "intercultural competence" by blending these styles. They may use English modal verbs for clarity while retaining Malay-style alerters to show respect. This hybrid approach enables colleagues to balance the Task (T) with the Relationship (R), ensuring the workplace remains both productive and harmonious. Mastering the function of these attention-getting devices is crucial for anyone working in a diverse professional setting.

In conclusion, the way colleagues make requests at work is heavily influenced by their diverse cultural, social, and linguistic backgrounds. English requests rely on direct alerters to ensure efficiency, whereas Malay requests use softened alerters to preserve social dignity and kindness. These differences are not merely stylistic; they reflect different ways of valuing time, hierarchy, and peer relationships. By recognising the importance of alerters in these two languages, professionals can better navigate the social nuances of the Malaysian office. Ultimately, the most effective workplace communication occurs when colleagues understand the cultural "cues" behind the request, enabling them to get the job done while keeping the professional bond intact.

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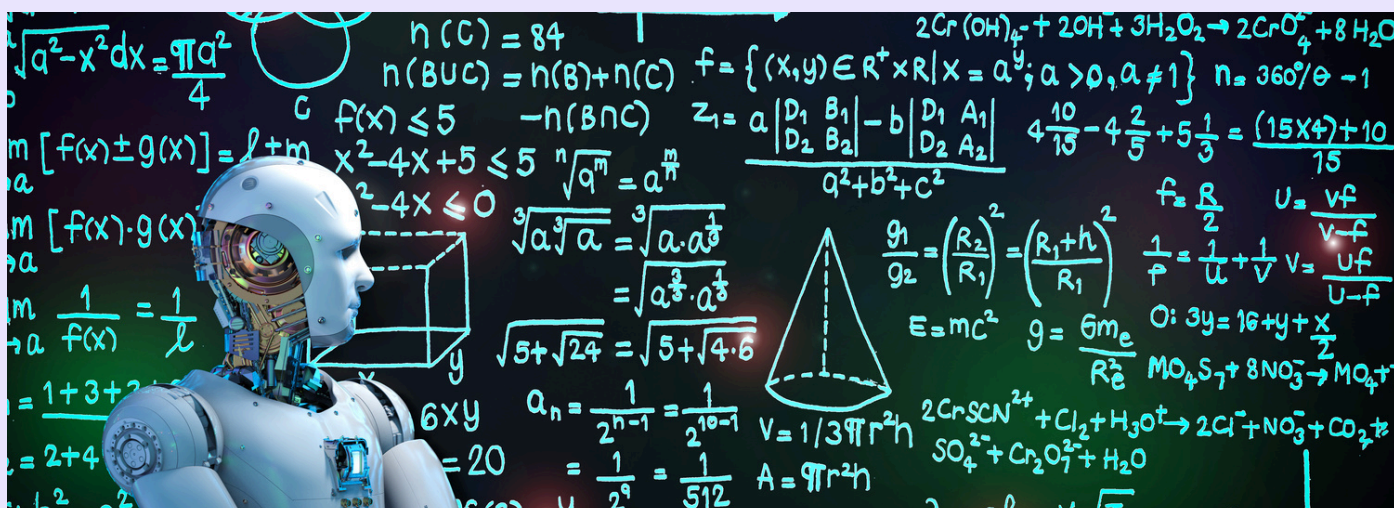
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Kajian Pembelajaran Mesin Dalam Memacu Dunia Pendidikan Moden

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Dalam era digital ini, dunia dibanjiri data yang dihasilkan secara meluas daripada penggunaan internet, peranti pintar, dan pelbagai aplikasi digital harian. Analisis terhadap data merupakan perkara penting dalam menghasilkan pengetahuan yang bernilai bagi kecerdasan buatan. Pembelajaran mesin atau dikenali sebagai *Machine Learning* (ML) merupakan satu cabang kecerdasan buatan (AI) yang membolehkan suatu mesin (komputer) belajar daripada sekumpulan data untuk membuat suatu keputusan tanpa dipengaruhi oleh manusia. Proses pembelajaran tersebut dipandu oleh algoritma-algoritma yang dicipta untuk mendapatkan pengetahuan atau corak penting daripada suatu data. Antara algoritma yang popular ialah *Decision Tree*, *Naïve Bayes*, *Neural Network* dan *Genetic Algorithm*. Mesin akan mempelajari corak-corak daripada data untuk menjadi lebih pintar. Banyak kajian telah dijalankan dalam bidang ini memandangkan ia memberi impak yang besar terhadap sesuatu bidang. Bagi mendapatkan hasil yang lebih tepat bagi proses pembelajaran mesin, terdapat banyak algoritma yang baru dihasilkan seperti *XGBoost*, *Bert*, *Deep Learning* and *Long Term Short Term*.



Sistem pendidikan kini berdepan pelbagai cabaran seperti perbezaan tahap kefahaman pelajar, kekangan masa pensyarah serta keperluan dan pendekatan pembelajaran yang lebih bersifat personalisasi. Oleh itu, ML semakin mendapat perhatian kerana keupayaannya dilihat sebagai salah satu penyelesaian inovatif yang berpotensi meningkatkan keberkesanan proses pengajaran dan pembelajaran seperti sistem pendidikan pintar yang mampu menganalisis data pelajar untuk menghasilkan kaedah dan hasil yang lebih tepat.

Lazimnya, golongan pendidik bergantung kepada modul dan kaedah pengajaran yang sama bagi semua pelajar. Beban tugas ini semakin meningkat apabila proses penilaian prestasi pelajar terpaksa dikendalikan secara manual. Walau bagaimanapun, dengan adanya kajian ML ini, ia mampu menghasilkan kaedah yang lebih pintar dan berkesan. Antara kaedah-kaedah yang terhasil:-

- **Sistem Pembelajaran Adaptif**

Sistem ini berfungsi seperti "tutor peribadi" digital, di mana algoritma akan memantau prestasi pelajar secara langsung berdasarkan tahap kemampuan pelajar tersebut (Dubey & Gupta, 2025). Jika seorang pelajar tidak mampu memahami dan menjawab soalan tertentu, sistem tidak akan memberikan soalan yang lebih sukar. Sebaliknya, ia akan mengundur ke belakang, mengenal pasti konsep asas yang pelajar tidak faham, dan memberikan video penjelasan atau latihan tambahan yang lebih khusus (Essa et al., 2023).

- **Analisis Ramalan (*Predictive Analytics*) untuk Mencegah Keciciran**

ML berupaya menghasilkan model untuk meramal pelajar yang berpotensi atau mempunyai kriteria bakal keciciran dalam pelajaran. Model ini amat penting sebagai langkah untuk menyelamatkan pelajar sebelum mereka gagal serta mengenalpasti faktor-faktor utama yang menyebabkan punca keciciran (Bellaj et.al 2024). Model ML akan menganalisis ribuan data daripada pelajar terdahulu seperti kekerapan penggunaan portal pembelajaran, keputusan kuiz mingguan, kaedah pembelajaran dan jumlah jam tidur seharian. Model ML akan mengenal pasti kriteria pelajar yang berpotensi untuk gagal dan kriteria pelajar yang berjaya. Seterusnya, sistem akan memadamkan maklumat pelajar baru berdasarkan kriteria yang diperolehi daripada model ML dan akan memberi amaran kepada pensyarah tentang pelajar yang mempunyai kebarangkalian untuk gagal. Dengan ini dapat membantu pelajar yang berpotensi gagal mendapat bantuan mentor dengan lebih awal.

- **Penilaian Automatik**

ML juga mampu melakukan penilaian secara automatik bukan sahaja terhadap soalan objektif, malah merangkumi soalan berstruktur. Melalui Natural Language Processing (NLP), ML mampu memeriksa soalan berbentuk esei dengan menganalisis jawapan pelajar terdahulu. Sistem ini akan mengenal pasti corak jawapan yang berpotensi memperoleh markah tinggi, sederhana atau rendah. Ia bukan sahaja mencari kesalahan ejaan, tetapi menilai struktur esei, isi kandungan, dan gaya penulisan. Sebagai contoh, Gradescope membantu guru menanda tugas Sains dan Matematik yang kompleks dengan cara yang lebih konsisten dan pantas, serta memberikan maklum balas segera kepada pelajar (Mickelwait, 2016).

- **Pendidikan Pelajar Berkeperluan Khas**

ML juga dapat membantu menghasilkan teknologi untuk pembelajaran pelajar OKU. Teknologi pengecaman suara (*Speech-to-Text*) membantu pelajar kurang upaya pendengaran mengikuti kuliah secara langsung, manakala teknologi huraian imej (*Image-to-Text*) membantu pelajar kurang upaya penglihatan "melihat" carta atau gambar rajah di dalam buku teks (Dubey & Gupta, 2025). Sebagai contoh, *Microsoft Learning Tools* menggunakan ML untuk membantu pelajar disleksia meningkatkan kemahiran membaca mereka dengan memberi fokus pada teks dan bacaan audio.

Pelbagai idea baharu telah diutarakan dalam penggunaan ML bagi memperkasa bidang pendidikan moden. Antara inovasi yang diperkenalkan ialah sistem pengesanan jurang pembelajaran yang berupaya mengenal pasti kelemahan konsep pelajar secara lebih mendalam serta mencadangkan bahan pembelajaran yang disesuaikan dengan tahap kemahiran dan potensi individu pelajar (Dubey & Gupta, 2025). Selain itu, terdapat juga kajian yang memfokuskan kepada analisis emosi pelajar bagi mengenal pasti faktor yang menyumbang kepada tekanan dan kebosanan semasa proses pengajaran dan pembelajaran berlangsung.

Oleh itu, pembelajaran mesin (ML) merupakan satu bidang yang perlu dititikberatkan. Kajian terhadap ML dapat memberi impak yang signifikan kepada pelbagai bidang terutamanya apabila set data dihasilkan dalam kuantiti yang besar serta berkualiti dan digunakan untuk tujuan analisis. Hal ini kerana ML mampu memproses data tersebut untuk mengenal pasti corak, membuat ramalan, dan menghasilkan keputusan yang lebih tepat dalam sesuatu bidang. Kajian yang meluas terhadap ML dapat memberi impak besar di seluruh dunia, sejajar dengan perkembangan dunia digital. Justeru itu, penguasaan dan penerokaan dalam bidang ini amat penting bagi memastikan teknologi yang dihasilkan mampu menyokong keperluan dunia moden dengan lebih berkesan dan inovatif.

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Nilai Ekonomi di Sebalik Penguasaan Pelbagai Bahasa

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Dalam era pasaran kerja global yang kompetitif, penguasaan pelbagai bahasa bukan lagi sekadar kemahiran sampingan, malah merupakan aset ekonomi yang signifikan bagi graduan universiti. Di Malaysia, kepelbagaian latar belakang sejarah telah membentuk masyarakat yang lazimnya fasih dalam bahasa Melayu, Inggeris, Mandarin, Tamil, atau Arab. Dari perspektif sosiologi, Pierre Bourdieu memperkenalkan konsep *linguistic capital*, di mana bahasa dianggap sebagai instrumen kuasa dan kekayaan yang memberikan kelebihan sosial serta ekonomi kepada individu. Artikel ini membincangkan bagaimana penguasaan pelbagai bahasa mampu meningkatkan kebolehpasaran graduan, mengoptimumkan prestasi dalam pasukan global, serta memangkin pertumbuhan ekonomi negara secara makro.

Manfaat utama penguasaan pelbagai bahasa ialah peningkatan prospek kerjaya merentasi pelbagai sektor strategik. Walaupun bahasa Inggeris kekal sebagai *lingua franca* perniagaan antarabangsa, penguasaan bahasa ketiga seperti bahasa Arab, Mandarin, atau bahasa Eropah memberikan nilai tambah yang membezakan kualiti seorang calon. Menurut Maksan dan Sukri (2025), kompetensi linguistik yang tinggi membolehkan graduan menembusi pasaran kerja yang lebih luas melalui keupayaan untuk mendepani keperluan pelanggan global dengan lebih berkesan. Sebagai contoh, keprofesionalan dalam mengendalikan rundingan perdagangan antara organisasi tempatan dan antarabangsa amat bergantung pada kelancaran komunikasi, yang secara langsung meningkatkan nilai pasaran dan dinamisme graduan tersebut.



Selain aspek komunikasi verbal, penguasaan bahasa tambahan turut mengintegrasikan pemahaman mendalam terhadap norma budaya dan etika profesional silang budaya. Hal ini merupakan elemen kritikal dalam menjamin keberkesanan kolaborasi dalam pasukan yang bersifat majmuk. Individu multilingual sering dikaitkan dengan fleksibiliti kognitif yang tinggi, iaitu kecekapan dalam penyelesaian masalah yang lebih dominan berbanding individu monolingual. Kajian oleh Bhar & Chua (2025) mengukuhkan kenyataan ini dengan mengatakan bahawa graduan yang menguasai pelbagai bahasa mempunyai kecenderungan lebih tinggi untuk menyandang jawatan kepimpinan pada peringkat awal kerjaya kerana keupayaan mereka meminimumkan risiko salah faham dan menangani konflik organisasi dengan lebih bijaksana.

Seterusnya, kepelbagaian linguistik berperanan sebagai pemacu utama dalam sektor perkhidmatan, hospitaliti, dan diplomasi antarabangsa. Dalam konteks Malaysia sebagai destinasi pelancongan utama, graduan yang mampu berkomunikasi dalam bahasa ibunda pelancong dapat menawarkan standard perkhidmatan yang unggul, sekaligus menjamin pertumbuhan kerjaya yang mampan. Di peringkat makro, graduan yang menguasai bahasa serantau ASEAN atau bahasa rakan dagang utama berperanan sebagai ejen pemudah cara dalam diplomasi ekonomi. Keupayaan mereka mengemudi landskap politik dan perniagaan yang kompleks membantu negara memeterai perjanjian perdagangan strategik, yang seterusnya memperkuat kestabilan ekonomi jangka panjang Malaysia.

Secara tuntasnya, penguasaan pelbagai bahasa merupakan pelaburan strategik yang memberikan pulangan ekonomi yang tinggi kepada graduan dan negara. Kemahiran ini bukan sahaja meningkatkan mobiliti kerjaya dalam syarikat multinasional, malah memperkasakan individu untuk menerajui organisasi yang berkembang dalam ekosistem perdagangan global yang dinamik. Oleh itu, pembangunan kompetensi bahasa tidak seharusnya dilihat semata-mata sebagai tuntutan akademik, tetapi perlu diiktiraf sebagai komponen fundamental dalam mempersiapkan modal insan yang berdaya saing demi kelangsungan ekonomi pada masa hadapan.

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Small Classroom Innovations and Their Real-World Impact on Teaching and Learning

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The landscape of modern education is undergoing a paradigm shift as traditional, lecture-based instruction gives way to a more interactive and learner-centered approach. Small-scale classroom innovations, such as subtle pedagogical adjustments to teaching practices and the careful use of technology, are manageable to implement and can lead to meaningful improvements in student learning. While these innovations, which include teaching methods, the classroom environment, and teacher-student interaction, may appear minor in isolation, their collective integration is significant not only in improving learning outcomes but also in developing real-world competencies.

Leading this shift is the integration of interactive teaching methods as a small classroom innovation. Approaches such as problem-based learning, flipped classrooms, and peer collaboration encourage active participation in lessons. Studies show that these methods improve critical thinking and academic performance among students (Bhuttah et al., 2024). Instead of passively receiving information, students become more involved by solving problems and discussing ideas. As a result, they develop a deeper understanding of the subject and are better able to apply knowledge in different contexts.



Furthermore, innovation extends beyond instructional methods, as small changes to the classroom environment and the use of simple technologies can also effectively enhance student learning. For example, flexible seating arrangements and group workspaces can increase student interaction and engagement. In addition, digital tools such as online quizzes, virtual boards, and attendance systems help make lessons more efficient and interactive. Research on smart classrooms shows that these small adjustments can support personalised learning and improve classroom management (Zhang et al., 2024). Furthermore, the integration of flexible, student-centered learning spaces has been shown to enhance engagement and support modern learning needs (Bautista & López-Costa, 2025). Importantly, these innovations are practical since they do not require large financial investments.

Small classroom innovations also improve teacher-student interaction and help develop important real-world skills. Teachers can create a more supportive learning environment by using small group discussions, mini-conferences, and quick feedback activities. These strategies allow for more personalised attention, which improves student understanding and participation. Research shows that smaller or more personalised classroom interactions lead to better engagement and stronger academic outcomes (Shaw & Elizondo, 2025). Furthermore, activities such as group projects and problem-solving tasks help students develop communication, teamwork, and critical-thinking skills. These abilities are essential for success in future academic and professional settings.

In addition, small innovations are easier for teachers to implement compared to large-scale reforms. A major challenge in educational change is the lack of time, resources, and training. However, incremental innovations are more practical and sustainable in real classroom settings. Research indicates that teachers are more likely to adopt new methods when they feel confident and supported (Zulkifli, 2025). Therefore, simple changes such as short reflective tasks or digital quizzes can help teachers gradually improve their teaching practices without feeling overwhelmed.



Retrieved from "How Technology Impacts Teaching and Learning Modern Classroom Dynamics" by Farrel, A., 2025.

In conclusion, small classroom innovations play a significant role in improving education. Through interactive teaching methods, simple classroom adjustments, and heightened teacher-student interaction, these innovations can enhance both learning outcomes and essential real-world competencies. Although they are small in scale, their impact is meaningful and long-lasting. Therefore, educators should focus on implementing practical and manageable innovations to create more effective and engaging learning experiences.

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