

Kod Rujukan: (Diisi oleh PJIM&A)	
RIG	
Bukti Kolaborasi	

BORANG GERAN i-TALENT

(Diisi oleh PJIM&A)

APPLICATION FORM GERAN INNOVATION IN TEACHING AND LEARNING (i-TALENT) *Dana Inovasi Dalam Pengajaran dan Pembelajaran (Pindaan 1/2024)*

**PJIM&A
UiTM CAWANGAN PERLIS**

A	TITLE OF PROPOSED RESEARCH: <i>Tajuk penyelidikan yang dicadangkan :</i> Online Health and Fitness Screening: Pre-participation screening and risk stratification to physical activity and exercise (OH-FITNESS)	
B	DETAILS OF RESEARCHER / MAKLUMAT PENYELIDIK	
B(i)	Name of Project Leader: <i>Nama Ketua Projek:</i> Nurul Hidayah binti Amir	IC / Passport Number: <i>No. Kad Pengenalan/ Pasport:</i> 880913-56-6374
B(ii)	Faculty/School/Centre/Unit (Please provide full address): <i>Fakulti/Jabatan /Pusat/Unit (Sila nyatakan alamat penuh):</i> Fakulti Sains Sukan dan Rekreasi (FSR), UiTM Cawangan Perlis, Kampus Arau, 02600, Perlis	
B(iii)	Office Telephone No.: <i>No. Telefon Pejabat:</i> 04-9882787	Handphone No.: <i>No. Telefon Bimbit:</i> 013-453 0344
B(iv)	E-mail Address: <i>Alamat e-mel:</i> nurul.amir@uitm.edu.my	
B(v)	Date of first appointment with this University: <i>Tarikh mula berkhidmat dengan Universiti ini:</i> 13.10.2014	

C	RESEARCH INFORMATION / MAKLUMAT PENYELIDIKAN																																	
C(i)	Research Domain (Please tick (✓)): <i>Domain Penyelidikan (Sila tanda (✓)):</i> A. Pure and Applied Sciences (Sains Tulen dan gunaan) <table border="0"> <tr> <td>☐ Chemistry (Kimia)</td> <td>☐ Physic (Fizik)</td> <td>☐ Biology (Biologi)</td> </tr> <tr> <td>☐ Biochemistry (Biokimia)</td> <td>☐ Materials Science (Sains Bahan)</td> <td>☐ Mathematics and Statistics (Matematik dan Statistik)</td> </tr> <tr> <td>☐ Materials Science (Sains Bahan)</td> <td></td> <td></td> </tr> </table> B. Social Sciences (Sains Sosial) <table border="0"> <tr> <td>☐ Anthropology (Antropologi)</td> <td>☐ Psychology (Psikologi)</td> <td>☒ Sociology (Sosiologi)</td> </tr> <tr> <td>☐ Political Science (Sains Politik)</td> <td>☐ Business and Management (Pengurusan dan Perniagaan)</td> <td>☐ Geography (Geografi)</td> </tr> <tr> <td>☐ Economic (Ekonomi)</td> <td>☐ Human Ecology (Ekologi Manusia)</td> <td>☐ Communication (Komunikasi)</td> </tr> </table> C. Arts and Applied Arts (Sastera dan Sastera Ikhtisas) <table border="0"> <tr> <td>☐ Language and Linguistic (Bahasa dan Linguistik)</td> <td>☐ Literature (Kesusasteraan)</td> <td>☐ Religion (Agama)</td> </tr> <tr> <td>☐ Philosophy (Falsafah)</td> <td>☐ Civilization (Tamadun)</td> <td>☐ History (Sejarah)</td> </tr> <tr> <td>☐ Art (Seni)</td> <td>☐ Culture (Budaya)</td> <td>☐ Education (Pendidikan)</td> </tr> <tr> <td>☐ Policies and Law (Dasar dan Undang-undang)</td> <td>☐ Built Environment (Alam Bina-Aspek Kemanusiaan)</td> <td>☐ Environment (Alam Sekitar-Aspek Kemanusiaan)</td> </tr> </table> D. Natural Sciences and National Heritage (Sains Tabii dan Warisan Negara) <table border="0"> <tr> <td>☐ Environment</td> <td>☐ Forestry</td> <td>☐ Agriculture</td> </tr> </table>	☐ Chemistry (Kimia)	☐ Physic (Fizik)	☐ Biology (Biologi)	☐ Biochemistry (Biokimia)	☐ Materials Science (Sains Bahan)	☐ Mathematics and Statistics (Matematik dan Statistik)	☐ Materials Science (Sains Bahan)			☐ Anthropology (Antropologi)	☐ Psychology (Psikologi)	☒ Sociology (Sosiologi)	☐ Political Science (Sains Politik)	☐ Business and Management (Pengurusan dan Perniagaan)	☐ Geography (Geografi)	☐ Economic (Ekonomi)	☐ Human Ecology (Ekologi Manusia)	☐ Communication (Komunikasi)	☐ Language and Linguistic (Bahasa dan Linguistik)	☐ Literature (Kesusasteraan)	☐ Religion (Agama)	☐ Philosophy (Falsafah)	☐ Civilization (Tamadun)	☐ History (Sejarah)	☐ Art (Seni)	☐ Culture (Budaya)	☐ Education (Pendidikan)	☐ Policies and Law (Dasar dan Undang-undang)	☐ Built Environment (Alam Bina-Aspek Kemanusiaan)	☐ Environment (Alam Sekitar-Aspek Kemanusiaan)	☐ Environment	☐ Forestry	☐ Agriculture
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	E. Information and Communication Technology (Teknologi Maklumat dan Komunikasi)		
	☒ Software and Information System (Perisian dan Sistem Maklumat) ☐ Soft Computing (Pengkomputeran Lembut) ☐ Computer Networking (Rangkaian Komputer)		
	☐ Information Security (Keselamatan Maklumat) ☐ Multimedia (Multimedia) ☐ Computer Engineering (Kejuruteraan Komputer)		
	☐ Computer Science (Sains Komputer)		
	F. Health Sciences (Sains Kesihatan)		
	☐ Basic Medical Sciences (Sains Perubatan Asas) ☐ Pharmacy (Farmasi) ☐ Pharmacology (Farmakologi)		
	☐ Medical Microbiology (Mikrobiologi Perubatan) ☐ Parasitology (Parasitologi) ☐ Pathology (Pathologi)		
	☒ Community Medical Prevention (Perubatan Pencegahan Masyarakat) ☐ Clinical Surgical (Klinikal Surgikal) ☐ Clinical Medical (Klinikal Medikal)		
	☒ Associate Health Science (Sains Kesihatan Bersekutu) ☐ Dental (Pergigian) ☐ Nursing Science (Sains Kejururawatan)		
C(ii)	Location of Research: Tempat penyelidikan dijalankan: UiTM Cawangan Perlis		

C(iii)	Duration of this research (Maximum 12 months): <i>Tempoh masa penyelidikan ini (Maksimum 12 bulan):</i> Duration: 1 year <i>Tempoh :</i> From : 1 June 2024 <i>Dari :</i> To : 31 May 2025 <i>Hingga :</i>																																	
C(iv)	Other Researchers: <i>Ahli-ahli penyelidik yang lain:</i> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Bil</th> <th style="width: 25%;">Name <i>Nama</i></th> <th style="width: 25%;">IC / Staff Number: <i>No. Kad Pengenalan/ No. Pekerja:</i></th> <th style="width: 25%;">University / Industry / Agency <i>Fakulti/ P.Pengajian/ Pusat/Unit</i></th> <th style="width: 20%;">Academic Qualification/ Designation <i>Tahap Kelayakan Akademik/Jawatan</i></th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Mohd Faridz bin Ahmad</td> <td>860228-38-6385 / 315876</td> <td>Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis</td> <td>PhD</td> </tr> <tr> <td>2.</td> <td>Nurul Afiqah binti Bakar</td> <td>890731-14-6212 / 332309</td> <td>Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis</td> <td>MSc</td> </tr> <tr> <td>3.</td> <td>Norfaezah binti Mohd Rosli</td> <td>871222-05-5212 / 336635</td> <td>Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis</td> <td>MSc</td> </tr> <tr> <td>4.</td> <td>Siti Hannariah binti Mansor</td> <td>890405-05-5016 / 330398</td> <td>Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis</td> <td>MSc</td> </tr> <tr> <td>5.</td> <td>Mohd Khairulanwar bin Md. Yusof</td> <td>880922-08-5759 / 323884</td> <td>Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis</td> <td>MSc</td> </tr> </tbody> </table>				Bil	Name <i>Nama</i>	IC / Staff Number: <i>No. Kad Pengenalan/ No. Pekerja:</i>	University / Industry / Agency <i>Fakulti/ P.Pengajian/ Pusat/Unit</i>	Academic Qualification/ Designation <i>Tahap Kelayakan Akademik/Jawatan</i>	1.	Mohd Faridz bin Ahmad	860228-38-6385 / 315876	Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis	PhD	2.	Nurul Afiqah binti Bakar	890731-14-6212 / 332309	Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis	MSc	3.	Norfaezah binti Mohd Rosli	871222-05-5212 / 336635	Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis	MSc	4.	Siti Hannariah binti Mansor	890405-05-5016 / 330398	Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis	MSc	5.	Mohd Khairulanwar bin Md. Yusof	880922-08-5759 / 323884	Fakulti Sains Sukan dan Rekreasi, UiTM Cawangan Perlis	MSc
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C(vi)	Please provide information on academic publications that have been published by the project leader for the last five (5) years. (Example: Journals, Books, Chapters in books, etc) <i>Sila kemukakan maklumat berkaitan penerbitan akademik yang telah diterbitkan oleh ketua penyelidik dalam tempoh lima (5) tahun terakhir. (Contoh: Jurnal, buku, bab dalam buku, dll)</i> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Title of publication <i>Tajuk penerbitan</i></th> <th style="width: 33%;">Name of journals/books <i>Nama jurnal/buku</i></th> <th style="width: 34%;">Year published <i>Tahun diterbitkan</i></th> </tr> </thead> <tbody> <tr> <td colspan="3" style="height: 40px;"></td> </tr> </tbody> </table>				Title of publication <i>Tajuk penerbitan</i>	Name of journals/books <i>Nama jurnal/buku</i>	Year published <i>Tahun diterbitkan</i>																											
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	The Role of Speckle-Tracking Echocardiography in Predicting Mortality and Morbidity in Patients With Congenital Heart Disease: A Systematic Review and Meta-analysis	Journal of the American Society of Echocardiography	2023
	Parental recommendations and exercise attitudes in congenital hearts	Cardiology in the Young	2023
	Exercise training in paediatric congenital heart disease: fit for purpose?	Archives of Disease in Childhood	2021
	The effects of hip- and ankle-focused exercise intervention on dynamic knee valgus: a systematic review	PeerJ	2021
	The Role of Speckle Tracking Echocardiography in the Evaluation of Common Inherited Cardiomyopathies in Children and Adolescents: A Systematic Review	Diagnostics	2021
C(vii)	Executive Summary of Research Proposal (maximum 300 words) (Please include the problem statement, objectives, research methodology, expected output/outcomes/implication, and significance of output from the research project) <i>Ringkasan Cadangan Eksekutif Penyelidikan (maksimum 300 patah perkataan)</i> <i>(Meliputi pernyataan masalah, objektif, kaedah penyelidikan, jangkaan hasil penyelidikan/implikasi dan kepentingan output projek penyelidikan)</i> Prior to engaging in any physical activity or exercise, individuals should be screened for potential signs, symptoms and risk factors of various chronic diseases and musculoskeletal injuries to mitigate associated risks with medical contraindications related to exercise. In the SR243 programme [Bachelor Degree in Sport Science (Hons)], students are taught pre-participation health screening and risk stratification and their competency is assessed as part of continuous assessments in the course of Applied Exercise and Sport Rehabilitation (SPS609). While most students grasp the concept of pre-participation screening, many struggle with accurately stratifying risks into low-, moderate- and high-risk categories. This project aims to address this challenge by developing an online application with an accurate algorithm to improve students' proficiency in risk stratification. The proposed application will include questions on signs and symptoms (i.e., chest pain, severe dizziness) and potential risk factors (i.e., cigarette smoking, family history, activity levels). Each question, marked either "yes" or "no" will account for points, and an algorithm will categorise individuals based on accumulated points into low-, moderate-, or high-risk categories. A higher mark indicates high risk. By developing a tool that facilitates teaching and self-learning before continuous assessment, this initiative aims to bridge the gap between theoretical understanding and practical application in pre-participation health screening. This improvement is crucial for ensuring the effectiveness and safety of exercise programs by accurately assessing individuals' health conditions and minimising potential risks associated with physical activity and exercise.		
C(viii)	Detailed proposal of research project: <i>Cadangan maklumat penyelidikan secara terperinci:</i> (a) Research background including: / <i>Latarbelakang penyelidikan termasuk:</i>		

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| | <p>i) Problem Statement / Pernyataan Masalah
Pre-participation health screening is vital for developing safe and effective exercise programmes. The main purpose of this evaluation is to identify individuals who may necessitate medical supervision during exercise due to clinically significant conditions, including cardiovascular, pulmonary, and metabolic diseases. Furthermore, it seeks to recognise individuals at increased risk of disease due to numerous risk factors and pre-existing signs and symptoms, which could be exacerbated by exercise. Traditionally, pre-participation health screening and risk stratification were conducted manually through a set of questionnaires as essential components before conducting any exercise testing and programmes and student competency is assessed as part of continuous assessments in the course of Applied Exercise and Sport Rehabilitation (SPS609). However, appropriately stratifying risks into low-, moderate- and high-risk poses a challenge to students' understanding and practical application, potentially compromising the safety of individuals undergoing pre-participation health screening.</p> <p>ii) Hypothesis / Hipotesis
The implementation of the OH-FITNESS online application is hypothesised to enhance students' self-competency in accurately stratifying risks during preparticipation health screening before exercise and physical activity.</p> <p>iii) Research Questions / Persoalan Penyelidikan</p> <ul style="list-style-type: none"> • What is the effectiveness of the online application (OH-FITNESS) in improving students' proficiency in accurately stratifying risks during pre-participation health screening? • How does this impact the safety of the exercise programme? <p>iv) Literature Reviews / Kajian Literatur</p> <p>Lifestyle interventions, such as increasing physical activity (PA) and reducing sedentary behaviour have been linked in a reduction in risk factors for metabolic and cardiovascular diseases (CVD)¹⁻³ and improving aerobic fitness.⁴ The benefits of regular PA and exercise training in improving health are well-established, demonstrating a strong inverse relationship with morbidity and a strong positive relationship with mortality.^{5,6} To delineate, PA has been defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" and is positively correlated with physical fitness, whereas exercise is defined as a "subset of physical activity defined as planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness".⁷</p> <p>However, the global impact of the COVID-19 pandemic on the PA levels worldwide, alongside the existing pandemic of physical inactivity, presents significant challenges in recovery from this "tale of two pandemics".⁸ Physical inactivity is now being recognised as the fourth (4th) leading risk factor for mortality, underscoring the importance of promoting PA to reduce the systemic impact on the healthcare system, environment, economic burden, and overall quality of life.⁹ The latest 2020 WHO PA guidelines recommend that adults engage in at least 150-300 minutes of moderate-intensity aerobic PA or 75-150 minutes of vigorous-intensity aerobic PA per week.¹⁰ While addressing the pandemic of physical inactivity has become a global priority with targeted efforts across all populations,¹¹ translating clinical recommendations into real-life daily living activity remains a challenge, especially for individuals with chronic diseases. Appropriate guidelines for pre-participation screening prior to exercise are crucial for prevention efforts to mitigate risk associated with increased PA, structured exercise programmes as well as for identifying individuals who may be at risk of sudden cardiac arrest (SCA) or sudden cardiac death (SCD)¹².</p> <p>The American College of Sport Medicine (ACSM), a leading professional organisation for exercise science and sport medicine, has established guidelines on exercise screening in individuals planning to engage in moderate-to-vigorous PA (MVPA). Based on a risk stratification process, individuals categorised into three risk levels: low, moderate and high. These categories are determined by evaluating the presence or absence of known cardiovascular, pulmonary and/or metabolic disease, signs and symptoms suggestive of the chronic diseases and CVD risk factors.¹³ Subsequently, appropriate recommendations are provided for medical examination, PA and exercise, exercise testing and medical supervision. Low-risk individuals, who have ≤ 1 CVD risk factor (Table 2.3) and are asymptomatic, may engage in PA or exercise without requiring</p> |
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medical clearance. Moderate-risk individuals who have ≥ 2 CVD risk factors (Table 2.3) and are asymptomatic, can engage in low-to-moderate-intensity PA without medical clearance. However, high risk individuals who have been diagnosed with cardiovascular, pulmonary or metabolic disease or exhibiting one or more signs and symptoms listed in Table 2.2, require thorough medical examination before initiating any PA or exercise at any intensity.¹³

Recognising the importance of integrating risk stratification into pre-participation health screening prior to engaging in PA and exercise, this component is included in the SR243 Bachelor in Sport Science (Hons) curriculum. The aim is to equip students with the essential theoretical knowledge and practical skills for real-world applications. While most students grasp the concept of pre-participation screening, many struggle with accurately stratifying risks into low-, moderate- and high-risk categories.

v) **Related References** / Rujukan berkaitan

1. Yafei Wu, Guijun Qin, Guixia Wang, Libin Liu, Bing Chen, Qingbo Guan, Zhongshang Yuan, Xu Hou, Ling Gao, Chao Xu, Haiqing Zhang, Xu Zhang, Qiu Li, Yongfeng Song, Fei Jing, Shizhan Ma, Shanshan Shao, Meng Zhao, Qingling Guo, Nanwei Tong, Hongyan Zhao, Xiaomin Xie, Chao Liu, Zhongyan Shan, Zhifeng Cheng, Xuefeng Yu, Shulin Chen, Tao Yang, Yangang Wang, Dongmei Li, Zhaoli Yan, Lixin Guo, Qiuhe Ji, Wenjuan Wang, Jiajun Zhao. Physical Activity, Sedentary Behavior, and the Risk of Cardiovascular Disease in Type 2 Diabetes Mellitus Patients: The MIDiab Study. (2023). *Engineering*. Vol 20. 26-35. <https://doi.org/10.1016/j.eng.2022.05.013>.
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9. Sousa, A. S. P., Guedes, D. C., Félix, J., Pereira, S., & Santos, R. (2023). Physical Activity, Readiness, and Cardiovascular Risk Stratification in the Polytechnics Communities of the Northern Region of Portugal Integrated in Mobility as a Service Concept. *Healthcare (Basel, Switzerland)*, 11(24), 3145. <https://doi.org/10.3390/healthcare11243145>
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the American Heart Association, European Society of Cardiology, European Association for Cardiovascular Prevention and Rehabilitation, and American College of Preventive Medicine. *Mayo Clin Proc.* 2015;90(8):1082–103.

12. Armstrong, M., Paternostro-Bayles, M., Conroy, M. B., Franklin, B. A., Richardson, C., & Kriska, A. (2018). Preparticipation Screening Prior to Physical Activity in Community Lifestyle Interventions. *Translational journal of the American College of Sports Medicine*, 3(22), 176–180. <https://doi.org/10.1249/TJX.0000000000000073>
13. American College of Sports Medicine . ACSM'S Guidelines for Exercise Testing and Prescription. 11th ed. *Wolters Kluwer Health*; Philadelphia, PA, USA: 2021.

- vi) **Relevance to Government Policy, if any / Berkaitan dengan Dasar Kerajaan, jika berkenaan**
- Implementing one of the Sustainable Development Goals (SDGs) which is “Good Health and Well-Being”
 - Implementing 2 from 17 'Big Bolds' in Ekonomi MADANI that are “Enculturation of MADANI Society” and “Digital- and Technology-Based HGV Industry”

(b) Objective (s) of the Research
Objektif Penyelidikan

The objective of the study is to develop an OH-FITNESS, an online application as an assistive tool to improve students' proficiency in accurately stratifying individuals into low-, moderate-, and high-risk categories during pre-participation health screening.

(c) Methodology
Kaedah penyelidikan (Please state in the form / Sila nyatakan di borang ini)

The ACSM's provides guidelines for categorising individuals into low-, moderate-, and high-risk categories based on specific criteria outlined in Table 2.2 and Table 2.3 of the ACSM's Guidelines for Exercise Testing and Prescription (2021). These criteria include major signs and symptoms of potential cardiovascular, pulmonary and metabolic disease, as well as thresholds for cardiovascular disease (CVD) risk factors.

To develop the online application, questions were adapted from the established questionnaires that have been frequently used in teaching of pre-participation health screening, aligning with the signs, symptoms and risk factors in the ACSM's guidelines. The questionnaire consists of two (2) sections, medical conditions including signs and symptoms (17 questions), and potential risk factors (7 questions). Each question answered “yes” or “no” corresponds to a specific point value, with higher points allocated for medical conditions (8 points) and lower points for potential risk factors (1 point).

Upon completion of the questionnaire, participants receive summary points, which determines their risk category. Their points are reflected in the table given below which directly determines their risk category.

Point(s)	Risk Category
0 – 1	Low risk
2 – 7	Moderate Risk
8 – 136	High Risk

Table 1: Points indicating for low, moderate and high risks.

(d) **Expected Results/Benefit**
Jangkaan Hasil Penyelidikan

1. **Innovation in teaching and learning**
Assist the students and also other sport trainers who are having difficulty in stratifying the individual.
2. **Research publications**
New innovation that might help the sport trainers and also the academician in producing more related journal articles.
3. **Impact on teaching and learning**
One step ahead in stratifying an individual and also assisting students in order to design a proper training program based on the client's risk category.

(e) **Research activity & Milestone**
Aktiviti penyelidikan & Carta perbatuan

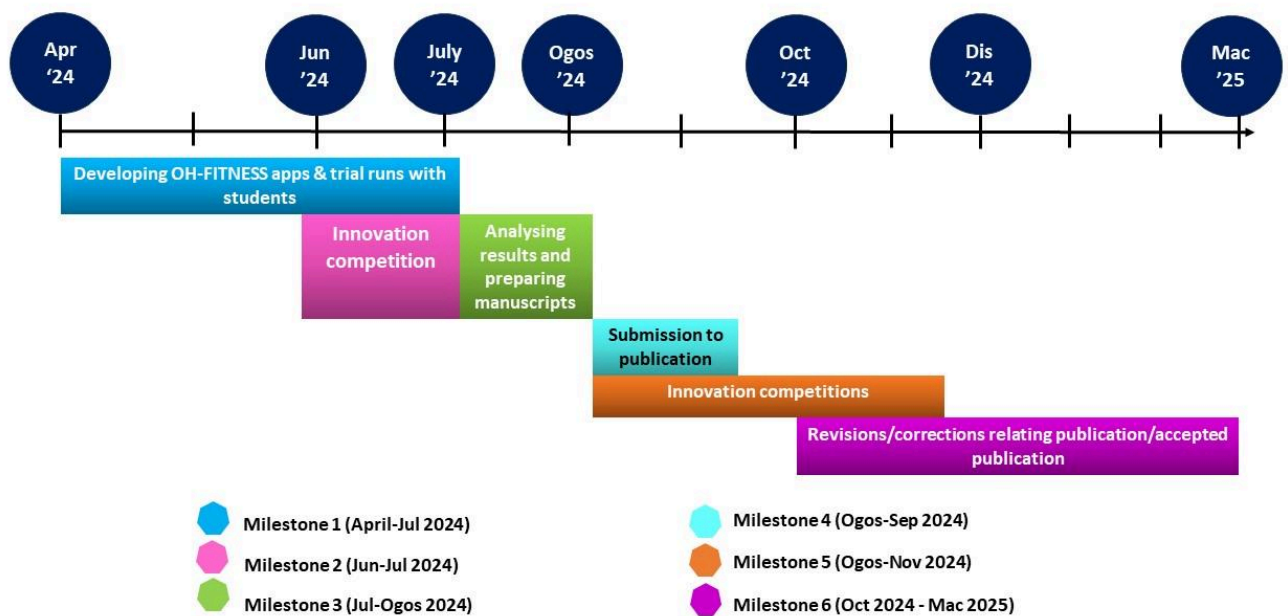


Figure 1: Proposed gantt chart and milestones for OH-FITNESS application for 12 months duration.

D	BUDGET /BELANJAWAN	
	Please indicate your estimated budget for this research and details of expenditure according to the guidelines attached. <i>Sila nyatakan anggaran bajet bagi cadangan penyelidikan ini dan berikan butir – butir perbelanjaan lengkap dengan berpandukan kepada garis panduan yang dilampirkan.</i>	
	Budget details <i>Butiran belanjawan</i>	Amount requested by applicant <i>Jumlah yang dipohon oleh pemohon</i>
		Year 1 Tahun 1 (RM)
D (i)	Vote 11000 - Salary and wages <i>Vot 11000 - Upah dan Elaun</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(ii)	Vote 21000 - Travelling and Transportation/ <i>Perjalanan dan Pengangkutan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(iii)	Vote 24000 - Rental <i>Vot 24000 - Sewaan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	

D(iv)	Vote 27000 - Research Materials & Supplies <i>Vot 27000 - Bekalan dan Bahan Penyelidikan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(v)	Vote 28000 - Maintenance and Minor Repair Services <i>Bvot 28000 - Baik pulih kecil dan ubahsuai</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(vi)	Vote 29000 - Professional Services <i>Vot 29000 - Perkhidmatan Ikhtisas</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i> Perkhidmatan Penyelidikan (Jumlah yang boleh digunakan untuk perbelanjaan perkhidmatan penyelidikan) 5% mengikut jumlah kelulusan peruntukan	1. Yuran pertandingan inovasi = RM250.00 2. Yuran hakcipta (50% dari jumlah peruntukan) = RM250.00 3. Proofread service: RM60.00 x 1 = RM 60.00 4. Application developer: RM652.50 x 1 application = RM865.00 RM75.00
D(vii)	Vote 35000 - Accessories and Equipment <i>Vot 35000 - Aksesori dan Peralatan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	

TOTAL AMOUNT JUMLAH BESAR		RM 1500.00
E	Declaration by applicant / Akuan Pemohon (Please tick (✓)): / (Sila tanda (✓)):	
I hereby declare that: Saya dengan ini mengaku bahawa: ☒ 1. All information stated here are accurate, and PJIM&A has right to reject or to cancel the offer without prior notice if there is any inaccurate information given. Semua maklumat yang diisi adalah benar, PJIM&A berhak menolak permohonan atau membatalkan tawaran pada bila-bila masa sekiranya keterangan yang dikemukakan adalah tidak benar. ☒ 2. Application of this research is presented for the Internal Research Acculturation (DPPD). Permohonan penyelidikan ini dikemukakan untuk Dana Pembudayaan Penyelidikan Dalaman (DPPD). ☒ 3. Application of this research is subject to Ethical Committee approval (if applicable). Permohonan penyelidikan ini dimajukan ke Jawatankuasa Etika (jika berkenaan). Date : 21/3/2024 Tarikh : Applicant's Signature : Tandatangan Pemohon :  Note: APPLICATIONS SUBMITTED WILL BE TREATED IN FULL CONFIDENCE. THE DECISION OF THE INTERNAL RESEARCH ACCULTURATION MAIN COMMITTEE UiTM CAWANGAN PERLIS IS FINAL. Semua permohonan dianggap sulit. Keputusan Jawatankuasa Induk Geran Penyelidikan Pembudayaan Dalaman UiTM Cawangan Perlis adalah MUKTAMAD.		

Kod Rujukan: (Diisi oleh PJIM&A)	
RIG	
Bukti Kolaborasi	

BORANG GERAN i-TALENT

(Diisi oleh PJIM&A)

APPLICATION FORM GERAN INNOVATION IN TEACHING AND LEARNING (i-TALENT) *Dana Inovasi Dalam Pengajaran dan Pembelajaran (Pindaan 1/2024)*

**PJIM&A
UiTM CAWANGAN PERLIS**

A	TITLE OF PROPOSED RESEARCH: <i>Tajuk penyelidikan yang dicadangkan :</i> Improving teaching basic physics using artificial intelligence	
B	DETAILS OF RESEARCHER / MAKLUMAT PENYELIDIK	
B(i)	Name of Project Leader: <i>Nama Ketua Projek:</i> ANG LEE SIN 790301075137	IC / Passport Number: <i>No. Kad Pengenalan/ Pasport:</i>
B(ii)	Faculty/School/Centre/Unit (Please provide full address): <i>Fakulti/Jabatan /Pusat/Unit (Sila nyatakan alamat penuh):</i> SAINS GUNAAN	
B(iii)	Office Telephone No.: <i>No. Telefon Pejabat:</i> 049882573	Handphone No.: <i>No. Telefon Bimbit:</i>
B(iv)	E-mail Address: <i>Alamat e-mel:</i> ANGLEE631@UITM.EDU.MY	
B(v)	Date of first appointment with this University: <i>Tarikh mula berkhidmat dengan Universiti ini:</i> 15 OGOS 2012	

C	RESEARCH INFORMATION / MAKLUMAT PENYELIDIKAN																																	
C(i)	Research Domain (Please tick (✓)): <i>Domain Penyelidikan (Sila tanda (✓)):</i> A. Pure and Applied Sciences (Sains Tulen dan gunaan) <table border="0"> <tr> <td>☐ Chemistry (Kimia)</td> <td>☒ Physics (Fizik)</td> <td>☐ Biology (Biologi)</td> </tr> <tr> <td>☐ Biochemistry (Biokimia)</td> <td>☐ Materials Science (Sains Bahan)</td> <td>☐ Mathematics and Statistics (Matematik dan Statistik)</td> </tr> <tr> <td colspan="3">☐ Materials Science (Sains Bahan)</td> </tr> </table> B. Social Sciences (Sains Sosial) <table border="0"> <tr> <td>☐ Anthropology (Antropologi)</td> <td>☐ Psychology (Psikologi)</td> <td>☐ Sociology (Sosiologi)</td> </tr> <tr> <td>☐ Political Science (Sains Politik)</td> <td>☐ Business and Management (Pengurusan dan Perniagaan)</td> <td>☐ Geography (Geografi)</td> </tr> <tr> <td>☐ Economic (Ekonomi)</td> <td>☐ Human Ecology (Ekologi Manusia)</td> <td>☐ Communication (Komunikasi)</td> </tr> </table> C. Arts and Applied Arts (Sastera dan Sastera Ikhtisas) <table border="0"> <tr> <td>☐ Language and Linguistic (Bahasa dan Linguistik)</td> <td>☐ Literature (Kesusasteraan)</td> <td>☐ Religion (Agama)</td> </tr> <tr> <td>☐ Philosophy (Falsafah)</td> <td>☐ Civilization (Tamadun)</td> <td>☐ History (Sejarah)</td> </tr> <tr> <td>☐ Art (Seni)</td> <td>☐ Culture (Budaya)</td> <td>☐ Education (Pendidikan)</td> </tr> <tr> <td>☐ Policies and Law (Dasar dan Undang-undang)</td> <td>☐ Built Environment (Alam Bina-Aspek Kemanusiaan)</td> <td>☐ Environment (Alam Sekitar-Aspek Kemanusiaan)</td> </tr> </table> D. Natural Sciences and National Heritage (Sains Tabii dan Warisan Negara) <table border="0"> <tr> <td>☐ Environment (Alam Sekitar)</td> <td>☐ Forestry (Perhutanan)</td> <td>☐ Agriculture (Pertanian)</td> </tr> </table>	☐ Chemistry (Kimia)	☒ Physics (Fizik)	☐ Biology (Biologi)	☐ Biochemistry (Biokimia)	☐ Materials Science (Sains Bahan)	☐ Mathematics and Statistics (Matematik dan Statistik)	☐ Materials Science (Sains Bahan)			☐ Anthropology (Antropologi)	☐ Psychology (Psikologi)	☐ Sociology (Sosiologi)	☐ Political Science (Sains Politik)	☐ Business and Management (Pengurusan dan Perniagaan)	☐ Geography (Geografi)	☐ Economic (Ekonomi)	☐ Human Ecology (Ekologi Manusia)	☐ Communication (Komunikasi)	☐ Language and Linguistic (Bahasa dan Linguistik)	☐ Literature (Kesusasteraan)	☐ Religion (Agama)	☐ Philosophy (Falsafah)	☐ Civilization (Tamadun)	☐ History (Sejarah)	☐ Art (Seni)	☐ Culture (Budaya)	☐ Education (Pendidikan)	☐ Policies and Law (Dasar dan Undang-undang)	☐ Built Environment (Alam Bina-Aspek Kemanusiaan)	☐ Environment (Alam Sekitar-Aspek Kemanusiaan)	☐ Environment (Alam Sekitar)	☐ Forestry (Perhutanan)	☐ Agriculture (Pertanian)
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C(ii)	Location of Research: Tempat penyelidikan dijalankan: Universiti Teknologi MARA Cawangan Perlis

C(iii)	Duration of this research (Maximum 12 months): <i>Tempoh masa penyelidikan ini (Maksimum 12 bulan):</i> Duration: 1 year <i>Tempoh :</i> From : 1 June 2024 <i>Dari :</i> To : 31 May 2025 <i>Hingga :</i>																																	
C(iv)	Other Researchers: <i>Ahli-ahli penyelidik yang lain:</i> <table border="1" data-bbox="199 741 1555 1566"> <thead> <tr> <th data-bbox="199 741 267 932">Bil</th><th data-bbox="267 741 573 932">Name Nama</th><th data-bbox="573 741 865 932">IC / Staff Number: No. Kad Pengenalan/ No. Pekerja:</th><th data-bbox="865 741 1235 932">University / Industry / Agency Fakulti/ P.Pengajian/ Pusat/Unit</th><th data-bbox="1235 741 1555 932">Academic Qualification/ Designation Tahap Kelayakan Akademik/Jawatan</th></tr> </thead> <tbody> <tr> <td data-bbox="199 932 267 1045">1</td><td data-bbox="267 932 573 1045">ANG LEE SIN</td><td data-bbox="573 932 865 1045">790301075137/ 301631</td><td data-bbox="865 932 1235 1045">SAINS GUNAAN</td><td data-bbox="1235 932 1555 1045">PHD</td></tr> <tr> <td data-bbox="199 1045 267 1163">2</td><td data-bbox="267 1045 573 1163">SITI NURLIA ALI</td><td data-bbox="573 1045 865 1163">851210025114/ 346175</td><td data-bbox="865 1045 1235 1163">SAINS GUNAAN</td><td data-bbox="1235 1045 1555 1163">PHD</td></tr> <tr> <td data-bbox="199 1163 267 1276">3</td><td data-bbox="267 1163 573 1276">ZALINA ZAINAL ABIDIN</td><td data-bbox="573 1163 865 1276">761005055390/ 150167</td><td data-bbox="865 1163 1235 1276">SAINS GUNAAN</td><td data-bbox="1235 1163 1555 1276">MSC</td></tr> <tr> <td data-bbox="199 1276 267 1457">4</td><td data-bbox="267 1276 573 1457">MOHAMMAD HAFIZ ISMAIL</td><td data-bbox="573 1276 865 1457">811028025373/ 239842</td><td data-bbox="865 1276 1235 1457">KOLEJ PENGAJIAN PENGKOMPUTERAN, INFORMATIK DAN MATEMATIK</td><td data-bbox="1235 1276 1555 1457">MSC</td></tr> <tr> <td data-bbox="199 1457 267 1566">5</td><td data-bbox="267 1457 573 1566">NURUL AIN MOHD ZAKI</td><td data-bbox="573 1457 865 1566">860829355170/ 337427</td><td data-bbox="865 1457 1235 1566">KOLEJ ALAM BINA</td><td data-bbox="1235 1457 1555 1566">PHD</td></tr> </tbody> </table>				Bil	Name Nama	IC / Staff Number: No. Kad Pengenalan/ No. Pekerja:	University / Industry / Agency Fakulti/ P.Pengajian/ Pusat/Unit	Academic Qualification/ Designation Tahap Kelayakan Akademik/Jawatan	1	ANG LEE SIN	790301075137/ 301631	SAINS GUNAAN	PHD	2	SITI NURLIA ALI	851210025114/ 346175	SAINS GUNAAN	PHD	3	ZALINA ZAINAL ABIDIN	761005055390/ 150167	SAINS GUNAAN	MSC	4	MOHAMMAD HAFIZ ISMAIL	811028025373/ 239842	KOLEJ PENGAJIAN PENGKOMPUTERAN, INFORMATIK DAN MATEMATIK	MSC	5	NURUL AIN MOHD ZAKI	860829355170/ 337427	KOLEJ ALAM BINA	PHD
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C(vi)	Please provide information on academic publications that has been published by the project leader for the last five (5) years. (Example: Journals, Books, Chapters in books, etc) <i>Sila kemukakan maklumat berkaitan penerbitan akademik yang telah diterbitkan oleh ketua penyelidik dalam tempoh lima (5) tahun terakhir. (Contoh: Jurnal, buku, bab dalam buku, dll)</i> <table border="1" data-bbox="199 1732 1555 1990"> <thead> <tr> <th data-bbox="199 1732 618 1856">Title of publication Tajuk penerbitan</th><th data-bbox="618 1732 1230 1856">Name of journals/books Nama jurnal/buku</th><th data-bbox="1230 1732 1555 1856">Year published Tahun diterbitkan</th></tr> </thead> <tbody> <tr> <td data-bbox="199 1856 618 1990">Simulation of Urea–Hydroxyapatite by using Density Functional Theory (DFT)</td><td data-bbox="618 1856 1230 1990">Journal of Sustainability Science and Management</td><td data-bbox="1230 1856 1555 1990">2022</td></tr> </tbody> </table>				Title of publication Tajuk penerbitan	Name of journals/books Nama jurnal/buku	Year published Tahun diterbitkan	Simulation of Urea–Hydroxyapatite by using Density Functional Theory (DFT)	Journal of Sustainability Science and Management	2022																								
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	Computational Density Functional Theory Investigation of Stability and Electronic Structures on Boron Nitride Systems Doped with/without Group IV Elements	Malaysian Journal of Chemistry	2022
	Density Functional Theory Study of Muon Hyperfine Interactions in 12mer Single-Strand Adenine, Cytosine, and Thymine Oligomers	Journal of the Physical Society of Japan	2022
	Density Functional Theory Investigation of Muon Hyperfine Interaction in Guanine–Cytosine Double-Strand DNA	Journal of the Physical Society of Japan	2022
	More Than Five Decades of Research on Urease Inhibitors: A Bibliometric Study	Journal of Sustainability Science and Management	2022
C(vii)	Executive Summary of Research Proposal (maximum 300 words) (Please include the problem statement, objectives, research methodology, expected output/outcomes/implication, and significance of output from the research project) <i>Ringkasan Cadangan Eksekutif Penyelidikan (maksimum 300 patah perkataan)</i> <i>(Meliputi pernyataan masalah, objektif, kaedah penyelidikan, jangkaan hasil penyelidikan/implikasi dan kepentingan output projek penyelidikan)</i> Physics courses are interesting in which we can use the knowledge gained to explain many things in our surroundings. For example, mechanics, electricity, and materials. In UiTM Perlis, physics subjects are offered at the diploma and degree level, and postgraduate studies, providing a platform for students to deepen their understanding of the subject. However, its complexity often deters students from fully engaging with the materials discussed in a physics subject. In the diploma program, AS120 (Diploma in Science), even though the course learning outcomes and lesson plans are mentioned, highlighted, and share with the students during the start of the semester, there is still rooms for enhancement in teaching fundamental physics concepts. The challenger encountered by lecturers teaching "Mechanics I" (course code PHY110) has been highlighted to the management for the last two semesters. The high failure rates, particularly evident in cohorts affected by the COVID-19 pandemic. Factors contributing to this issue include students lacking a science background or possessing marginal qualifications for PHY110. To address these challenges, the introduction of artificial intelligence (AI) presents a promising solution. AI, a technology increasingly integrated into educational settings, has demonstrated significant impacts on teaching and learning practices. In this initiative, AI will be incorporated into the PHY110 classroom to enhance student engagement and comprehension. By integrating AI into existing teaching practices and exercises, a novel approach to teaching and learning will be introduced, combining innovation with established pedagogical methods. This endeavor represents a pioneering exploration of a hybrid teaching model that merges AI technology with traditional instructional strategies, aiming to revitalize the learning experience for students in PHY110. The fusion of innovative AI tools with established teaching practices signifies a transformative shift in pedagogical approaches within the academic realm, offering a pathway to enriching the educational landscape at our esteemed institution.		
C(viii)	Detailed proposal of research project: <i>Cadangan maklumat penyelidikan secara terperinci:</i> (a) Research background including: / <i>Latarbelakang penyelidikan termasuk:</i> i) Problem Statement / <i>Pernyataan Masalah</i>		

Problem statement: In the context of the Diploma in Science program at UiTM Perlis, the teaching of basic physics subjects, particularly "Mechanics I" (PHY110), has encountered significant challenges, as evidenced by persistently high failure rates among students. The identified issues include students lacking a science background or possessing insufficient qualifications for the course. Despite clear course objectives and lesson plans, there is a recognized need for improvement in the delivery of physics education to enhance student comprehension and success rates. The integration of artificial intelligence (AI) into the PHY110 classroom is proposed as a solution to make learning more engaging and effective. This initiative aims to address the existing shortcomings in teaching basic physics subjects and improve student outcomes by innovatively combining AI technology with traditional teaching practices.

ii) **Hypothesis / Hipotesis**

The incorporation of artificial intelligence (AI) technology into the classroom environment of PHY110 will lead to increased student engagement, improved comprehension of physics concepts, and subsequently result in reduced failure rates among students. The innovative fusion of AI with traditional teaching practices is expected to create a more interactive and personalized learning experience, catering to the diverse academic backgrounds of students, ultimately enhancing the overall effectiveness of physics education.

iii) **Research Questions / Persoalan Penyelidikan**

- a. How do perceptions and attitudes of the students influence their engagement and learning experiences in PHY110?
- b. How can this integration pave the way for future advancements in physics education at UiTM Perlis?

iv) Literature review: **Literature Reviews / Kajian Literatur**

The integration of artificial intelligence (AI) in teaching physics courses offers a modern approach to addressing challenges in delivering basic physics subjects, such as "Mechanics I" (PHY110), within academic institutions like UiTM Perlis. While traditional teaching methods have faced difficulties in engaging students effectively, the potential of AI to enhance student learning experiences has attracted significant attention in educational research (Charles & Nixon, 2019; Chen et al., 2020). By incorporating AI elements into the classroom environment, educators aim to create more interactive and personalized learning experiences that cater to the diverse academic backgrounds of students (Babu & Moorthy, 2024). A few other related works are as follows:

- i. Fahimirad & Kotamjani (2018) explored the application of AI in teaching and learning within educational contexts. Their conceptual review paper delved into the emergence of AI in education, shedding light on the transformative impact of AI technologies on pedagogical approaches. The study underscored the importance of leveraging AI to create dynamic and personalized learning experiences for students in physics courses.
- ii. The integration of artificial intelligence (AI) in teaching physics has garnered significant attention in educational research. Mahligawati et al. (2023) conducted a comprehensive literature review focusing on the application of AI in physics education. The review highlighted the growing trend of utilizing AI technologies to enhance teaching practices in physics, emphasizing the potential benefits of AI in improving student learning outcomes.
- iii. The study by Popenici & Kerr (2017) delved into the impact of AI on teaching and learning in higher education. Their research explored the emergence of AI technologies in educational settings, emphasizing the transformative potential of AI in reshaping pedagogical practices. The findings underscored the need for innovative approaches, such as integrating AI, to enhance the teaching of physics courses.

Studies have emphasized the significance of innovative teaching methodologies in improving student engagement and understanding of complex subjects like physics (Naz & Murad, 2017). The utilization of AI technology in educational settings has demonstrated improvements in student outcomes by offering tailored support and adapting to individual learning needs (Guo (2022), Kortemeyer (2023)). The challenges encountered by lecturers teaching basic physics subjects, especially in cohorts with students lacking a science background or adequate qualifications, highlight the necessity for innovative pedagogical approaches (Zhang & Aslan, 2021). The proposed integration of AI in the

PHY110 classroom aims to bridge these gaps by introducing a new paradigm that combines established teaching practices with cutting-edge technology (Yang & Wang, 2020). By leveraging AI tools alongside traditional teaching methods, educators aim to revolutionize the learning experience for students, ultimately enhancing academic performance and reducing failure rates in physics courses.

v) References **Related References** / Rujukan berkaitan

Babu, S. S., and Moorthy A. D. (2024). Application of artificial intelligence in adaptation of gamification in education: A literature review. *Computer Applications in Engineering Education*, **32**, e22683.

Charles, R. L. & Nixon, J. (2019). Measuring mental workload using physiological measures: A systematic review. *Applied Ergonomics*, **74**, 221.

Chen, L., Chen P. and Lin Z. (2020). Artificial Intelligence in Education: A Review. *IEEE Access*, **8**, 75264.

Fahimirad, M. & Kotamjani, S. (2018). A review on application of artificial intelligence in teaching and learning in educational contexts. *International Journal of Learning and Development*, **8**, 106.

Guo, H. (2022). Research on the construction of the quality evaluation model system for the teaching reform of physical education students in colleges and universities under the background of artificial intelligence. *Scientific Programming*, **6556631**, 1.

Kortemeyer, G. (2023). Could an artificial-intelligence agent pass an introductory physics course? *Physical Review Physics Education Research*, **19**, 010132.

Mahligawati, F., Allanas E., Butarbutar, M. H., and Nordin N. A. N. (2023). Artificial intelligence in physics education: a comprehensive literature review. *Journal of Physics Conference Series*, **2596**, 012080.

Naz, F., & Murad, H. S. (2017). Innovative teaching has a positive impact on the performance of diverse students. *Sage Open*, **7**, 1.

Popenici, S. & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, **12**, 1.

Yang, D. & Wang, Y. (2020). Hybrid physical education teaching and curriculum design based on a voice interactive artificial intelligence educational robot. *Sustainability*, **12**, 8000.

Zhang, K. and Aslan A. B. (2021). AI technologies for education: recent research & future directions. *Computers and Education: Artificial Intelligence*, **2**, 100025.

- vi) **Relevance to Government Policy, if any** / *Perkaitan dengan Dasar Kerajaan, jika berkenaan*
Artificial intelligence (AI) has the potential to revolutionize physics education in Malaysia in alignment with the government's "AI UNTUK RAKYAT" policy. By incorporating AI-powered tools into physics learning, students can benefit from personalized learning pathways and progress at their own pace. Research has shown that AI technologies, such as ChatGPT, can enhance students' educational activities, providing quick access to information and aiding in university-related assignments efficiently. Furthermore, this project is in line with the UiTM circular on the importance in using AI technologies, such as ChatGPT in teaching and learning.

(b) Objective (s) of the Research

Objektif Penyelidikan

- i) The objective of this research question is to investigate the impact of student perceptions and attitudes on their engagement levels and learning experiences in the PHY110 physics course. By exploring how students' attitudes shape their engagement with the subject matter, the study aims to identify factors that influence student learning outcomes and academic performance in physics education.
- ii) The objective of this research question is to assess how the integration of artificial intelligence (AI) in teaching physics, specifically in the PHY110 course, can lead to advancements in physics education at UiTM Perlis. By examining the implications of incorporating AI technology in the classroom, the study aims to identify opportunities for innovation, improvement in teaching practices, and enhancement of student learning experiences. The objective is to explore how this integration can contribute to the evolution and enhancement of physics education at the institution.

(c) Methodology

Kaedah penyelidikan

To achieve the objectives related to the research questions, the following detailed methods will be employed:

Methodology:

a. Objective 1

1. Survey Design: Develop a comprehensive survey questionnaire comprising items related to student perceptions, attitudes towards physics, engagement levels, and learning experiences in PHY110.
2. Sampling: Implement a stratified random sampling technique to ensure representation across different student demographics and academic backgrounds.
3. Data Collection: Administer the survey to a sample of PHY110 students at UiTM Perlis, ensuring anonymity and confidentiality of responses.
4. Data Analysis: Utilize statistical analysis methods such as correlation analysis and regression analysis to examine the relationship between student perceptions, attitudes, engagement, and learning outcomes.
5. Qualitative Interviews: Conduct in-depth interviews with a subset of students to gain deeper insights into the factors influencing their engagement and learning experiences in PHY110.
6. Triangulation: Combine quantitative survey data with qualitative interview findings to provide a comprehensive understanding of how student perceptions and attitudes impact their engagement and learning in physics education.

b. Objective 2

1. Stakeholder Consultation: Engage with physics educators, AI experts, and students to gather insights on the feasibility and implications of integrating AI in physics teaching.
2. Pilot Implementation: Implement a pilot program integrating AI tools in the PHY110 classroom to assess its impact on student engagement, comprehension, and academic performance.
3. Observational Studies: Observe classroom dynamics, student interactions with AI technology, and teaching outcomes to evaluate the effectiveness of the integration.
4. Feedback Mechanisms: Collect feedback from students, educators, and AI specialists to iteratively refine the integration process and address any challenges or limitations.
5. Longitudinal Study: Conduct a longitudinal study to track the long-term effects of AI integration on physics education outcomes and identify opportunities for continuous improvement and innovation.

(d) Expected Results/Benefit

Jangkaan Hasil Penyelidikan

1. ***Innovation in teaching and learning***

Innovations in Teaching and Learning:

The integration of artificial intelligence (AI) in physics education at UiTM Perlis can lead to several innovative advancements in teaching and learning practices. By incorporating AI technology in the PHY110 classroom, educators can tailor learning experiences to individual student needs, preferences, and learning styles. AI algorithms can analyze student data and provide personalized recommendations, exercises, and feedback, enhancing student engagement and comprehension. All in all, AI integration can foster the development of innovative teaching approaches that combine traditional pedagogical methods with AI-driven technologies. Educators can experiment with new instructional strategies, assessment methods, and learning resources to create dynamic and engaging learning experiences. These approach and ideas (the framework) to enhance students' understanding and performance in basic physics, will be submitted to MyIPO for copyright application. A poster with title "Incorporating Artificial Intelligence in enhancing students' understanding and performance in basic physics" will be created for the task. Furthermore, the project will be used to join two teaching-related innovation competition: International Innovation Competition on Languages, Education and Societies (IINNCOME) and International Teaching Aid Competition (iTAC).

2. ***Research publications***

The outcomes of this project will be published in Physics Education, a Scopus-indexed journal. Possible title: "AI Integration in Physics Learning: Transformative Pathways and Educational Implications".

3. ***Impact on teaching and learning***

The integration of AI in physics education can pave the way for continuous improvement and innovation in teaching practices. Educators can leverage AI technologies to experiment with new teaching methodologies, refine instructional techniques, and explore emerging trends in educational technology.

(e) Research activity & Milestone

Aktiviti penyelidikan & Carta perbatuan

Research Activity and Milestones:

To achieve the research objectives related to student perceptions and attitudes in PHY110 and the integration of AI in physics education at UiTM Perlis, the following research activities and milestones can be outlined:

Research Activity 1: Survey Development and Administration

- Milestone 1: Develop a comprehensive survey questionnaire to assess student perceptions, attitudes, engagement, and learning experiences in PHY110.
- Milestone 2: Obtain ethical approval and permissions for survey administration.
- Milestone 3: Administer the survey to a sample of PHY110 students at UiTM Perlis.

Research Activity 2: Data Collection and Analysis

- Milestone 4: Collect survey responses and compile data for analysis.
- Milestone 5: Conduct statistical analysis to examine the relationship between student perceptions, attitudes, engagement, and learning outcomes.
- Milestone 6: Analyze qualitative interview data to gain deeper insights into student experiences.

Research Activity 3: Stakeholder Consultation and Pilot Implementation of AI

	- Milestone 7: Engage with physics educators, AI experts, and students to gather insights on AI integration. - Milestone 8: Develop a pilot program for integrating AI tools in the PHY110 classroom. - Milestone 9: Implement the pilot program and observe classroom dynamics and student interactions with AI technology. <u>Research Activity 4: Feedback Collection and Longitudinal Study</u> - Milestone 10: Collect feedback from students, educators, and AI specialists on the pilot implementation. - Milestone 11: Iterate and refine the AI integration based on feedback. - Milestone 12: Conduct a longitudinal study to track the long-term effects of AI integration on student outcomes. <u>Research Activity 5: Data Synthesis and Reporting</u> - Milestone 13: Synthesize quantitative and qualitative data to draw conclusions. - Milestone 14: Prepare research reports, academic papers, and presentations to disseminate findings. - Milestone 15: Present research outcomes to stakeholders and academic community for feedback and discussion. By following these research activities and milestones, researchers can systematically investigate student perceptions, attitudes, engagement, and learning experiences in PHY110, as well as evaluate the impact of AI integration on physics education at UiTM Perlis. These structured activities will facilitate the achievement of research objectives and contribute to the advancement of teaching and learning practices in physics education.	
D	BUDGET /BELANJAWAN	
	Please indicate your estimated budget for this research and details of expenditure according to the guidelines attached. <i>Sila nyatakan anggaran bajet bagi cadangan penyelidikan ini dan berikan butir – butir perbelanjaan lengkap dengan berpandukan kepada garis panduan yang dilampirkan.</i>	
	Budget details <i>Butiran belanjawan</i>	Amount requested by applicant <i>Jumlah yang dipohon oleh pemohon</i>
		Year 1 Tahun 1 (RM)
D (i)	Vote 11000 - Salary and wages <i>Vot 11000 - Upah dan Elaun</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	

D(ii)	Vote 21000 - Travelling and Transportation/ <i>Perjalanan dan Pengangkutan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(iii)	Vote 24000 - Rental <i>Vot 24000 - Sewaan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(iv)	Vote 27000 - Research Materials & Supplies <i>Vot 27000 - Bekalan dan Bahan Penyelidikan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(v)	Vote 28000 - Maintenance and Minor Repair Services <i>Bvot 28000 - Baik pulih kecil dan ubahsuai</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	

D(vi)	Vote 29000 - Professional Services <i>Vot 29000 - Perkhidmatan Ikhtisas</i> Publication fees Copyright application to MyIPO: RM 200 Participation fees for teaching innovation competition: 1. iTAC: RM 200 2. IINNCOME: RM 150 Perkhidmatan Penyelidikan (Jumlah yang boleh digunakan untuk perbelanjaan perkhidmatan penyelidikan) 5% mengikut jumlah kelulusan peruntukan	RM 875.00 RM 200.00 RM 200.00 RM 150.00 75.00
D(vii)	Vote 35000 - Accessories and Equipment <i>Vot 35000 - Aksesori dan Peralatan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
TOTAL AMOUNT <i>JUMLAH BESAR</i>		RM 1500
E	Declaration by applicant / Akuan Pemohon (Please tick (✓)): / (Sila tanda (✓)):	

I hereby declare that:

Saya dengan ini mengaku bahawa:

- ☒ 1. **All information stated here are accurate, and PJIM&A has right to reject or to cancel the offer without prior notice if there is any inaccurate information given.**
Semua maklumat yang diisi adalah benar, PJIM&A berhak menolak permohonan atau membatalkan tawaran pada bila-bila masa sekiranya keterangan yang dikemukakan adalah tidak benar.
- ☐ 2. **Application of this research is presented for the Internal Research Acculturation (DPPD).**
Permohonan penyelidikan ini dikemukakan untuk Dana Pembudayaan Penyelidikan Dalam (DPPD).
- ☒ 3. **Application of this research is subject to Ethical Committee approval (if applicable).**
Permohonan penyelidikan ini dimajukan ke Jawatankuasa Etika (jika berkenaan).

Date : 11 May 2024

Tarikh :

Applicant's Signature :

Tandatangan Pemohon :



Note: APPLICATIONS SUBMITTED WILL BE TREATED IN FULL CONFIDENCE. THE DECISION OF THE INTERNAL RESEARCH ACCULTURATION MAIN COMMITTEE UiTM CAWANGAN PERLIS IS FINAL.
Semua permohonan dianggap sulit. Keputusan Jawatankuasa Induk Geran Penyelidikan Pembudayaan Dalam UiTM Cawangan Perlis adalah MUKTAMAD.

Kod Rujukan: (Diisi oleh PJIM&A)	
RIG	
Bukti Kolaborasi	

BORANG GERAN i-TALENT

(Diisi oleh PJIM&A)

APPLICATION FORM GERAN INNOVATION IN TEACHING AND LEARNING (i-TALENT) *Dana Inovasi Dalam Pengajaran dan Pembelajaran (Pindaan 1/2024)*

**PJIM&A
UiTM CAWANGAN PERLIS**

A	TITLE OF PROPOSED RESEARCH: <i>Tajuk penyelidikan yang dicadangkan :</i> Enhancing English Pronunciation of University Students through Free Text-to-Speech Tools for Improved Employability	
B	DETAILS OF RESEARCHER / MAKLUMAT PENYELIDIK	
B(i)	Name of Project Leader: <i>Nama Ketua Projek:</i> NOR AZIRA MOHD RADZI	IC / Passport Number: <i>No. Kad Pengenalan/ Pasport:</i> 760521-07-5406
B(ii)	Faculty/School/Centre/Unit (Please provide full address): <i>Fakulti/Jabatan /Pusat/Unit (Sila nyatakan alamat penuh):</i> AKADEMI PENGAJIAN BAHASA	
B(iii)	Office Telephone No.: <i>No. Telefon Pejabat:</i> 04-9882682	Handphone No.: <i>No. Telefon Bimbit:</i> 0164422737
B(iv)	E-mail Address: <i>Alamat e-mel:</i> norazira202@uitm.edu.my	
B(v)	Date of first appointment with this University: <i>Tarikh mula berkhidmat dengan Universiti ini:</i> 30/5/2011	

C	RESEARCH INFORMATION / MAKLUMAT PENYELIDIKAN																																	
C(i)	Research Domain (Please tick (√)): <i>Domain Penyelidikan (Sila tanda (√)):</i> A. Pure and Applied Sciences (Sains Tulen dan gunaan) <table border="0"> <tr> <td>☐ Chemistry (Kimia)</td> <td>☐ Physic (Fizik)</td> <td>☐ Biology (Biologi)</td> </tr> <tr> <td>☐ Biochemistry (Biokimia)</td> <td>☐ Materials Science (Sains Bahan)</td> <td>☐ Mathematics and Statistics (Matematik dan Statistik)</td> </tr> <tr> <td>☐ Materials Science (Sains Bahan)</td> <td></td> <td></td> </tr> </table> B. Social Sciences (Sains Sosial) <table border="0"> <tr> <td>☐ Anthropology (Antropologi)</td> <td>☐ Psychology (Psikologi)</td> <td>☐ Sociology (Sosiologi)</td> </tr> <tr> <td>☐ Political Science (Sains Politik)</td> <td>☐ Business and Management (Pengurusan dan Perniagaan)</td> <td>☐ Geography (Geografi)</td> </tr> <tr> <td>☐ Economic (Ekonomi)</td> <td>☐ Human Ecology (Ekologi Manusia)</td> <td>☐ Communication (Komunikasi)</td> </tr> </table> C. Arts and Applied Arts (Sastera dan Sastera Ikhtisas) <table border="0"> <tr> <td>☐ Language and Linguistic (Bahasa dan Linguistik)</td> <td>☐ Literature (Kesusasteraan)</td> <td>☐ Religion (Agama)</td> </tr> <tr> <td>☐ Philosophy (Falsafah)</td> <td>☐ Civilization (Tamadun)</td> <td>☐ History (Sejarah)</td> </tr> <tr> <td>☐ Art (Seni)</td> <td>☐ Culture (Budaya)</td> <td>☒ Education (Pendidikan)</td> </tr> <tr> <td>☐ Policies and Law (Dasar dan Undang-undang)</td> <td>☐ Built Environment (Alam Bina-Aspek Kemanusiaan)</td> <td>☐ Environment (Alam Sekitar-Aspek Kemanusiaan)</td> </tr> </table> D. Natural Sciences and National Heritage (Sains Tabii dan Warisan Negara) <table border="0"> <tr> <td>☐ Environment (Alam Sekitar)</td> <td>☐ Forestry (Perhutanan)</td> <td>☐ Agriculture (Pertanian)</td> </tr> </table>	☐ Chemistry (Kimia)	☐ Physic (Fizik)	☐ Biology (Biologi)	☐ Biochemistry (Biokimia)	☐ Materials Science (Sains Bahan)	☐ Mathematics and Statistics (Matematik dan Statistik)	☐ Materials Science (Sains Bahan)			☐ Anthropology (Antropologi)	☐ Psychology (Psikologi)	☐ Sociology (Sosiologi)	☐ Political Science (Sains Politik)	☐ Business and Management (Pengurusan dan Perniagaan)	☐ Geography (Geografi)	☐ Economic (Ekonomi)	☐ Human Ecology (Ekologi Manusia)	☐ Communication (Komunikasi)	☐ Language and Linguistic (Bahasa dan Linguistik)	☐ Literature (Kesusasteraan)	☐ Religion (Agama)	☐ Philosophy (Falsafah)	☐ Civilization (Tamadun)	☐ History (Sejarah)	☐ Art (Seni)	☐ Culture (Budaya)	☒ Education (Pendidikan)	☐ Policies and Law (Dasar dan Undang-undang)	☐ Built Environment (Alam Bina-Aspek Kemanusiaan)	☐ Environment (Alam Sekitar-Aspek Kemanusiaan)	☐ Environment (Alam Sekitar)	☐ Forestry (Perhutanan)	☐ Agriculture (Pertanian)
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	☐ Marine (Marin) ☐ Archaeology (Arkeologi) ☐ Geoscience (Geosains) ☐ Ethnography (Etnografi) ☐ Built Environment (Heritage Aspect) Alam Bina (Aspek Warisan) ☐ Culture (Budaya) ☐ Biodiversity (Kepelbagaian Biologi) E. Information and Communication Technology (Teknologi Maklumat dan Komunikasi) ☐ Software and Information System (Perisian dan Sistem Maklumat) ☐ Soft Computing (Pengkomputeran Lembut) ☐ Computer Networking (Rangkaian Komputer) ☐ Information Security (Keselamatan Maklumat) ☐ Multimedia (Multimedia) ☐ Computer Engineering (Kejuruteraan Komputer) ☐ Computer Science (Sains Komputer) F. Health Sciences (Sains Kesihatan) ☐ Basic Medical Sciences (Sains Perubatan Asas) ☐ Pharmacy (Farmasi) ☐ Pharmacology (Farmakologi) ☐ Medical Microbiology (Mikrobiologi Perubatan) ☐ Parasitology (Parasitologi) ☐ Pathology (Pathologi) ☐ Community Medical Prevention (Perubatan Pencegahan Masyarakat) ☐ Clinical Surgical (Klinikal Surgikal) ☐ Clinical Medical (Klinikal Medikal) ☐ Associate Health Science (Sains Kesihatan Bersekutu) ☐ Dental (Pergigian) ☐ Nursing Science (Sains Kejururawatan)
C(ii)	Location of Research: Tempat penyelidikan dijalankan: UiTM Cawangan Perlis

C(iii)

Duration of this research (Maximum 12 months):
Tempoh masa penyelidikan ini (Maksimum 12 bulan):

Duration: 1 year
Tempoh :

From: 1 June 2024
Dari :

To : 31 May 2025
Hingga :

User
2024-05-07 13:52:58

Please change the grant duration from
1 June 2024 to 31 May 2025

C(iv)

Other Researchers:
Ahli-ahli penyelidik yang lain:

Bil	Name Nama	IC / Staff Number: No. Kad Pengenalan/ No. Pekerja:	University / Industry / Agency Fakulti/ P.Pengajian/ Pusat/Unit	Academic Qualification/ Designation Tahap Kelayakan Akademik/Jawatan
1.	Latisha Asmaak Shafie	141655	UiTM Cawangan Perlis	PhD
2.	Razlina Razali	350970	UiTM Cawangan Perlis	PhD
3.	Nor Alifah Rosaidi	304492	UiTM Cawangan Perlis	Master
4.	Hafizah Hajimia	830121075352/ 6469	Universiti Utara Malaysia	PhD
5.	Raisa Rastom	930604025366	UiTM Cawangan Perlis	Master

C(vi)

Please provide information on academic publications that have been published by the project leader for the last five (5) years. (Example: Journals, Books, Chapters in books, etc)
Sila kemukakan maklumat berkaitan penerbitan akademik yang telah diterbitkan oleh ketua penyelidik dalam tempoh lima (5) tahun terakhir. (Contoh: Jurnal, buku, bab dalam buku, dll)

Title of publication Tajuk penerbitan	Name of journals/books Nama jurnal/buku	Year published Tahun diterbitkan
Narrative Persuasion of Environmental Leaders on Social Media: Case Studies of Two Language Educators	International Journal of Academic Research in Business and Social Sciences	15/01/2022

	STUDENTS' PREFERENCES IN ONLINE DISTANCE LEARNING DURING COVID-19	IJEPC - International Journal of Education, Psychology and Counselling	05/09/2022
	Students' Perceptions Of Their Autonomy Over Online Distance Learning During The Covid-19 Outbreak	Borneo International Journal	01/03/2022
	Use Of Corpus-Integrated Data-Driven Learning Approach In The Language Classroom: Malaysian Educator's Perspectives	RES MILITARIS	22/12/2022
	LACKING MANNERS AMONG TERTIARY STUDENTS IN MALAYSIA FOLLOWING THE MOVEMENT CONTROL ORDER	INTERNATIONAL JOURNAL OF MODERN EDUCATION	27/06/2023
	CHALLENGES FACED BY STUDENTS IN LEARNING SPEAKING SKILLS USING VIDEO CONFERENCING	INTERNATIONAL JOURNAL OF EDUCATION, PSYCHOLOGY AND COUNSELLING (IJEPC)	27/06/2023
	MEDIA BIAS: IS IT REAL?	INTERNATIONAL JOURNAL OF LAW, GOVERNMENT AND COMMUNICATION (IJLGC)	09/09/2022
	Compilation of Poems ARAU INTERNATIONAL POETRY FESTIVAL 2021	PUBLISHED BY MALAYA NETWORK	11/11/2022
C(vii)	Executive Summary of Research Proposal (maximum 300 words) (Please include the problem statement, objectives, research methodology, expected output/outcomes/implication, and significance of output from the research project) <i>Ringkasan Cadangan Eksekutif Penyelidikan (maksimum 300 patah perkataan)</i> <i>(Meliputi pernyataan masalah, objektif, kaedah penyelidikan, jangkaan hasil penyelidikan/implikasi dan kepentingan output projek penyelidikan)</i> English language competency is essential for anyone learning a second language in today's globalised society, particularly in business. Even though English proficiency is important, a lot of university students find it difficult to reach the required level, which affects their employment options. Text-to-speech (TTS) programmes are one example of how technology integration in language acquisition has shown promise in addressing this difficulty. The purpose of this study is to investigate the effects of TTS tools on employability skills and how well university students pronounce English. To improve pronunciation competency, the proposed study will examine the use of text-to-speech technology in English language courses. It will also look into student involvement and progress and identify best practices for maximising pronunciation training and enhancing employability skills. A mixed research methodology will be used for the study, combining quantitative (questionnaires) and qualitative (interviews) methods. There will be voluntary participation from 150 ESL students from a public institution in Malaysia and three seasoned lecturers. Developing a vocabulary list, making lesson plans that incorporate TTS tools, practising pronunciation for a month, surveying students about their opinions of TTS tools, and conducting interviews to gain more in-depth knowledge are all part of the research. The purpose of the study is to shed light		

	on how well TTS tools work to help university students pronounce words more correctly in English. Through the incorporation of technology, the findings will help optimise language learning outcomes and improve students' employment skills. This study fills in knowledge gaps about how TTS tools affect language learning outcomes and provides educators with useful information to improve their teaching methods and students' language proficiency for improved job chances. The goal of this research is to improve second language learner educational outcomes by investigating the possibilities of TTS technology in higher education settings.
C(viii)	Detailed proposal of research project: <i>Cadangan maklumat penyelidikan secara terperinci:</i> (a) Research background including: / <i>Latarbelakang penyelidikan termasuk:</i> i) Problem Statement / <i>Pernyataan Masalah</i> ii) Hypothesis / <i>Hipotesis</i> iii) Research Questions / <i>Persoalan Penyelidikan</i> iv) Literature Reviews / <i>Kajian Literatur</i> v) Related References / <i>Rujukan berkaitan</i> vi) Relevance to Government Policy, if any / <i>Perkaitan dengan Dasar Kerajaan, jika berkenaan</i> Research Background: In today's globalized world, proficiency in English has become increasingly important for second language learners, particularly in the workplace. However, many second language learners face challenges in achieving the necessary level of English proficiency, which can hinder their career prospects and limit their opportunities for advancement. The study by Aizawa et al. (2020) highlights the significant impact of English language proficiency on the challenges faced by Japanese students in an English medium instruction program, emphasizing the correlation between TOEIC scores and difficulties in academic skills (reading, listening, speaking, and writing). Additionally, Şahan and Şahan (2023) delve into the emotional effects of English medium instruction, revealing feelings of frustration, anxiety, and pride among graduates in Turkey, emphasizing the obligation to develop English skills for career opportunities. Furthermore, Bjørge, Baci, and Whittaker (2020) explore language learner motivation among Romanian students, shedding light on the role of language skills, particularly English, in opening up diverse career possibilities. These studies collectively underscore the challenges and emotional impacts of language proficiency on career prospects for second language learners. One of the stumbling blocks for graduates to obtain employment at entry level in Malaysia is a poor command of English (Survey by Manpower Inc. 2008 as cited in Ministry of Higher Education Malaysia, 2012, p. 9). A similar finding was reported based on a survey conducted by TalentCorp and the World Bank (World Bank, 2014, p. 24) where a lack of communication skills was cited as a major hindrance to hiring local graduates by 81 per cent of employers surveyed. This is supported by another study, this time by Jobstreet.com (2015), which surveyed 472 clients, managers and senior managers across industries in Malaysia. The survey found that a poor command of English is one of the top five reasons fresh graduates are not hired. Surveys keep citing the lack of English proficiency as among the top reasons for graduate unemployability (e.g. Malaysian Employers Federation, 2016). This link between English language proficiency (ELP) and employability is a main push factor in recent policies aimed at improving the ELP of students, such as the English Language Roadmap 2015–2025 (English Language Standards and Quality Council, Ministry of Education Malaysia, 2015) (Zainuddin et al.,2019). To address this issue, educators and researchers have explored various approaches to language learning, including the use of technology. One promising area of research is the use of text-to-speech technology in enhancing learners' English pronunciation. Examples of text-to-speech tools are NaturalReader, Murf, Amazon Polly, Panopreter Basic, Notevibes and Capti Voice. These tools can also facilitate continuous learning and provide access to language resources outside the classroom, which can enhance learners' engagement and motivation((Al-Jarf, 2022; Duong, 2022; Gottardi et al., 2022; Fitria, 2022; Widyana et al., 2022; Amin, 2024). Despite the existing research, a notable gap remains, as there is insufficient exploration of the effectiveness and impact of TTS technology on second language learners' English workplace proficiency in higher education. Therefore, further research is warranted to address this gap and enhance our understanding of the potential benefits in a professional language learning context.

In addition, this research will help to identify best practices for integrating generative AI tools into language learning and optimize educational outcomes for second language learners.

Hypothesis - None

Problem Statement:

In an ideal scenario, where English proficiency is crucial in the global job market, university students would seamlessly develop advanced vocabulary and pronunciation skills.

Despite the growing importance of English proficiency in the global job market, many university students face challenges in developing the advanced vocabulary and pronunciation skills necessary for enhanced employability (Zainuddin et al., 2019). The integration of text-to-speech technology in English language courses presents a promising solution.

There are several studies which support the efficacy of TTS technology in enhancing English pronunciation skills, providing insights into practical usage, positive outcomes, and learner engagement (Al-Jarf, 2022; Duong, 2022; Gottardi et al., 2022; Fitria, 2022; Widyana et al., 2022; Amin, 2024). In terms of improvements in pronunciation, Al-Jarf (2022), Gottardi et al. (2022), Fitria (2022), Duong (2022), Widyana et al. (2022), and Amin (2024) collectively demonstrate that the use of TTS technology results in significant improvements in English pronunciation skills among language learners. In terms of diverse TTS Technologies, past studies explored various TTS technologies, such as NaturalReader (Al-Jarf, Fitria 2022) and AI-powered TTS apps (Amin), showcasing a diversity of tools in the application of TTS for pronunciation improvement. Gottardi et al. (2022) and Fitria (2022) study indicate TRS as a role supplement whereby they positioned TTS technology, including ASR and Natural Reader, as valuable supplements to traditional pronunciation teaching, emphasizing the role of technology in fostering learner autonomy. Widyana et al.'s systematic review (2022) emphasizes the practical role of TTS technology in supporting knowledge transfer in language learning, despite certain limitations in intonation and real-time class interaction. Amin's research (2024) and Al-Jarf's study (2022) both highlight positive attitudes and perceptions among students regarding the use of TTS technology, indicating a favourable reception of these tools for pronunciation learning.

Together, these studies collectively contribute to the growing body of evidence supporting the effectiveness of TTS technology in enhancing English pronunciation skills, showcasing similarities in duration, diverse TTS tools, and positive impacts on learners' attitudes and knowledge transfer.

However, there is a lack of comprehensive understanding regarding its effective implementation and impact on students' pronunciation proficiency, and employability skills. Furthermore, the levels of student engagement and progress in pronunciation through text-to-speech technology remain underexplored, hindering the identification of best practices for optimizing text-to-speech technology usage in university settings to enhance students' language skills and improve their competitiveness in the job market. Addressing these gaps is essential to maximize the potential benefits of text-to-speech technology for students' language learning outcomes and future career opportunities.

Research Questions:

1. How can text-to-speech technology be effectively integrated into English language courses to enhance English pronunciation proficiency among students?
2. What is the impact of text-to-speech technology usage on student engagement levels and progress in pronunciation skills, and how does this contribute to their employability prospects?
3. What are the best practices for implementing text-to-speech technology in university settings to optimize pronunciation training, and how do these practices impact students' employability in the competitive job market?

(iv) Literature Review

Teaching pronunciation in English has not received much attention. In Malaysia, teaching pronunciation in the second

languages are not emphasised in formal classrooms as it is left to the learners (Lin & Ooi, 2023). A program called a text-to-speech (TTS) synthesiser converts written text to speech automatically. With high-quality, native-speaker voices, TTS technologies are now widely employed in devices including computer voice interfaces, audiobooks, electronic dictionaries, desktop speech systems, and more. Better learning settings for their students were made possible by teachers with the use of computer-assisted pronunciation teaching, or CAPT (Duong, 2022).

To have effective and good communication, Levis (2018) points out that pronunciation is key for speech intelligibility and comprehensibility. Without proper exposure and training in pronunciation, local graduates who are ESL learners may be struggling with their pronunciation despite years of learning the English language (Cox, Henrichsen, Tanner and McMurphy, 2019).

Pronunciation known as "servant" skill does not exist in isolation but is intricately linked to other facets of spoken language (Levis, 2018). It is commonly known that pronunciation is rarely taught explicitly in the classroom as English language teachers pass over pronunciation teaching in favour of the main four skills. One of the reasons for this is that teachers perceive that pronunciation is not as fundamental as language skills but students deem it as valuable to learn because they want to be understood by native speakers (Grim and Sturm, 2016). Another reason is teachers especially non-native speakers feel that they have not gained complete mastery of pronunciation (Grim and Sturm, 2016). Wahid and Sulong (2013) also found that teachers lack the technical knowledge on this particular element such as the stress pattern. This also echoes a study by Nguyen and Newton (2020) that teachers reported that they lacked training in pronunciation and there is a necessity for pronunciation pedagogy in teacher training programmes. Moreover, there are two categories of challenges that novice teachers struggle to teach pronunciation which are internal and external challenges. Norbazila Mohd Asikin and Noor Aireen Ibrahim (2020) identified internal challenges to be the lack of confidence, sufficient knowledge and pedagogical issues. In terms of external challenges, they are referred to the time constraints, lack of priority and teaching materials.

Despite the challenges, teachers and students have access to free online resources that benefit them and are very helpful in the classroom and self-learning. Computer-assisted pronunciation Training (CAPT) enhances conventional learning approaches and students can receive immediate inputs regarding their pronunciation (Rogerson-Revell, 2021). Rogerson-Revell (2021) suggests teachers, researchers and developers consider the functionality of CAPT as it is generally known that students today are easily motivated and engaged in lessons digitally. One of the applications that can assist in language learning classes is the Text-to-Speech tool that transforms written text into spoken words. This tool is perceived positively by students and is very effective in assisting ESL students with their pronunciation after going through a few pronunciation lesson plans (Duong, 2022). Moreover, a study conducted by Meihani and Hussein (2014) discovered that utilising TTS in the classroom not only improved their reading fluency but also word stress, word intonation and pitch contour.

Underpinning Theory: Sociocultural Theory

The proposed study is underpinned by the Sociocultural theory (SCT) which was proposed by L.S Vygotsky. One of the central tenets of SCT is that understanding of the subject matter is acquired when humans utilize existing or new artefacts that facilitate their regulation of behaviour (self-regulation). To achieve self-regulation, learners need to be supported by object regulation and other regulations. Object regulation is described as instances when artefacts in the environment afford cognition/activity, while another regulation refers to feedback or comments by people to increase understanding and learning (Lantolf et al., 2015).

In the context of our study, TTS technology functions as an artefact for object regulation, while feedback from the lecturer during the lessons serves as another regulation. It is argued that these elements can catalyze students' pronunciation skills and therefore have a positive impact on their second-language proficiency (van Compernelle & Williams, 2013).

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(vi) Relevance to Government Policy

A research study focusing on optimizing text-to-speech tools for enhanced English pronunciation proficiency among university students holds significant relevance to Malaysian government policies in education. The Malaysian government has been actively promoting the integration of technology in education to enhance learning outcomes and prepare students for the demands of the modern workforce. By investigating the effectiveness of text-to-speech tools in improving language competencies, particularly in pronunciation, this research aligns with Malaysia's educational goals of fostering language proficiency and employability skills among university students.

The implications of this research project extend to informing Malaysian government policies on language education and technology integration in higher education institutions. By identifying best practices for implementing TTS tools in university settings and optimizing training outcomes, the study can provide valuable insights for policymakers to enhance language training programs and better equip students for the job market. The findings from this research have the potential to influence educational practices by highlighting the benefits of utilizing technology like TTS to improve English language skills. Teachers need to be exposed to the use of TTS so that they can be more familiar with and can assist the students to better explore the method in helping them to improve English pronunciation. All of these, ultimately contribute to Malaysia's efforts to enhance the employability of graduates in a competitive professional environment. TTS needs to be explored since most respondents agreed that it was helpful for some aspects of their pronunciation (Duong, 2022) and it was useful for self-correction purposes (James, 2016).

10-10 Malaysian Science, Technology, Innovation and Economic (MySTIE) Framework – SED - Education

(b) Objective (s) of the Research

Objektif Penyelidikan

1. To explore how text-to-speech technology can be implemented in English language courses to enhance English pronunciation proficiency among students, focusing on its effectiveness in improving employability skills
2. To investigate student engagement levels and progress in pronunciation skills through text-to-speech technology usage, examining how this technology influences learning outcomes and contributes to students' employability prospects.
3. To Identify Best Practices for Text-to-speech Technology Implementation: Identify and recommend best practices for implementing text-to-speech technology in university settings to optimize pronunciation training, considering its implications for enhancing students' employability in the competitive job market

(c) Methodology

Kaedah penyelidikan

Please state in the form / Sila nyatakan di borang ini

Research design

This study will be conducted using a mixed-method research design. Quantitative data will include a questionnaire to investigate the effects of using text-to-speech (TTS) technology on ESL students' pronunciation. Qualitative data will be collected through individual, semi-structured interviews to provide more insightful information about the impact of TTS on ESL students' pronunciation attitudes.

Research participants

Three (3) experienced lecturers teaching pronunciation and 150 ESL students at a public university in Malaysia will be recruited to participate in this study. To this end, a convenience sampling approach will be employed. This will allow the researchers to conveniently access potential participants who are readily available, therefore giving

the researchers control over the selection of participants that meet the study needs (Etikan et al., 2016). Participants will be informed that their participation is voluntary.

Data collection procedure

Intervention

Before the fieldwork, the researchers will develop a vocabulary list that will include 1000 professional vocabularies. In addition, the researchers will also prepare samples of lesson plans that can be supported by TTS tools to teach pronunciation to the students. These lesson plans can be used by the lecturers involved. The lessons will include teaching the students to use TTS tools to enhance their pronunciations independently (on their own). Each pronunciation lesson will take 15-20 minutes per class. The lecturers will be instructed to conduct this activity for a month.

Survey

Following the intervention, a questionnaire will be administered to investigate the students' attitudes towards utilising TTS tools and their pronunciation expectations. A five-point Likert scale will be used to examine the students' opinions. This quantitative data will then be analysed using SPSS software.

Individual, semi-structured interview

The three (3) lecturers and five (5) students will be selected to participate in an individual, semi-structured interview session. The five students will be selected based voluntarily. The objectives of the interview are (1) to verify the effects of TTS Tools on students' pronunciation, and (2) to verify how it affects their pronunciation. The interview session will be carried out in English. Data collected from the interviews will be analysed using thematic analysis. Frequent peer debriefing will be conducted with the research team members to identify gaps in the data, discuss the appropriateness of the constructs and sub-constructs elicited from the data and triangulate the data (McMohan & Winch, 2018).

(d) Expected Results/Benefit

Jangkaan Hasil Penyelidikan

1. Innovation in teaching and learning

1 innovation project- SpeakSmart: Revolutionizing English Language Proficiency with Text-to-Speech Technology for ESL Learners' Career Success

1 micro-credential course

(Using Mastering English Vocabulary Pronunciation for ESL Learners: Leveraging Free Text-to-Speech Tools for Enhanced Employability)

2. Research publications

1 article in MyCite Journal

Empowering University Students: Elevating English Vocabulary and Pronunciation with Free Text-to-Speech Tools for Enhanced Employability

3. Impact on teaching and learning

Through a systematic investigation of the usage of TTS tools in improving English pronunciation, this research seeks to provide valuable insights that can inform pedagogical practices and enhance language learning outcomes among university students.

(e) Research activity & Milestone

Aktiviti penyelidikan & Carta perbatuan

Research Activities	Description	Start Date	End Date	Cumulative Project
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					Completion Percentage(%)
	Setting Up Vocabulary List, Lesson Plans, Questionnaire and Interview Protocol Development	Develop a vocabulary list of 1,000 professional words and create a lesson plan examples. Design the questionnaire and develop the semi-structured interview protocol	June 1, 2024	June 30, 2024	10%
	Ethics Review Process:	Submit the research proposal for ethics review and approval.	July 1, 2024	August 31, 2024	20%
	Journal Writing, Innovation and Pre-Data Collection	Write a review paper Write abstracts for innovation Contact potential participants	September 1, 2024	October 30, 2024	40%
	Data Collection (Fieldwork)	Phase 1 - Implement lessons in class using TTS tools for pronunciation improvement. Phase 2 - Administer the questionnaire to assess students' attitudes and expectations. Phase 3 - Conduct semi-structured interviews to gather qualitative data on TTS impact.	November 1, 2024	December 31, 2024	60%
	Data Analysis	Analyze the collected data using SPSS software and thematic analysis Present at a conference	January 1, 2025	March 15, 2025	80%
	Report Writing	Compile findings and write the research report for the final report	March 16, 2025	May 31, 2025	100%
D	BUDGET /BELANJAWAN				
	Please indicate your estimated budget for this research and details of expenditure according to the guidelines attached. <i>Sila nyatakan anggaran bajet bagi cadangan penyelidikan ini dan berikan butir – butir perbelanjaan lengkap dengan berpanduan kepada garis panduan yang dilampirkan.</i>				
	Budget details <i>Butiran belanjawan</i>			Amount requested by applicant <i>Jumlah yang dipohon oleh pemohon</i>	
				Year 1 Tahun 1 (RM)	
D (i)	Vote 11000 - Salary and wages				

	Vot 11000 - Upah dan Elaun Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(ii)	Vote 21000 - Travelling and Transportation/ <i>Perjalanan dan Pengangkutan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(iii)	Vote 24000 - Rental <i>Vot 24000 - Sewaan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(iv)	Vote 27000 - Research Materials & Supplies <i>Vot 27000 - Bekalan dan Bahan Penyelidikan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	Asus 2024-05-06 09:56:19 ----- Please itemize the budget for vot 27000
D(v)	Vote 28000 - Maintenance and Minor Repair Services <i>Bvot 28000 - Baik pulih kecil dan ubahsuai</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	

D(vi)	Vote 29000 - Professional Services <i>Vot 29000 - Perkhidmatan Ikhtisas</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i> i. Research Services: RM75 ii. MYIPO = RM200 iii. Fee- Innovation Competition: RM350 iv. Conference Fee: RM350 v. Article Processing Charges (APC): RM400.00 vi. Honorarium (Interview): RM125	Asus 2024-05-06 09:56:45 ----- 1) Please allocate RM75 (5%) for Perkhidmatan Penyelidikan (required) 2) Please allocate RM200 for my IPO application (required) 3) Please allocate some budget for the innovation competition fee 4) Please note that based on the new guidelines, publication is optional
D(vii)	Vote 35000 - Accessories and Equipment <i>Vot 35000 - Aksesori dan Peralatan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
TOTAL AMOUNT <i>JUMLAH BESAR</i>		RM1500
E	Declaration by applicant / Akuan Pemohon (Please tick (✓)): / (Sila tanda (✓)):	

I hereby declare that:

Saya dengan ini mengaku bahawa:



- 1. All information stated here is accurate, and PJIM&A has the right to reject or cancel the offer without prior notice if there is any inaccurate information given.**

Semua maklumat yang diisi adalah benar, PJIM&A berhak menolak permohonan atau membatalkan tawaran pada bila-bila masa sekiranya keterangan yang dikemukakan adalah tidak benar.



- 2. Application of this research is presented for the Internal Research Acculturation (DPPD).**

Permohonan penyelidikan ini dikemukakan untuk Dana Pembudayaan Penyelidikan Dalaman (DPPD).



- 3. Application of this research is subject to Ethical Committee approval (if applicable).**

Permohonan penyelidikan ini dimajukan ke Jawatankuasa Etika (jika berkenaan).

Date :

Tarikh :

8/3/24

Applicant's Signature :

Tandatangan Pemohon :

Note: APPLICATIONS SUBMITTED WILL BE TREATED IN FULL CONFIDENCE. THE DECISION OF THE INTERNAL RESEARCH ACCULTURATION MAIN COMMITTEE UiTM CAWANGAN PERLIS IS FINAL.
Semua permohonan dianggap sulit. Keputusan Jawatankuasa Induk Geran Penyelidikan Pembudayaan Dalaman UiTM Cawangan Perlis adalah MUKTAMAD.

Kod Rujukan: (Diisi oleh PJIM&A)	
RIG	
Bukti Kolaborasi	

BORANG GERAN i-TALENT

(Diisi oleh PJIM&A)

APPLICATION FORM GERAN INNOVATION IN TEACHING AND LEARNING (i-TALENT) *Dana Inovasi Dalam Pengajaran dan Pembelajaran (Pindaan 1/2024)*

**PJIM&A
UiTM CAWANGAN PERLIS**

A	TITLE OF PROPOSED RESEARCH: <i>Tajuk penyelidikan yang dicadangkan :</i> Case Study on STEM and non-STEM Among Universiti Teknologi MARA (UiTM) Students: Academic Performance on Student Learning Time Allocation for Science and Technology Subjects	
B	DETAILS OF RESEARCHER / MAKLUMAT PENYELIDIK	
B(i)	Name of Project Leader: <i>Nama Ketua Projek:</i> Dr Rosyaini Afindi Zaman	IC / Passport Number: <i>No. Kad Pengenalan/ Pasport:</i> 780903035598
B(ii)	Faculty/School/Centre/Unit (Please provide full address): <i>Fakulti/Jabatan /Pusat/Unit (Sila nyatakan alamat penuh):</i> Fakulti Sains Gunaan, UiTM Cawangan Perlis, Kampus Arau, 02600 Arau, Perlis	
B(iii)	Office Telephone No.: <i>No. Telefon Pejabat:</i> 049882485	Handphone No.: <i>No. Telefon Bimbit:</i> 0126046931
B(iv)	E-mail Address: <i>Alamat e-mel:</i> rosyaini@uitm.edu.my	

B(v)	Date of first appointment with this University: <i>Tarikh mula berkhidmat dengan Universiti ini:</i> 8 Ogos 2005																														
C	RESEARCH INFORMATION / MAKLUMAT PENYELIDIKAN																														
C(i)	Research Domain (Please tick (✓)): <i>Domain Penyelidikan (Sila tanda (✓)):</i> A. Pure and Applied Sciences (Sains Tulen dan gunaan) <table border="0"> <tr> <td>☐ Chemistry (Kimia)</td> <td>☐ Physic (Fizik)</td> <td>☐ Biology (Biologi)</td> </tr> <tr> <td>☐ Biochemistry (Biokimia)</td> <td>☐ Materials Science (Sains Bahan)</td> <td>☐ Mathematics and Statistics (Matematik dan Statistik)</td> </tr> <tr> <td>☐ Materials Science (Sains Bahan)</td> <td></td> <td></td> </tr> </table> B. Social Sciences (Sains Sosial) <table border="0"> <tr> <td>☐ Anthropology (Antropologi)</td> <td>☐ Psychology (Psikologi)</td> <td>☐ Sociology (Sosiologi)</td> </tr> <tr> <td>☐ Political Science (Sains Politik)</td> <td>☐ Business and Management (Pengurusan dan Perniagaan)</td> <td>☐ Geography (Geografi)</td> </tr> <tr> <td>☐ Economic (Ekonomi)</td> <td>☐ Human Ecology (Ekologi Manusia)</td> <td>☐ Communication (Komunikasi)</td> </tr> </table> C. Arts and Applied Arts (Sastera dan Sastera Ikhtisas) <table border="0"> <tr> <td>☐ Language and Linguistic (Bahasa dan Linguistik)</td> <td>☐ Literature (Kesusasteraan)</td> <td>☐ Religion (Agama)</td> </tr> <tr> <td>☐ Philosophy (Falsafah)</td> <td>☐ Civilization (Tamadun)</td> <td>☐ History (Sejarah)</td> </tr> <tr> <td>☐ Art (Seni)</td> <td>☐ Culture (Budaya)</td> <td>☒ Education (Pendidikan)</td> </tr> <tr> <td>☐ Policies and Law (Dasar dan Undang-undang)</td> <td>☐ Built Environment (Alam Bina- Aspek Kemanusiaan)</td> <td>☐ Environment (Alam Sekitar- Aspek Kemanusiaan)</td> </tr> </table>	☐ Chemistry (Kimia)	☐ Physic (Fizik)	☐ Biology (Biologi)	☐ Biochemistry (Biokimia)	☐ Materials Science (Sains Bahan)	☐ Mathematics and Statistics (Matematik dan Statistik)	☐ Materials Science (Sains Bahan)			☐ Anthropology (Antropologi)	☐ Psychology (Psikologi)	☐ Sociology (Sosiologi)	☐ Political Science (Sains Politik)	☐ Business and Management (Pengurusan dan Perniagaan)	☐ Geography (Geografi)	☐ Economic (Ekonomi)	☐ Human Ecology (Ekologi Manusia)	☐ Communication (Komunikasi)	☐ Language and Linguistic (Bahasa dan Linguistik)	☐ Literature (Kesusasteraan)	☐ Religion (Agama)	☐ Philosophy (Falsafah)	☐ Civilization (Tamadun)	☐ History (Sejarah)	☐ Art (Seni)	☐ Culture (Budaya)	☒ Education (Pendidikan)	☐ Policies and Law (Dasar dan Undang-undang)	☐ Built Environment (Alam Bina- Aspek Kemanusiaan)	☐ Environment (Alam Sekitar- Aspek Kemanusiaan)
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☐ Art (Seni)	☐ Culture (Budaya)	☒ Education (Pendidikan)																													
☐ Policies and Law (Dasar dan Undang-undang)	☐ Built Environment (Alam Bina- Aspek Kemanusiaan)	☐ Environment (Alam Sekitar- Aspek Kemanusiaan)																													

	D. Natural Sciences and National Heritage (<i>Sains Tabii dan Warisan Negara</i>) ☐ Environment (<i>Alam Sekitar</i>) ☐ Forestry (<i>Perhutanan</i>) ☐ Agriculture (<i>Pertanian</i>) ☐ Marine (<i>Marin</i>) ☐ Archaeology (<i>Arkeologi</i>) ☐ Geoscience (<i>Geosains</i>) ☐ Ethnography (<i>Etnografi</i>) ☐ Built Environment (<i>Heritage Aspect</i>) <i>Alam Bina (Aspek Warisan)</i> ☐ Culture (<i>Budaya</i>) ☐ Biodiversity (<i>Kepelbagaian Biologi</i>) E. Information and Communication Technology (<i>Teknologi Maklumat dan Komunikasi</i>) ☐ Software and Information System (<i>Perisian dan Sistem Maklumat</i>) ☐ Soft Computing (<i>Pengkomputeran Lembut</i>) ☐ Computer Networking (<i>Rangkaian Komputer</i>) ☐ Information Security (<i>Keselamatan Maklumat</i>) ☐ Multimedia (<i>Multimedia</i>) ☐ Computer Engineering (<i>Kejuruteraan Komputer</i>) ☐ Computer Science (<i>Sains Komputer</i>) F. Health Sciences (<i>Sains Kesihatan</i>) ☐ Basic Medical Sciences (<i>Sains Perubatan Asas</i>) ☐ Pharmacy (<i>Farmasi</i>) ☐ Pharmacology (<i>Farmakologi</i>) ☐ Medical Microbiology (<i>Mikrobiologi Perubatan</i>) ☐ Parasitology (<i>Parasitologi</i>) ☐ Pathology (<i>Pathologi</i>) ☐ Community Medical Prevention (<i>Perubatan Pencegahan Masyarakat</i>) ☐ Clinical Surgical (<i>Klinikal Surgikal</i>) ☐ Clinical Medical (<i>Klinikal Medikal</i>) ☐ Associate Health Science (<i>Sains Kesihatan Bersekutu</i>) ☐ Dental (<i>Pergigian</i>) ☐ Nursing Science (<i>Sains Kejururawatan</i>)
C(ii)	Location of Research: <i>Tempat penyelidikan dijalankan:</i>

	Universiti Teknologi MARA (UiTM) Cawangan Perlis				
C(iii)	Duration of this research (Maximum 12 months): <i>Tempoh masa penyelidikan ini (Maksimum 12 bulan):</i> Duration: 1 year <i>Tempoh :</i> From : 1 June 2024 <i>Dari :</i> To : 31 May 2025 <i>Hingga :</i>				
C(iv)	Other Researchers: <i>Ahli-ahli penyelidik yang lain:</i>				
	Bil	Name Nama	IC / Staff Number: No. Kad Pengenalan/ No. Pekerja:	University / Industry / Agency <i>Fakulti/ P.Pengajian/ Pusat/Unit</i>	Academic Qualification/ Designation <i>Tahap Kelayakan Akademik/Jawatan</i>
	1.	Dr. Nur Nasulhah binti Kasim	830606-09-5030/241047	Faculty of Applied Sciences, Universiti Teknologi MARA Cawangan Perlis.	PhD in Chemistry/ Senior Lecturer
	2.	Dr. Siti Nurlia binti Ali	851210025114 / 346175	Faculty of Applied Sciences, Universiti Teknologi MARA Cawangan Perlis.	PhD in Chemistry/ Senior Lecturer
	3.	Dr. Nur Faezah binti Omar	871201095100 / 342360	Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Cawangan Perlis.	PhD/ Senior Lecturer
	4	Dr. Faiezah binti Hashim	820809-07-5546/245205	Faculty of Applied Sciences, Universiti Teknologi MARA Cawangan Perlis	PhD/ Senior Lecturer
	5.	Dr. Abdullah bin Abdul Samat	870830-40-5015	Fakulti Kejuruteraan & Teknologi Mekanikal, Universiti Malaysia Perlis	PhD in Fuel Cell Engineering/ Senior Lecturer
C(vi)	Please provide information on academic publications that has been published by the project leader for the last five (5) years. (Example: Journals, Books, Chapters in books, etc) <i>Sila kemukakan maklumat berkaitan penerbitan akademik yang telah diterbitkan oleh ketua penyelidik dalam tempoh lima (5) tahun terakhir. (Contoh: Jurnal, buku, bab dalam buku, dll)</i>				
	Title of publication Tajuk penerbitan		Name of journals/books Nama jurnal/buku		Year published Tahun diterbitkan

	Ekzema: Punca dan Rawatan	Majalah PP Biologi UiTM CNS	2024
	Writing For FYP: A Guide for Good Proposal & Report	Ebook Penerbit Press UiTM	2024
C(vii)	Executive Summary of Research Proposal (maximum 300 words) (Please include the problem statement, objectives, research methodology, expected output/outcomes/implication, and significance of output from the research project) <i>Ringkasan Cadangan Eksekutif Penyelidikan (maksimum 300 patah perkataan)</i> <i>(Meliputi pernyataan masalah, objektif, kaedah penyelidikan, jangkaan hasil penyelidikan/implikasi dan kepentingan output projek penyelidikan)</i> Education based on Science, Technology, Engineering and Mathematics (STEM) plays an important role in providing technically skilled human resources for the development of the nation. The number of students taking STEM-related programmes in higher education institutions (HEI) is still low. The number of students taking STEM programmes in HEI is reducing year by year compared to others. Based on the current situation, Ministry of Higher Education (MoHE) Malaysia open an opportunities for students non-STEM based (during upper secondary school) to continue study in HEI in Science and Technology programme. But with no background in STEM, their performance in science and technology subjects will affected. Thus this study will focus on evaluate the performance of STEM and non-STEM students' on four science and technology subjects (Physics, Biology, Chemistry and Mathematic). If the performance shows the gap between the students, this research will look at the effect of learning time allocation on non-STEM students' based on their performance. This study will collect data from student performance results from two semester (semester October 2023-February 2024 and October 2024-February 2025) of semester 1 student Diploma in Scince Program, UiTM Perlis Branch. First stage of this study involves analysis of data from semester October 2023-February 2024 of academic result's semester 1 students Diploma in Science. Second stage will be collected and anlysed for semester October 2024-February 2025. Comparison academic performance between 2 semester will be studied on their different academic background in secondary schoool which can be divided into STEM and Non-STEM. The effect of addition Student Learning Time (Non Face to face) to Non-STEM student also will be monitored. The factors influencing students' achievement output can be separated into two main factors. The first factor is personal characteristics such as innate learning ability, family background, school education quality, and student learning time. Data analysis will be using SPSS as tools for analysing the data. Since the non-STEM students continue study in S&T, it will create a gap between them and STEM students in terms of the length of learning time students and academic achievement. Based on the finding, this research will come out with idea to help student from non-STEM to survive and excellent in S&T in HEI. Thus, it will fulfill the desired number to provide technically skilled human resources for the nation's development.		
C(viii)	Detailed proposal of research project: <i>Cadangan maklumat penyelidikan secara terperinci:</i> (a) Research background including: / Latarbelakang penyelidikan termasuk:		

- i) **Problem Statement / Pernyataan Masalah**
- ii) **Hypothesis / Hipotesis**
- iii) **Research Questions / Persoalan Penyelidikan**
- iv) **Literature Reviews / Kajian Literatur**
- v) **Related References / Rujukan berkaitan**
- vi) **Relevance to Government Policy, if any / Perkaitan dengan Dasar Kerajaan, jika berkenaan**

i) Problem Statement

Science, Technology, Engineering and Mathematics (STEM) is important to provide technically skilled human resources for the nation's development. Malaysia needs eight million workers based on STEM skills by 2050 as reported by Academy of Sciences Malaysia in 2018. However, the number of students taking STEM programmes in Higher Education Institution (HEI) is reducing year by year compared to others. This is due to the trend of science stream enrolment keep on reducing as reported by Academy of Sciences Malaysia (2018) and Ministry of Education (2020). The data shows that the enrollment in 2017, 2018 and 2019 is 45.74%, 44.36% and 43.47% respectively. Regarding to this situation, Ministry of Higher Education (MoHE) Malaysia start to encourage student to fulfill and increase the number of student in taking STEM in HEI by opening up opportunities for students non-STEM based (during upper secondary school) to continue study in HEI in Science and Technology programme for example Diploma in Science. The performance (grade) will focus on four subjects (Mathematic, Physics, Chemistry and Biology) and CGPA.

This is a great opportunity for students to explore and show their performance even though they come from non-science based. But can the students show their great performance during their study in UiTM? Especially in Mathematics, Physics, Chemistry and Biology. The answer will be yes or no. Thus, this study will focus on the performance of non-STEM students compared to the performance of STEM based students in Diploma In Science (UiTM Perlis). This study needs to find out the factor contributed to the result among the students.

ii) Hypothesis

The Ministry of Higher Education (MoHE) offers great opportunities for non-STEM based students. Some students may show good performance and others may not. The result from four subjects (Mathematic, Physics, Chemistry and Biology) and CGPA become the indicator whether the students from non-STEM based can adapt the study or not in science programme in HEI.

iii) Research Questions

- 1) What is the performance (grade) of non-STEM based students when they need to study four subjects (Mathematic, Physics, Chemistry and Biology) in UiTM Perlis?
- 2) How the self learning time allocation to all S&T students influence on non-STEM students' in academic results

iv) Literature Reviews

Malaysia desired STEM education as a method to develop the country. Malaysia needs to achieve the number of STEM workers, and fulfill the challenges and demands of a STEM-driven economy. Education is crucial in order to produce competitive and efficient students in HEI. The Malaysian Ministry of Education (MOE) (2013) has indicated an interest in improving STEM education. Many measures to reform STEM education have been made, such as the introduction of a new secondary school science curriculum in 2017 and school-based assessment in 2011. All of these initiatives are focused at transforming STEM education in Malaysian schools so that career aspirations among students increase and their motivation to continue learning Science and can compete globally (Bunyamin et al, 2020).

Policy by the Ministry of Science, Technology and Innovation (MOSTI), which highlights the need to achieve a 60:40 ratio of which 60 % of students major in STEM. The target is still not achieved due to the lack of awareness about STEM. The factor contributed include content-heavy of STEM curriculum, inconsistent quality of teaching and learning, and limited and outdated infrastructure (Ministry of Education, 2011)

According to the Malaysia Blueprint 2013-2025 Annual Reports, the percentage of upper secondary students who enrolled in STEM in 2018 was 44.36% and slightly dropped to 43.47% in 2019 (Ministry of Education, 2020). However, in 2020, when new STEM packages were first introduced, the percentage was slightly increased to 47.18% (172124 students) with 20.51% involving Pure Science, while the remaining 26.67% was for Technical and Vocational Education and Training (TVET) (Ministry of Education, 2021). These statistics are alarming as it is still far behind the targeted 60%.

Based on the situation, Ministry of Education offers non-STEM students from upper secondary school to study in a diploma programme (Science and Technology (S&T)). It was reported that 25% (102 from 408 responded) from non-STEM pursue study in S&T in HEI (M.M. Isa and N.H. Julaihi, 2023).

Since the non-STEM students continue study in S&T, it will create a gap between them and STEM students in terms of the length of learning time students and academic achievement. It is well realized that learning time is an important factor affecting students' academic achievement indeed (Seidel). However, there are still some controversies and uncertainties about the relationship between students' learning time and academic achievement. Some of the research suggested that there is a positive correlation between students' learning time and their academic performance and achievement. Additionally, some research results show that learning time and learning outcomes are negatively correlated.

Therefore, this research makes precisely the above research contributions to fulfill the desired STEM education as a method to develop the country and achieve the number of STEM workers. The chance from Ministry of Education offers non-STEM students pursue study in S&T is great opportunity to fulfill. But with no background in STEM, the learning time should be optimized in order to balance their learning time allocation against the appropriate learning time standards.

v) Related References

Academy of Sciences Malaysia (2018). *Science outlook 2017: Converging towards progressive Malaysia 2050*. Kuala Lumpur, Malaysia: Academy of Sciences Malaysia.

Bunyamin, M. A. H., Talib, C. A., Ahmad, N. J., Ibrahim, N. H., & Surif, J. (2020). Current Teaching Practice of Physics Teachers and Implications for Integrated STEM Education. *Universal Journal of Educational Research*, 8(5A), 18-28.

Isa, M.M, Julaihi, N. H. (2023) Factors the Choice of Higher Education Institution and Diploma Programme among Universiti Teknologi MARA (UiTM) Students. *International Journal of Service Management and Sustainability* 8(1) 1 - 24.

Liu A, Wei Y, Xiu Q, Yao H, Liu J. How Learning Time Allocation Make Sense on Secondary School Students' Academic Performance: A Chinese Evidence Based on PISA 2018. *Behav Sci (Basel)*. 2023 Mar 8;13(3):237

Ministry of Education. (2013). *Malaysia education blueprint 2013-2025 (Pre-School to postsecondary education)*. Putrajaya: Ministry of Education.

Ministry of Education (2020). *Pelan Pembangunan Pendidikan Malaysia 2013-2025: Laporan Tahunan 2019*.

Ministry of Education (2021). *Pelan Pembangunan Pendidikan Malaysia 2013-2025: Laporan Tahunan 2020*

Seidel, T.; Shavelson, R.J. Teaching effectiveness research in the past decade: The role of theory and research design in disentangling meta-analysis results. *Rev. Educ. Res.* 2007, 77, 454–499.

(b) Objective (s) of the Research
Objektif Penyelidikan

- 1. To evaluate the performance of STEM and non-STEM students' on four science and technology subjects (Physics, Biology, Chemistry and Mathematic)
- 2. To study the effect of learning time allocation on non-STEM students' academic performance taken science and technology programme (S&T) in Higher Education Institution (HEI)

(c) Methodology
Kaedah penyelidikan

3.1. Data Collection

The data of this research will be obtained from the results student for four (4) course codes i.e., PHY120, CHM131, BIO120 and MAT133 of the Program Diploma in Science from Faculty of Applied Sciences, Universiti Teknologi MARA Perlis Branch. This reseach will involve student from STEM and Non-stem background students of semester 1 from Diploma in Science for 2 semester duration which will be collected data in semester October 2023-February 2024 and October 2024-February 2025.

3.1.1 First Stage

The first stage of sampling selected a representative sample from academic result's semester 1 students Diploma in Science for semester October 2023-February 2024. The data will be analysed for four (4) course code stated that involved in semester October 2023-February 2024. About 166 academic results for four (4) courses will be involved.

3.1.2 Second Stage

The data for selected courses will be collected and anlysed for semester October 2024-February 2025. Comparison academic performance between 2 semester will be studied on their different academic background in secondary schoool which can be divided into STEM and Non-STEM. The effect of addition Student Learning Time (Non Face to face) to Non-STEM student also will be monitored.

3.2. Variables

According to previous studied, the research on student academic performance is generally analyzed based on input–output efficiency models, and Hanushek’s classical educational production function theory model will be used (Liu A. et al.,2023). The factors influencing students’ achievement output (Yij) can be separated into two main factors. The first factor is personal characteristics such as innate learning ability (Iij), family background (Fij), school education quality (SCj), and student learning time (Timeij). The second factor refers to the other random residual components that cannot be estimated (eij). The theoretical model developed is as follows:

$$Y_{ij}=F(I_{ij}+F_{ij}+SC_{ij}+Time_{ij}+e_{ij})$$

(1)

Based on the theoretical model, the independent variables, dependent variables, and control variables selected by this research are shown in Table 1. The descriptive statistics of the variables are also shown in Table 1.

Table1: Description of independent variables, dependent variables, and control variables

Types of Variables	Description Variables
independent variables	The dependent variable is student academic performance, which is expressed as the grade of four course i.e., PHY120, CHM131, BIO120 and MAT133
dependent variables	The independent variable of this research is student learning time. It refers to the length of time students devote to learning each subject course with the unit of minutes/week.
control variables	The control variable is student study's background. It refer to STEM and Non-STEM student.

3.3 Data Analysis

All the data analyses will be used Statistical Package for the Social Sciences (SPSS). There are three steps in data analysis. (1) The research explores the effect of students' learning time on academic achievement through the multiple regression model. (2) This research analyzed the optimal range of students' learning time through a threshold regression model. (3) The Quantile regression model was used to analyze the heterogeneity of the learning time investment for students with different academic performance levels. SPSS is capable of conducting all major tests required for quantitative data analysis in the field of social sciences.

Reference:

Liu A, Wei Y, Xiu Q, Yao H, Liu J. How Learning Time Allocation Make Sense on Secondary School Students' Academic Performance: A Chinese Evidence Based on PISA 2018. Behav Sci (Basel). 2023 Mar 8;13(3):237. doi: 10.3390/bs13030237

(d) Expected Results/Benefit

Jangkaan Hasil Penyelidikan

1. **Innovation in teaching and learning**

New approach on Student Learning Time (SLT) for non-STEM student could be enhance the performance of student in science and technology subject through Extraordinary Intensive Class (EIC). This innovation product can be establish as a education tools to enhance the student's academic achivement. This product will be registered in MyIPO.

2. **Research publications**

Two publications will be published in the following expected journals

i) International Journal of Sustainability in Higher Education

ii) Universal Journal of Educational Research

iii) Journal of Higher Education

3. **Impact on teaching and learning**

Create an opputinity to non-STEM student to pursue their study in science and technology at Higher Education Institution.

(e) Research activity & Milestone
Aktiviti penyelidikan & Carta perbatuan

PROJECT GANNT CHART														
No	ACTIVITIES	DURATION (MONTHS)	2024										2025	
1	MILESTONE 1		A	M	J	J	A	S	O	N	D	J	F	M
i	Data collection - obtained from the results student for four (4) course codes	4	√	√	√	√								
2	MILESTONE 2													
i	Data sampling – first stages Sample from academic result's semester 1 students Diploma in Science for semester October 2023-February 2024	4				√	√	√	√					
ii	Data sampling – Second stages The data for selected courses will be collected and analysed for semester October 2024-February 2025.	4						√	√	√	√			
iii	Data Analysis - SPSS	4								√	√	√	√	
3	MILESTONE 3													
i	Data Analysis - SPSS	4								√	√	√	√	√
ii	Writing and Report	3										√	√	√

D

BUDGET /BELANJAWAN

Please indicate your estimated budget for this research and details of expenditure according to the guidelines attached.

Sila nyatakan anggaran bajet bagi cadangan penyelidikan ini dan berikan butir – butir perbelanjaan lengkap dengan berpandukan kepada garis panduan yang dilampirkan.

Budget details <i>Butiran belanjawan</i>	Amount requested by applicant <i>Jumlah yang dipohon oleh pemohon</i>
	Year 1 Tahun 1 (RM)

D (i)

Vote 11000 - Salary and wages
Vot 11000 - Upah dan Elaun

Please specify
Sila nyatakan secara lengkap dengan pecahannya sekali.

D(ii)	Vote 21000 - Travelling and Transportation/ <i>Perjalanan dan Pengangkutan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i> 1. Perbelanjaan penginapan, perjalanan dan pengangkutan.	725.00
D(iii)	Vote 24000 - Rental <i>Vot 24000 - Sewaan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
D(iv)	Vote 27000 - Research Materials & Supplies <i>Vot 27000 - Bekalan dan Bahan Penyelidikan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i> 1. Bahan cenderahati untuk sampel (pelajar) semasa pengumpulan data.	200.00
D(v)	Vote 28000 - Maintenance and Minor Repair Services <i>Bvot 28000 - Baik pulih kecil dan ubahsuai</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	

D(vi)	Vote 29000 - Professional Services <i>Vot 29000 - Perkhidmatan Ikhtisas</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i> 1. Penfailan Harta Intelek 200.00 2. Innovation Competition Fee 300.00 Perkhidmatan Penyelidikan (Jumlah yang boleh digunakan untuk perbelanjaan perkhidmatan penyelidikan) 75.00 5% mengikut jumlah kelulusan peruntukan	
D(vii)	Vote 35000 - Accessories and Equipment <i>Vot 35000 - Aksesori dan Peralatan</i> Please specify <i>Sila nyatakan secara lengkap dengan pecahannya sekali.</i>	
TOTAL AMOUNT JUMLAH BESAR		1500
E	Declaration by applicant / Akuan Pemohon (Please tick (✓)); / (Sila tanda (✓)):	

I hereby declare that:

Saya dengan ini mengaku bahawa:

- ✓ **1. All information stated here are accurate, and PJIM&A has right to reject or to cancel the offer without prior notice if there is any inaccurate information given.**

Semua maklumat yang diisi adalah benar, PJIM&A berhak menolak permohonan atau membatalkan tawaran pada bila-bila masa sekiranya keterangan yang dikemukakan adalah tidak benar.

- ✓ **2. Application of this research is presented for the Internal Research Acculturation (DPPD).**

Permohonan penyelidikan ini dikemukakan untuk Dana Pembudayaan Penyelidikan Dalaman (DPPD).

- ✓ **3. Application of this research is subject to Ethical Committee approval (if applicable).**

Permohonan penyelidikan ini dimajukan ke Jawatankuasa Etika (jika berkenaan).

Date : 28 Mac 2024

Tarikh :

Applicant's Signature :

Tandatangan Pemohon :



Note: APPLICATIONS SUBMITTED WILL BE TREATED IN FULL CONFIDENCE. THE DECISION OF THE INTERNAL RESEARCH ACCULTURATION MAIN COMMITTEE UiTM CAWANGAN PERLIS IS FINAL. Semua permohonan dianggap sulit. Keputusan Jawatankuasa Induk Geran Penyelidikan Pembudayaan Dalaman UiTM Cawangan Perlis adalah MUKTAMAD.