Universiti Kebangsaan Malaysia
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NARATIF BAHARU UKM
UNIVERSITI WATAN KITA

FACULTY OF MEDICINE
THE NATIONAL UNIVERSITY OF MALAYSIA

1st INTERNATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE IN MEDICAL EDUCATION WITH MAEMHS 2024

(Malaysia Association of Education in Medical & Health Science)

Theme :

"Decoding The Future of Medical Education With AI"

06 - 08 DEC 2024

Hybrid

LECTURE HALL 1,
PRECLINICAL BUILDING,
FACULTY OF MEDICINE,
UNIVERSITI KEBANGSAAN MALAYSIA (UKM)
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https://www.ukm.my/aimec/

Med & Health Dec 2024; 19(9) (Suppl): 01-97 https://doi.org/10.17576/MH.2024.s1909

KEYNOTE

The Current Status of AI Research in Medical Education: Critical Analysis and Future Directions

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ABSTRACT

Artificial intelligence (AI) typically includes machine learning (ML) and deep learning (DL). The term AI dates to the 50s, and it encompasses a variety of applications ranging from general ones to highly specialised tasks, such as image recognition, speech recognition, or diagnosing a disease. Current research on the use of AI in medicine has addressed several exciting areas, including medical images, nuclear medicine, cancer histopathology, cardiology, ophthalmology, healthcare, drug discovery, and others. However, medical education research has been constantly challenged to keep pace with advances in science and technology. We face a profound shift from the information age to the artificial intelligence age. However, medical education research on AI and its use faces considerable challenges and is moving at a slower rate than what is observed in medicine, pathology, surgery and radiology. The use of AI in education and research is expected to cover areas such as (i) AI in curricula reformation and precision education, (ii) Management of AI applications, (iii) AI and medical student assessment, (iv) AI and teaching and learning, and (v) Cultivation of empathy, compassion, and ethical standards. Currently, the literature in this field is predominantly on "editorials," "commentaries," "personal views," "perspectives," "articles," "conference abstracts," "letter-to-the- editor," and "reviews." We can hardly find "original research" covering the challenges facing medical education and the use of AI in medical education. In this keynote speech, I will explore the status of publications and research on AI in medical education, the challenges we face in AI research, and how we can overcome such challenges and contribute to research on AI in medical education.

Keywords: Artificial intelligence in medical education; curriculum reformation; precision education medical education research; AI implementation challenges

PLENARY

Decoding the Future of Medical Education with Artificial Intelligence (AI)

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ABSTRACT

The rapid development of AI has brought unprecedented possibilities to various fields, and medical education is no exception. In this domain, AI has become a focal point, as educators look forward to leveraging its capabilities in curriculum design, teaching resource development, and learning outcome assessment. In particular, the exceptional performance of deep learning technologies in image recognition and the ability of large language models (LLMs) to understand and generate language have opened up many new possibilities for medical educators. In this presentation, I will share our center's research on applications of computer vision and generative AI, aiming to inspire more innovative ideas. First, we have utilized AI's image recognition capabilities to develop a system called Virtual Rater for evaluating Basic Life Support (BLS) performance. This system has been compared with human raters, with results showing that while AI surpasses human raters in certain aspects, it also has its limitations. Moving forward, we will continue to refine the model to enhance its precision and reliability. Additionally, we have explored how tools like ChatGPT can be employed to design high-quality simulation lesson plans. This requires combining core principles of simulation-based education with well-crafted prompts to guide AI in generating content that meets instructional needs. We will introduce a human-AI collaboration model, demonstrating how AI can assist medical educators in improving the efficiency and creativity of lesson plan design. I hope this presentation will inspire you and spark innovative ideas for applying AI in medical education, as we collectively explore the future possibilities of this rapidly evolving field.

Keywords: Artificial intelligence in medical education; computer vision applications; generative AI in teaching; simulation-based education; human-AI collaboration

Research Proposal Smart Tool in Medical Education

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ABSTRACT

The development of high-quality research proposals in medical education is often hindered by challenges such as time constraints, resource limitations, and the complexity of methodological design. To address these issues, this paper introduces the *Research Proposal Smart Tool in Medical Education (RPST)*, an AI-powered solution designed to streamline and support the proposal-writing process. Currently, in the pilot phase, RPST offers features such as guided topic selection, structured problem statement development, literature review synthesis, methodological design recommendations, and ethical planning tools. The platform also provides resources such as templates, budget planners, and project timelines to enhance usability. This paper outlines the conceptual framework and design of RPST, detailing its key functionalities and the potential impact on proposal quality. Early feedback from pilot users suggests the tool's promise to address common obstacles in research development by improving efficiency, accessibility, and methodological rigor. Future evaluations will assess its full effectiveness and scalability. By integrating artificial intelligence with best practices in educational research, RPST aims to empower researchers in medical education, contributing to a more innovative and efficient research ecosystem.

Keywords: Artificial intelligence; medical education; research development; proposal writing; pilot study; methodology

SPECIAL LECTURE BY THE TUANKU MUHRIZ ROYAL CHAIR

Type 2 Diabetes Mellitus, Obesity and Heart Failure: Application of Artificial Intelligence

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ABSTRACT

Although the concept of Artificial Intelligence (AI) was first proposed in the 1950s, itsapplication in the healthcare sector has only expanded in the last decade. The utility of AI stems from its ability to process large volume of data efficiently and accurately and there is now emerging evidence supporting its application in cardiology for risk prediction, cardiovascular imaging and in research. My research program is underpinned by my clinical and research interest in the disease combination of diabetes and heart failure. In recent years, I have utilised AI to help with my translational research. The availability of population-based integrated electronic health records creates affordable and efficient research opportunities, benefitting from large sample size and generalisable patient populations. The quality and quantity of electronic health records data are expanding that now include electronic health records-linked biobanks and cardiac imaging data. We have successfully shown that AI algorithms coupled with electronic health records linked echocardiography can accurately and efficiently identify patients with heart failure. This ability will have the potential to improve efficiency, reduce the time for patient selection for pragmatic clinical trials, and improve HF surveillance and early diagnosis across hospital systems. We have also performed network analyses based on differential protein expression coupled with biological physical protein–protein interaction, and clinical outcome, to identify pathophysiological pathways in diabetes and heart failure. These new insights into pathophysiology are utilised in my drug repurposing research program. AI is transforming our research and clinical program with a potential impact that can lead to a paradigm shift in the diagnosis and management of cardiovascular diseases.

Keywords: Artificial intelligence; deep learning; heart failure; diabetes mellitus

SYMPOSIUM

VR and Simulation in Medical Curriculum

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ABSTRACT

The effectiveness of simulation based medical education (SBME) in the cognitive, psychomotor and affective aspects of learning has been proven beyond doubt. The application of simulation in medical education delivery requires good judgment based on evidence and standards of best practice. Virtual reality (VR) is a relatively new technological application in SBME. In utilizing this new technology, care must be taken to prioritize effectiveness of this learning modality, rather than overzealousness in adopting sophisticated technology. Unfamiliarity or discomfort of teachers and learners with a new high technology simulation modality such as VR may hinder rather than facilitate learning by unnecessarily increasing the extraneous cognitive load. The current hardware design of VR devices is not user friendly, especially for bespectacled myopic individuals. Cybersickness adds to the difficulty. Nonetheless, it has advantages in adding immersiveness in simulation, and in teaching psychomotor algorithm, hence it has its own niche in the medical curriculum.

Keywords: Simulation based medical education; virtual reality; immersiveness in simulation; psychomotor algorithm

Artificial Intelligent-enabled Virtual Reality Simulation for Interprofessional Education

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ABSTRACT

Introduction: AI-powered medical doctor agents offer nursing students valuable opportunities to participate in interprofessional team-based training and enhance collaborative skills.
Aim/Purpose/Objective: This study aimed to evaluate an AI-powered doctor versus Human-controlled doctor on nursing students' clinical care and team communication.
Method: A randomized controlled trial study was conducted with 64 undergraduate nursing students who were randomly assigned to undertake team training with AI-powered doctor (AI-powered doctor groups) or medical students using virtual reality simulation (Human-controlled doctor groups). The participants' clinical knowledge and self-efficacy in interprofessional communication were evaluated before and after the study interventions. They were evaluated on their clinical care and communication performances through simulation-based assessments. Their users' experience was also evaluated at the end of the study interventions.
Results: There was no significant differences found in the clinical care performance between groups (P=.39). The AI-powered doctor groups had statistically significantly higher post-test knowledge scores (P <.01) than the Human-controlled doctor groups. The Human-controlled doctor group reported a significant higher level of self-efficacy in interprofessional communication (P <.001) than the AI-powered doctor group. The Human-controlled doctor group reported a significantly higher level of users' experience (P <.39) than the AI-powered doctor group (P <.001).
Conclusion: The study highlights the potential of AI-powered doctors to expand and enhance interprofessional education for nursing students, offering scalable solutions for training in collaborative healthcare environments

Keywords: Artificial intelligent; interprofessional education; team training; virtual reality and simulation

From Virtual to Reality: Lessons Learned from Incorporating Virtual Reality (VR) into the Curriculum

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ABSTRACT

In recent years, Virtual Reality (VR) and simulation technologies have revolutionized higher education by offering immersive, interactive, and (hopefully) more effective learning experiences. The development and implementation of VR technologies provide many benefits, however, they do not come without challenges. In resource constraint countries, especially, the cost-effectiveness of VR needs to be carefully considered. Universitas Indonesia has started to develop different VR-based learning resources, including for medical education. The VR developed in Universitas Indonesia has been used in a range of students, from undergraduate to postgraduate medical students. There is also a VR specifically developed to be used in a multiprofessional setting. It is expected that embedding VR-based practices in the existing curriculum will enable a more efficient achievement of learning outcomes. This presentation will start by describing the concepts of VR and what can VR offer in theory. The first part of the presentation will also include the steps of VR development and how to ensure VR can be succesfully embedded in the curriculum. The presentation will continue with describing case studies of VR development and implementation in Universitas Indonesia, for example VR for practicing basic life support skills and supporting basic medical sciences learning such as anatomy, histology, and physiology through case/problem-based learning. The impact, challenges and limitations of implementing VR will be addressed in the current talk. Balancing the needs to keep abreast with the technological advancement related to VR and simulation and leverage its use to improve the quality of medical education and healthcare services, while keeping the cost and resources as efficient as possible is one of the prominent challenges.

Keywords: Virtual reality; simulation; curriculum; technology; medical education

Mindful Integration: Harnessing the Power of Simulation in Resource-Constrained Seings

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ABSTRACT

Simulation is a powerful learning tool in the medical curriculum where learners develop technical and non-technical skills in a safe environment. However, resource constraints may limit access to simulation-enhanced education. The common resource constraints are funding, simulators, curriculum, infrastructure and time. Such constraints can exacerbate the mismatch between learners' needs and instructional methods available, potentially compromising the quality of training. This presentation will provide practical solutions to overcome these limitations, focusing on optimising available resources and harnessing innovative approaches. At the end of session, the audience will be equipped with immediate actionable strategies to implement the best learning opportunities for their learners.

Keywords: Simulation-based education; resource constraints; medical curriculum; practical solutions; learner development; scalability

ORAL FREE PAPER 1

Assessing the Quality of AI-authored Exam Questions

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ABSTRACT

Introduction: Recent advancements in artificial intelligence (AI) have opened new avenues in educational methodologies, particularly in medical education.
Aim/Purpose/Objective: This study seeks to assess whether generative AI might be useful in addressing the depletion of assessment question banks and to augment the pool of formative assessment opportunities available to students.
Method: This research utilized a commercially available AI large language model (LLM), OpenAI GPT-4, to generate 200 single best answer (SBA) questions, adhering to Medical Schools Council Assessment Alliance guidelines the and a selection of Learning Outcomes (LOs) of the Scottish Graduate-Entry Medicine (ScotGEM) program. The AI-generated questions underwent standard quality-assurance screening to ensure compliance with the stipulated guidelines and LOs. A subset of these questions was then incorporated into an examination format alongside an equal number of human-authored questions, and subsequently undertaken by a cohort of medical students. The performance of both AI-generated and human-authored questions was evaluated, focusing on facility and discrimination index as key metrics.
Results: The screening process revealed that a significant majority of the AI-generated SBAs were fit for inclusion in the examinations with little to no modifications required. Modifications, when necessary, were predominantly due to reasons such as the inclusion of "all of the above" options, usage of American English spellings, and non-alphabetized answer choices. Post hoc statistical analysis indicated no significant difference in performance between the AI authored and human-authored questions in terms of facility and discrimination index.
Conclusion: The outcomes of this study suggest that AI LLMs can generate SBA questions that are in line with best-practice guidelines and specific LOs. However, the necessity of a quality assurance process to fine-tune formatting and curriculum alignment is evident. The insights gained from this research provide a foundation for further investigation into refining AI prompts, aiming for a more reliable generation of curriculum-aligned questions.

Keywords: Artificial intelligence; medical education; assessment; single best answer; GenAI

Effective Assessment Strategies: Designing Resident Progression Criteria for Optimal Outcomes

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ABSTRACT

Introduction: The shift towards competency-based medical education (CBME) necessitates effective progression criteria to foster growth and achieve desired outcomes. Clinical Competency Committees (CCC) require tools to enhance decision-making. By systematically assessing needs, designing appropriate metrics, and continuously refining approaches, training programs can ensure meaningful and sustained advancement for trainees.

Aim/Purpose/Objective: This project aims to develop and implement effective assessment strategies tailored to program requirements, focusing on resident progression criteria that promote optimal outcomes.

Method: We employed a multi-step approach to enhance assessment practices across our residency programs. Initially, an in-depth review of current assessment practices identified strengths, gaps, and areas for improvement. Based on these findings, we developed a program-specific resident progression criterion matrix for 23 residency and training programs, emphasizing both performance and compliance. The new criteria were piloted to assess their effectiveness in improving resident outcomes, systematically evaluating their impact on performance and development.

Results: The pilot implementation of the new assessment model resulted in significant improvements in the resident progression process. Feedback from the review team and program directors became more precise and actionable, enabling residents to receive targeted guidance on specific competencies. The model effectively aligned educational objectives with practical requirements, resulting in enhanced resident capacity to address complex health issues across multiple domains.

Conclusion: Designing and implementing effective resident progression metrics is a multifaceted process requiring meticulous attention to detail. By integrating diverse data sources and actively involving stakeholders, comprehensive metrics can be established to enhance resident development and ensure superior training outcomes. Continuous research and innovation are essential for refining these metrics and adapting to emerging

challenges, sustaining high standards in medical education and practice.

Keywords: Competency-based medical education; effective assessment strategies; resident progression; enhanced resident capacity

A Critical Evaluation of AI-enhanced Medical Education Platforms

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ABSTRACT

Introduction: The integration of Artificial Intelligence (AI) - enhanced platforms in medical education is revolutionising how medical educators teach, how students learn and engage with medical topics. These platforms leverage artificial intelligence to offer personalised and adaptive learning experiences, assessments with real-time feedback, to enhance the educational experience.
Aim/Purpose/Objective: To evaluate and compare the usability, user-friendliness, accessibility, content quality, pedagogical effectiveness, interactivity, assessment and feedback of three AI- enhanced medical education platforms.
Method: Lecturio, Cyberpatient 3.0 (CP) and Biodigital Human (BDH) are selected based on their relevance, innovative use of AI and credibility.
Results: Usability is excellent for all three platforms, with intuitive, friendly and interactive interfaces. As for quality of contents, Lecturio has high-quality video and written content, covering a wide range of medical topics in-depth. CP has case-based clinical scenarios whereas BDH offers highly detailed and anatomically accurate 3D models and pathology animations. Pedagogically, contents in all three platforms are structured to promote effective learning. Lecturio's focuses on active and adaptive learning strategies, based on learning science principles. CP's case-based approach is suited for developing clinical reasoning skills and to bridge the gap between knowledge and skills. BDH's interactive 3D models and simulations are effective for visual and kinesthetic learners. Lecturio offers interactive quizzes and CP provides a highly interactive, case-based learning experience with opportunities for clinical decision-making. BDH is the most interactive, with extensive 3D models, simulations and exploration tools. Lecturio provides comprehensive assessment with spaced retrieval function, adaptive review and performance analytics. CP offers detailed feedback and performance analytics to help learners identify areas for improvement regarding the full spectrum of a virtual hospital experience and BDH's assessment includes quizzes with immediate feedback.
Conclusion: Each platform has its strengths, making them suitable for different aspects of medical education depending on the needs of the learner and area studied. With their use, it is possible for the next generation of healthcare professionals to be equipped for the demands in the era of digital transformation.

Keywords: Artificial intelligence; medical education platforms; personalised learning; adaptive learning; technology-enhanced learning

Effectiveness of Moodle-based E-Learning Activities in Enhancing Student Learning in Musculoskeletal Biochemistry for First Year MBBS Students

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ABSTRACT

Introduction: E-learning involves the use of technologies in the learning process and offers the learners control over the content, time, and learning sequence. E-learning platforms are ideal to incorporate self-learning packages (SLP), empowering students to engage actively with content and develop self-directed learning skills at their own pace. In Moodle, HTML5 package (H5P) enhances interactivity and self-directed learning by enabling the creation of engaging content. Though H5P has been shown to support blended learning, flipped classrooms, active learning, and virtual simulations, its application within Moodle-based platforms, particularly in health profession and continuing education, remains underexplored.

Aim/Purpose/Objective: This study aimed to evaluate the effectiveness of integrating Moodle-based e-learning activities into SLP for the musculoskeletal biochemistry among Year 1 MBBS students.

Methods: A mixed method study using pre-post design was conducted. Following ethical approval, first year MBBS students (n=148) enrolled in the musculoskeletal system were recruited for the study. The same student cohort completed two SLPs, one in the traditional method and one enhanced with interactive tools via Moodle-based H5P. VARK learning style questionnaire was administered to assess the student's preferred learning styles. The student performance was determined from students' quiz scores following both the SLP methods. Feedback responses were obtained using structured questionnaires to determine the engagement between methods.

Results: Findings showed significantly improved ($p<0.001$) test scores in the Moodle-based SLP. The large effect size (Cohen's $d = 1.71$) showed that the Moodle-based SLP had a significant impact of student performance in musculoskeletal biochemistry, indicating that interactive activities enhance student learning. Students favoured many aspects of the Moodle-based SLP, particularly better engagement in the process. The VARK results indicated that most of the students had a multimodal preference which might have been a contributing factor for their improved performance and engagement with the Moodle-based learning package.

Conclusion: In conclusion, effectively integrating e-learning tools, such as Moodle-based interactive activities in SLPs, promotes student engagement and fosters deeper understanding and learning among students in musculoskeletal biochemistry.

Keywords: E-Learning; self-learning package (SLP); interactive activities; student engagement; technology-enhanced learning

Impact of Academic Intervention Regarding Plagiarism for Using Chat GPT in a Private Medical College

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ABSTRACT

Introduction: True level of understanding of the students cannot be judged in the era of Artificial Intelligence. Problem of plagiarism via Chat GPT in higher education appears to be worsening, placing an obligation on academia to make students aware of plagiarism.
Aim/Purpose/Objective: To introduce an educational strategy to make students aware and improve as a result of the academic intervention.
Method: Academic Interventional study was conducted from May to October 2023 at JMDC for all classes from 1st to final year through convenience sampling. Same Self-administered questionnaire was given at baseline and 15 days after the intervention after taking written consent in their respective classes by interactive session on awareness of plagiarism with regard to Chat GPT after taking ERC by the undergraduate research committee. Data was entered and analyzed by SPSS version 25. Categorical variables were described using frequency and percentages and numerical by Mean and SD. Intra group differences were analyzed by using Paired t test and inter group by using independent t test.
Results: Study included 317 MBBS participants, of which 42.3%(n=132) were females, majority of students were below 22 years of age 198 (63.5%).46 questions were asked about Chat GPT use, teacher control on AI use, teaching factor pushing towards use of AI, other Chat GPT related factors and consequences of plagiarism. Scores has been significantly improved post interventional (p-value >0.001) Most of the students strongly acknowledge that chat GPT material should be properly referenced (73.7%).
Conclusion: Most of the students strongly acknowledge that chat GPT material should be properly referenced pointing towards the fact of fairness throughout the assessment process. Higher Education Commission should advocate the implementation of policies that mandate the disclosure of Artificial Intelligence usage in research and academia.

Keywords: Plagiarism awareness; artificial intelligence in higher education; chatgpt usage; academic intervention; ethical AI practices

Algorithms versus Educators: Comparison of AI-Generated and Human Tutor Feedback in Medical Education_

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ABSTRACT

Introduction: There has been significant evolution in feedback practices over the years. There is also growing recognition that incorporating artificial intelligence (AI) into educational practices has the potential to transform the landscape of learning and teaching.
Aim/Purpose/Objective: This study aimed to investigate the comparative effectiveness of feedback generated by AI, specifically ChatGPT, versus traditional feedback from human tutors in a medical education setting.
Method: Second-year medical students were given two pieces of feedback on a written assignment: one from their designated tutor and the other generated by ChatGPT (without any reviewing or editing). Students were asked to evaluate each piece of feedback using an online questionnaire based on several criteria, including clarity, relevance, and usefulness.
Results: Feedback provided by human tutors was consistently rated higher across multiple dimensions. It was perceived as clearer ($p<0.001$), more relevant ($p<0.001$), more actionable ($p=0.009$), more comprehensive ($p=0.001$), and more accurate and reliable ($p=0.003$). Overall, tutor feedback was considered more useful ($p<0.001$) compared to ChatGPT-generated feedback. However, 62.3% of students noted that both types of feedback complemented each other. Open-ended responses echoed these findings, with a slight preference for tutor feedback due to its specificity, detail, and relevance. Interestingly, some students appreciated the clarity and ease of understanding offered by ChatGPT's feedback. This suggests that format and delivery of feedback play a critical role in its effectiveness. Many students perceived value in both, acknowledging that combination of AI-generated and human tutor feedback provided a more comprehensive perspective.
Conclusion: The study highlights the strengths and limitations of AI-generated feedback in medical education. While human tutors delivered superior feedback in terms of clarity, relevance, and actionability, AI's potential as a supplementary tool is undeniable. These findings suggest a promising future for a blended approach, where AI-generated and human feedback can together enhance the learning experience for medical students.

Keywords: Feedback evaluation; feedback comparison; tutor feedback; AI-generated feedback; Chatgpt; medical education

Investigating and Combating Gender Bias in Generative Large Language Models

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ABSTRACT

Introduction: Artificial intelligence (AI) is currently being trialled for applications within medical education. Large language models (LLMs) could be prompted to respond as a virtual simulated patient, that a student could interact with to practice history taking. Concerns about AI safety include a potential lack of diversity in the outputs of LLMs.
Aim/Purpose/Objective: The aim of the study was to determine whether there are gender-based inequalities in the output of GPT-4 (Generative Pre-trained Transformer) in the context of medical education. GPT-4 is a popular LLM created by OpenAI.
Method: Firstly, a literature review identified areas in which recent research has found evidence of gender-based inequalities in medical practice. Secondly, a prompt was generated which could be used by a medical student practicing history taking with GPT-4. Thirdly, the prompt was adapted to scenarios taken from the literature review. Tests were then run to determine the distribution of genders produced by GPT-4 using several scenarios. Tests also studied if the history given to the student by the virtual simulated patient would vary with gender.
Results: The results found that the gender of virtual simulated patients for most scenarios tested was significantly different from the expected distribution of genders. The history given by patients of different genders was not significantly different. A suggested method for improving the diversity of the output of LLMs was trialled with some success.
Conclusions: In conclusion, educators looking to use innovations in artificial intelligence should consider AI safety, equality, diversity and inclusion during the design phase of their project.

Keywords: AI safety; diversity; large language models

ORAL FREE PAPER 2

Healthcare Simulation Using Artificial Intelligence in Medical Education: A Systematic Review

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ABSTRACT

Introduction: Artificial intelligence (AI) has become a progressive advancing method incurrent era of medical education due to its capability to bring education to a higher level of outcome achievement. This resulted in paradigm shifts of traditional teaching methods to modern methods of delivery by using AI in healthcare simulation. Among its strengths are the ability to provide accurate and precise information, analyzing and interpreting data, transforming learning methods to an effective approach. Healthcare simulation using AI assists students and educators to enhance important skills such as communication, leadership, diagnostic skills, emergency surgical procedure and patient management skills.
Aim/Purpose/Objective: This systematic review summarized the use of AI in medical education healthcare simulation.
Method: An extensive literature search was done in PubMed and BMC medical education from January 2020 to September 2024. The inclusion criteria taking all the original research related to healthcare simulation using AI in medical education. During the search, 118 journal articles were identified, whereby 26 had met the inclusion criteria.
Results: Most studies reported that AI in healthcare simulation improved the student's performance in communication skills, leadership skills, diagnosis, emergency or surgical procedure and patient management. There were few studies that showed that non-AI groups (face to face training) performed better than groups using AI for training especially in performing cardiopulmonary resuscitation compression depth and surgical dissection. There was a study that showed that in teamwork training and team communication skills, both AI and non- AI groups performed equally well. Hence, the effectiveness of using AI depends on the type of training skills required.
Conclusions: In conclusion, more future studies are needed to provide conclusive evidence regarding the specific role of AI in specific medical skills training. Further on this, ethical issues involving AI need to be strengthened.

Keywords: Artificial intelligence; simulation; medical education; skills

The Digital Well-being among Learners in Higher Education: A Scoping Review

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ABSTRACT

Introduction: Digitalization has changed how we learn and share knowledge. The rapid growth of technology has transformed how people interact with themselves, each other, and their environment, impacting their well-being. This calls for more research.
Aim/Purpose/Objective: This review aimed to systematically map the functional elements of digital well-being among higher education learners and its relation with overall well-being issues.
Method: Primary literature from January 2018 to October 2023 were collected using the three-phase search strategy according to the Joanna Briggs Institute (JBI) scoping review guideline. Terms 'digital well being' OR 'digital well-being' OR 'digital wellbeing' AND 'higher education' AND 'learners' were searched from the Web of Science, PubMed and Scopus databases. We included all peer-reviewed articles that describe the effects of digitalization on the well-being of all learners in higher education institutes.
Results: Out of the 348 articles initially identified, 35 were reviewed, covering 10,838 undergraduate and postgraduate students aged 17 to 48 from 23 countries. Eight key themes of functional elements influencing digital well-being emerged from the analysis: digital self-regulation, digital self-efficacy, digital intention, digital conduct, digital engagement, digital support, digital resources, and digital safety. These factors had both positive and negative effects on well-being. The majority of evidence pointed to the negative effects of poor self-regulation in the digital realm. However, there was limited evidence supporting the effects of digital conduct and digital safety on general well-being. Additionally, some elements of digital self-regulation and digital resources did not show a significant impact on general well-being.
Conclusions: These findings highlight the need for further research, particularly in underexplored areas like digital conduct and digital safety. While these are important parts of digital well-being, their impact on overall well-being is still unclear. Expanding the research in these areas will help provide a more comprehensive understanding of digital well-being as a whole.

Keywords: Digital well-being; higher education learners; self-regulation; digitalization effects; well-being in education

Assessing the Impact of AI-Driven Adaptive Learning Platforms on Student Engagement, Motivation, Confidence and Perception on Feedback in Clinical History-taking

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ABSTRACT

Introduction: Undergraduate medical students typically report challenges in history-taking during their clinical years. Artificial Intelligence (AI)-driven adaptive learning platforms have the potential to enhance the experience by providing personalized feedback.
Aim/Purpose/Objective: This study aims to determine whether AI-driven adaptive learning platforms improve medical students' engagement, motivation, confidence, and perception on feedback in clinical history-taking.
Method: A mixed-methods pre- and post-intervention design was used with 56 undergraduate medical students in their 3rd and 5th year of study. A pre-intervention survey was administered, assessing engagement, motivation, confidence, and feedback. Students are then given access to a ChatGPT4o-based platform that records their history-taking sessions with actual patients. The GPT is configured to only refer to verified surgical textbooks and the faculty's marking rubrics when assessing and giving feedback to students. A post-intervention survey was then administered after 6-9 weeks, assessing the same domains.
Results: Quantitative results showed significant improvements in engagement (pre: 3.43, post: 3.95, p=0.002), motivation (pre: 3.39, post: 3.73, p=0.043), and confidence (pre: 2.59, post: 3.3, p<0.001) for students using the AI platform. Additionally, they reported higher perceptions of feedback usefulness (pre: 3.61, post: 4.13, p=0.006) and scoring accuracy compared to peer feedback. Qualitative data revealed themes of enhanced engagement due to real-time feedback and increased confidence from personalized, structured guidance.
Conclusion: AI-driven platforms significantly improve students' engagement, motivation, confidence, and perception on feedback in clinical history-taking. This study's main limitations are the small sample size and heterogeneity of students' proficiency in technology. The platform has the potential to complement traditional bedside teaching methods and has the added benefit of enabling students to practice in a self-directed manner.

Keywords: Artificial intelligence; engagement; history-taking; medical students; motivation

Develop a LINE Chatbot for Medical Undergraduates to Learn Patient-centered Shared Decision Making

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ABSTRACT

Introduction: Shared Decision-Making (SDM), an emerging critical competency of patient-centered care, is a prerequisite for physicians. The AI technology of Large Language Models (LLMs) to apply in medical education for patient-physician communication is currently an innovative approach with significant potential.
Aim/Purpose/Objective: Integration of LLMs into SDM training to develop a LINE chatbot for medical undergraduates (UGYs) practicing SDM anytime and anywhere.
Method: A total of 112 medical students participated in SDM simulation training and engaged in clinical consultations with standardized patients, using stress urinary incontinence (SUI) as an example of a clinical scenario. All conversations from these consultations were recorded and rewritten to transcripts for content analysis. Two trained analysts initially analyzed ten common transcripts, achieving a Cohen's kappa coefficient of 0.592. Chi-square tests of clinical teachers' rating in SDM OPTION5 scores were also

computed to determine whether there were significant differences between the codes and the scores. Prompt engineering with natural language processing (NLP) was applied to design and retune the most proper dialogues during the patient-physician communication.
Results: A total of 112 encounter SDM dialogue were recorded and recoded according to the intents, contexts, and entities of the framework of three-talk SDM model. The human-machine interface uses Line as the client interaction tool, while model building and training are developed using LINE Developers. Google DialogFlow is used for text processing. Finally, a total of seven categories with 24 statements were developed by 5 experts' consensus. Furthermore, higher SDM competency groups (ie, higher OPTION5 scores) compared to lower ones showed significant difference in addressing the following three statements: the explanation of pelvic floor stimulation; concerning the surgical treatment and risks; involving the joint discussion with the patient to make medical decisions.
Conclusion: Our LINE chatbot developed from real simulation data could be a feasible tool to learn SDM in UGYs.

Keywords: Shared decision-making; patient-centered; large language models; medical undergraduates; LINE Chatbot

Development and Feasibility of The Immersive Preoperative Virtual Reality Intervention for Patient Care (IMPRoVR)

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ABSTRACT

Introduction: Over 50% of children undergoing surgery suffer from preoperative anxiety (PA). Children who experience anxiety tend to be more agitated, sad, uncooperative, and resistant prior to surgery. Various interventions used to reduce anxiety include psychoeducation, using pamphlets, watching movies, or using distractions like playing video games or listening to music. However, these methods may often not be practical. Immersive virtual reality (VR) tours of the operation and anaesthesia procedures may provide a realistic and inexpensive experience which may help to reduce PA among children.
Aim/Purpose/Objective: The Immersive Preoperative Virtual Reality Intervention for Patient Care (IMPRoVR) project aims to explore the use of VR as a tool to reduce PA among children who will be undergoing elective surgery using quantitative measures.
Method: We aim to design and develop a preliminary virtual reality prototype that mimics the preoperative preparation and anaesthesia procedures for children aged 9 to 12 at Hospital Al-Sultan Abdullah UiTM. A collaborative, iterative development process is used to create the VR environment and simulation. The principal investigator and co-researchers regularly test the prototype and evaluate it in a focus group with ten healthy children.
Results: Children feel the sense of presence experienced in a virtual environment assessed using Presence Questionnaire (PQ). A significant reduction in PA was assessed using the State-Trait Anxiety Inventory (STAI) and Visual Analog Scale (VAS) in children and parents before and after the VR experience. Children feel absorbed or engaged in the virtual environment, contributing to better preparation for elective surgery. They also easily adapt to the virtual environment and feel comfortable assessing it using the Simulator Sickness Questionnaire (SSQ).

Conclusion: IMPRoVR is hopes to reduce PA and improve general well-being of children. It is a useful tool for healthcare procedure and has the potential to establish novel benchmarks in patient education and care.

Keywords: Immersive virtual reality; preoperative anxiety; digital health

From 2D to 3D: Leveraging AI Models to Improve Spatial Understanding in CT Scan Interpretation

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ABSTRACT

Introduction: As medical students transition from preclinical to clinical phases, they often face significant challenges in interpreting CT scans. The limited spatial context of 2D images complicates their ability to visualize anatomical structures accurately. However, effective imaging interpretation is crucial for diagnosis and patient management.
Aim/Purpose/Objective: This study proposes a solution through AI-driven 3D modelling, utilizing free and accessible tools that convert CT scans into interactive, patient-specific models, aiming to enhance spatial understanding and improve the detection of abnormalities and pathologies.
Method: DICOM files were downloaded from publicly accessible sources and viewed in 3D Slicer. Pretrained AI models, including MONAI Auto3DSeg and TotalSegmentator, through 3D Slicer's extension modules, were used to segment the scans. 3D models were then generated from the segmentations, allowing for detailed visualization of anatomical structures.
Results: The CT scans were segmented with reasonable accuracy, yielding highly detailed anatomical models. Masks outlining different structures were applied to the scans, facilitating easy differentiation and identification of anatomical structures. This layered approach allows for side-by-side comparisons of the original CT images and the segmented models, including views showing the scans cutting through or overlaying the 3D models. This visualization technique could further enhance students' ability to interpret imaging data and understand complex spatial relationships.
Conclusion: The main advantage of using open-source segmentation models, including MONAI, is their ability to create patient-specific 3D models that integrate both sectional and 3D anatomy. This approach provides detailed and reasonably accurate representations, allowing students an immersive, clinically relevant understanding of anatomical structures as seen in real cases. By bridging theoretical anatomy with practical radiologic interpretation, these models support personalized learning, foster critical thinking, and better prepare students for the clinical challenges of patient care.

Keywords: Spatial visualization in Anatomy; medical education technology; digital learning in medicine; artificial intelligence in healthcare; interactive Anatomy education

The Effect of an Ergonomic Intervention Educational Program on Knowledge, Attitude and Practice for the Prevention of Musculoskeletal Disorders among Health Science Students in Universiti Kebangsaan Malaysia

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ABSTRACT

Introduction: Ergonomic interventions are seen as crucial resources in avoiding the development of musculoskeletal disorders (MSD). To prevent MSD, participatory ergonomics should be implemented in the initial phases. As a result, the Ergonomic Intervention Educational Program (EIEP) was developed in the format of an e-booklet and introduced to health science students to support them and encourage them to maintain this habit during their time in university.
Aim/Purpose/Objective: The research aims to assess the effects of EIEP on health science students' knowledge, attitude, and practice in preventing MSD.
Method: This study was an experimental design with a single group measuring outcomes before and after an intervention. The research team completed the survey before starting the intervention as a baseline measure, and again after the intervention to assess changes in knowledge, attitude, and practice related to ergonomics and preventing MSDs after 6 weeks.
Results: Participants showed a significant improvement in their ergonomic knowledge and attitude before and after the intervention ($p<0.05$). There was no noticeable change in the practice of the participants in the study before and after EIEP.
Conclusions: The educational program focusing on ergonomics had a positive impact on health science students' knowledge and attitude, even though it did not lead to a significant change in their ergonomic practices.

Keywords: Ergonomics; musculoskeletal disorders; knowledge; attitude; practice; health

POSTER

Implementing AI-Driven Online Learning Management Systems to Enhance Teaching and Learning in Medical Education: A Medical Library Perspective

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ABSTRACT

Introduction: This study explores the opportunities and challenges of integrating AI-driven online learning management systems (OLMS) within medical libraries to enhance medical education. The study examines how AI-enhanced OLMS can support personalized learning, expedite information retrieval, and optimize content discovery for researchers, medical students, and healthcare professionals.
Aim/Purpose/Objective: This study aims to advance AI-based OLMS through medical libraries to enhance teaching and learning in medical education.
Method: The Human-Organization-Technology Fit (HOT-Fit) framework, which evaluates how users, organizational structure, and technology fit while implementing AI-driven OLMS, serves as the foundation for the study's methodology. 43 papers met the inclusion criteria after a systematic literature review using PRISMA guidelines sourced 3,713 records from Web of Science, PubMed, Scopus, and IEEE Xplore between 2014 and 2024.
Results: Findings suggest AI-driven OLMS can automate resource curation, expedite information retrieval, and offer adaptive learning pathways that are customized to meet the needs of each user. The findings also point to important factors that facilitate personalized learning experiences such as intelligent search capabilities and AI-based recommendations, which enable users to access relevant studies, clinical guidelines, and case materials.
Conclusion: The result of this study, although constrained by a 10-year literature scope, underscores the potential of medical libraries as pivotal hubs for AI-driven educational support in medical education. Consequently, this study offers actionable insights for educators, librarians, and administrators in designing and implementing effective AI-driven OLMS to enhance teaching and learning in medical environments.

Keywords: AI-driven learning management systems; teaching and learning; medical education; medical libraries; systematic literature review

Transforming Medical Education Through Digitalization: A Recent Comprehensive Structured Review of Curriculum Design and Development

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ABSTRACT

Introduction: The rapid advancement of digital technologies has significantly influenced the design and development of medical education curricula, driving a shift toward more interactive, accessible, and personalized learning environments.
Aim/Purpose/Objective: This systematic literature review explores the impact of digitalization on medical education, particularly focusing on how recent curriculum reforms have incorporated digital tools such as artificial intelligence, e-learning platforms, and virtual simulations. The review identifies a critical gap in traditional medical education, where the rigid, content-heavy approach often fails to meet the dynamic needs of modern healthcare.
Method: To achieve this, we conducted an extensive search of scholarly articles from reputable databases such as Scopus, Web of Science and Eric, focusing on studies published between 2022 and 2024. The flow of the study is based on the PRISMA framework. The database found (n=26) final primary data was analysed.
Results: The finding was divided into three themes which is (i) AI integration in medical education, (ii) Technological innovations in medical education and (iii) Curriculum design and implementation for AI.
Conclusion: The review concludes that while digitalization holds immense potential to revolutionize medical education, there is a pressing need for structured, scalable, and inclusive approaches to ensure its successful implementation. Future research should focus on refining these digital tools and evaluating their long-term impact on medical education outcomes.

Keywords: Curriculum design; curriculum development; medical education; digitalization

Transforming Clinical Reasoning with Interactive Online Tutorials Powered by the Illness Script Framework

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ABSTRACT

Introduction: Clinical reasoning is traditionally trained in the wards, where students learn by observing and practicing in real-life settings. However, the clinical environment rapidly changes, and exposure to different cases and experiences varies significantly between students. This disparity often limits students' ability to develop robust diagnostic skills consistently.

Aim/Purpose/Objective: We developed an online collaborative tutorial to enhance clinical reasoning among medical students using the illness script framework.

Method: In this Padlet-based tutorial, students engage with weekly clinical case vignettes, fostering peer feedback and collaborative learning in a flexible online environment. Feedback was provided by peers and the facilitator weekly. The tutorial employed social constructivist principles, wherein learning occurs through social interaction and collaboration. It encouraged students to form illness scripts by engaging with peers and instructors, reflecting the concept of communities of practice. The tutorial incorporated deliberate practice, allowing students to repeatedly engage with clinical cases, apply diagnostic frameworks, and receive structured feedback. This iterative process helped students refine their clinical reasoning skills.

Results: A pre-intervention survey conducted among Year 6 medical students revealed that while 70% of students had prior formal training in differential diagnosis, only 35% felt confident in forming differential diagnoses. Common challenges included limited knowledge (45%) and difficulties in narrowing down diagnoses (35%). Additionally, only 30% of students regularly used structured tools such as mnemonics or frameworks. Post-intervention data showed significant improvement in students' confidence and ability to approach differential diagnoses systematically, with 100% of participants indicating that illness scripts were effective in enhancing their diagnostic reasoning.

Conclusion: This innovation represents a scalable, interactive solution for enhancing diagnostic reasoning skills in medical education.

Keywords: E-learning; clinical reasoning; online learning; health professions education; medical education

Leveraging E-Learning to Enhance Clinical Reasoning in Undergraduate Medical Education: A Scoping Review

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ABSTRACT

Introduction: E-Learning encompasses the delivery of educational content through digital platforms, enabling flexible and scalable access to learning resources. Given the increasing demands on clinical teaching time and limited opportunities for diverse patient exposures, e-learning offers a promising alternative for enhancing clinical reasoning skills in health professions education.

Aim/Purpose/Objective were to identify current modalities of e-learning used to improve clinical reasoning, assess the scope and effectiveness of these interventions in health professions education and discuss the relevance of e-learning as an educational tool in this context.

Methods: A scoping review was conducted using systematic searches of PubMed, MEDLINE, and EMBASE databases for relevant articles published up to November 2024, following a predefined search strategy.

Results: A total of 25 studies were included in the review. E-learning was utilized to enhance clinical reasoning through various methods: virtual patients for case-based simulations (12/25); interactive case-based learning modules (7/25); adaptive quizzes for self-assessment (4/25); and problem-based tutorials integrated with online resources (2/25). Implementation strategies involved online simulations, guided tutorials, and adaptive assessments to create interactive, real-world learning experiences. Most studies reported significant improvements in students' clinical reasoning skills, diagnostic accuracy, and critical thinking. Virtual patient simulations and adaptive quizzes were particularly effective in promoting deeper engagement and self-directed learning. However, the lack of control groups in many studies highlights the need for more rigorous research designs to confirm these outcomes.

Conclusions: E-Learning has emerged as a viable and effective approach for teaching clinical reasoning in undergraduate medical education. This scoping review indicates that e-learning enhances diagnostic skills, fosters self-directed learning, and improves student engagement. Future studies should focus on well-designed randomized controlled trials to validate these findings and explore blended models that integrate e-learning with traditional clinical education for optimal impact.

Keywords: E-learning; clinical reasoning; online learning; health professions education; medical education

Virtual Microscopy: Enhancing Accessibility and Efficiency in Undergraduate Pathology Education

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ABSTRACT

Introduction: Pathology is a fundamental subject in undergraduate medical education, focusing on the study of diseases, their aetiologies, pathogenesis, and clinical manifestations. Traditional practical sessions rely on light microscopy and glass slides, which require extensive preparation and maintenance. The need for multiple slides and printed substitutes can limit student access and efficiency. The COVID-19 pandemic highlighted these issues, as students lacked access to laboratory resources, negatively impacting their learning. To address these challenges, digital pathology was introduced, utilizing virtual microscopy and digital software. This transformation allows tissue and blood slides to be scanned and accessed online, facilitating simultaneous demonstrations and improving student engagement.

Aim/Purpose/Objective: This study aims to evaluate the impact of digital pathology on the effectiveness, accessibility, and sustainability of pathology training.

Method: A comparative, cross-sectional survey was conducted among 57 students across three cohorts. Participants provided feedback on their experiences with both traditional and virtual microscopy. Objective Structured Practical Examination (OSPE) results were compared between two cohorts: one using traditional microscopy (2022/2023) and the other using virtual microscopy (2023/2024).

Results: The survey indicated that virtual microscopy offered a superior learning experience, with students highlighting its user-friendly interface, better image quality, increased accessibility, and enhanced lecturer support. Notably, 78.9% of students found virtual microscopy more effective for identifying pathological changes, while 73.7% preferred it for future learning. OSPE results showed a reduction in the failure rate from 13% in the traditional cohort to 11% in the virtual cohort.

Conclusion: The transition to digital pathology has improved pathology education by enhancing student outcomes and engagement. Virtual microscopy provides a more sustainable and accessible learning environment, offering an effective alternative to traditional methods and better preparing students for clinical practice.

Keywords: Virtual microscopy; pathology; undergraduate

From Dependence to Competence: Addressing the Risks of Over-Reliance on AI in Medical Education

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ABSTRACT

Introduction: The rapid integration of artificial intelligence (AI) into medical education is transforming learning, teaching and assessment. However, there are concerns about the growing reliance on AI, particularly its negative impact on essential medical student competencies.
Aim/Purpose/Objective: This narrative review aims to explore the effects of excessive reliance on AI in medical education and how it can affect medical students' competence. This review also aims to propose solutions to mitigate these risks.
Methods: An extensive literature search was conducted by searching four databases (PubMed, Scopus, Web of Science and Ovid MEDLINE), focusing on English-language publications published from January 2022 to September 2024. Search keywords included "artificial intelligence", "medical education", "overreliance", "competence" and "solutions". The search focused on studies that covered the effects of AI overreliance on medical students' competence and proposed strategies to overcome these challenges. A total of eight peer-reviewed publications were included in the review.
Results: The review revealed that overreliance on AI can impair critical thinking, creativity and reasoning among medical students. Automation bias, where students assume that AI responses are always accurate and fail to validate them, was also a major concern. Proposed solutions included integrating AI literacy into medical curricula, developing guidelines on appropriate AI use and promoting interactive exercises (e.g. presentations, debates, group discussions, peer-based learning, etc.). These strategies can help balance AI's benefits while encouraging independent learning and cognitive skills.
Conclusions; The findings emphasise that a balanced approach to AI integration in medical education is needed. While AI can enhance medical education, overreliance poses significant risks to medical students' competence. Further research is needed to explore the long-term consequences of AI on medical education and strategies for its appropriate use. These interventions are crucial for preparing future physicians to effectively leverage AI while preserving their decision-making autonomy.

Keywords: Artificial intelligence; medical education; medical students; automation bias; clinical competence

Is It Possible to use AI to Help Students Learn Nursing Care Plans?

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ABSTRACT

Introduction: Nursing process and critical thinking is pivotal in nursing. An interactive digital platform is helpful for students learning it anytime.
Aim/Purpose/Objective: This writing aims to describe the development process of a learning platform by multidisciplinary collaboration among nursing, engineering, and computer science to bring the ideas into reality.
Method: The platform is called Smart PASIVIK. It is abbreviation for Virtual Patient Simulation for Nursing in Bahasa. The word "Smart" is used because this platform provides recommendations to students based on their performance on the platform. The product development process went through stages: (i) Research and validation (ii) development, started with students' need assessment (iii) usability testing. This platform is meant to give students seamless interaction with the virtual patient. At the early development, a manual database was used to build the virtual patient's response algorithm. Later when generative AI came to place, we used it to build seamless interaction between users and the virtual patients.
Results: We successfully integrated AI into Smart PASIVIK at the assessment step of the nursing process in the platform. It allows students to conduct interviews with the virtual patient as if they are doing it to a real patient. However, integrating AI to give recommendations for students in planning care is still challenging since nursing care should address the patients' biopsychosociocultural and spiritual needs not merely only the disease. This results in variations in the nursing care plan.
Conclusion: Smart-PASIVIK represents a significant step forward in integrating AI technology into nursing education. However, while it presents numerous benefits, there are inherent challenges, when integrating AI into the platform. The diverse and personalized

nature of nursing care plans makes it a complex field for AI to navigate. It's crucial for future developments to dive deeper into understanding and exploring AI abilities to facilitate learning patient-centric nursing care.

Keywords: Nursing; nursing care plan; artificial intelligence; personalized learning; virtual patient

Perceived Challenges of Artificial Intelligence in Healthcare among Undergraduate Medical Students at a Public Medical School in Sarawak, Malaysia

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ABSTRACT

Introduction: As artificial intelligence (AI) becomes more integrated into healthcare, it also brings challenges. Understanding these perceived challenges among medical students is crucial for developing educational frameworks that prepare them to navigate these challenges in clinical practice. However, the perceived challenges of AI in healthcare among medical students in Sarawak, Malaysia, remain underexplored.
Aim/Purpose/Objective: This study aimed to assess the perceived challenges of AI in healthcare among undergraduate medical students at a public medical school in Sarawak, Malaysia.
Method: A mixed-method cross-sectional survey was conducted from October 2023 to August 2024 among 185 undergraduate medical students from year one to year five at a public medical school in Sarawak. A convenience sampling method was employed. Data were collected using a validated questionnaire adapted from a previous Canadian study assessing medical students' perceived challenges of AI in healthcare. Participants rated their agreement on a 5-point Likert scale. Quantitative responses were analysed descriptively while qualitative data from open-ended questions were thematically analysed
Results: Most students expressed concerns about AI-related challenges: 73.0% (30.3% strongly agree, 42.7% agree) supported the statement that "AI in medicine will raise new ethical challenges" while 79.5% (30.3% strongly agree, 49.2% agree) supported that "AI in medicine will raise new social challenges." Additionally, 73.5% (27.0% strongly agree, 46.5% agree) supported that "AI in medicine will raise new challenges around health equity." In contrast, only 22.2% (6.5% strongly agree, 15.7% agree) supported that "The Malaysian healthcare system is currently well prepared to deal with challenges having to do with AI". Qualitative thematic analysis highlighted key themes of "Ethical, privacy, and security issues" and "Trust and reliability concerns".
Conclusion: Most of the medical students in this study expressed concerns about challenges of AI in healthcare, especially in ethical, privacy and security challenges. Comprehensive AI training, including ethical guidelines, is needed to equip future healthcare professionals to address these challenges effectively.

Keywords: Artificial intelligence; challenges; healthcare; medical students; medical education

Attitudes towards Artificial Intelligence in Medical Education and Practice among Undergraduate Medical Students at a Public Medical School in Sarawak, Malaysia

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ABSTRACT

Introduction: Artificial intelligence (AI) is revolutionising medical education and practice, making it essential to understand medical students' attitudes toward AI for curriculum development. However, the attitudes of medical students in Sarawak, Malaysia, toward AI remain underexplored.

Aim/Purpose/Objective: This study aimed to assess the attitudes of undergraduate medical students at a public medical school in Sarawak, Malaysia, toward AI in medical education and practice.

Method: A quantitative cross-sectional survey was conducted from October 2023 to August 2024, involving 185 undergraduate medical students from year one to year five at a public medical school in Sarawak, Malaysia. A convenience sampling method was employed. Data were collected using a validated questionnaire adapted from a previous United Kingdom study assessing medical students' attitudes toward AI in education and practice. Participants rated their agreement on a 5-point Likert scale. Quantitative responses were analyzed using descriptive statistics.

Results: Most students reported positive attitudes toward AI, with 73% (combining 31.4% strongly agree and 41.6% agree) supporting the statement that "All medical students should receive teaching in AI". Additionally, 78.3% (combining 29.7% strongly agree and 48.6% agree) supported the statement that "Participating in AI education will be beneficial to my academic journey". Furthermore, 74.6% (combining 28.1% strongly agree and 46.5% agree) supported the statement that "I am open to exploring more career options with AI advancement". Lastly, 64.8% (combining 27.0% strongly agree and 37.8% agree) supported the statement that "AI will play an important role in healthcare".

Conclusion: The majority of the medical students in this study showed positive attitudes toward AI, supporting its inclusion in the curriculum and its future role in healthcare. These findings provide a strong foundation for integrating AI into medical education and practice.

Keywords: Artificial intelligence; attitudes; medicine; medical students; medical education

Dengue Empowerment & Volunteerism Towards Zero Dengue (DENV-0): a Digital Health Module to Enhance Experiential Learning in Aedes Larval Source Management

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ABSTRACT

Introduction: Dengue, a vector borne disease (VBD) remains an important public health issue in our country. Previously students were taught on VBD epidemiology for dengue prevention under MBBS 4109 through traditional lectures. There is a need to enhance the learning experience through combined digital and experiential learning.

Aim/Purpose/Objective: The aim was to develop, validate and evaluate the effect of the DENV-0 module on dengue experiential learning.

Method: There are 4 phases of the one-year interventional study design, which are preparation, experiential, assessment and reflective. Preparation phase involves the development of the DENV-0 application, a digital educational hub and one stop center to learn dengue using Python programming and validation by public health experts. Students are given a vector borne disease epidemiology module through flipped classroom, combined with artificial intelligence (AI)-assisted in-application learning including computer vision-mosquito identification. Students applied the larval source management (LSM) by searching and destroying Aedes larvae in the field, recording videos and reporting its geolocation in the DENV-0 application. One of the important continuous assessment rubric components was container index, defined as the number of positive Aedes breeding larvae divided by number of containers inspected. Finally, feedback was obtained for system improvement.

Results: A total of 771 containers with 77 search and destroy activities were inspected and done, respectively. Median container index was 10.0 (Interquartile range=8.3). The container index shows a downward trend since the start of the DENV-0 module. Majority (65%) of the students feel that the DENV-0 was easy to use, had useful health promotion materials and empowered to do Aedes larvae search and destroy activities.

Conclusion: The DENV-0 module managed to reduce Aedes breeding ground and obtained positive feedback. This teaching innovation served to bridge the gap between technology and field experience, hence better equip the students on dengue prevention in the 21st century.

Keywords: DENV-0; digital health; experiential learning; aedes; larval source management

Comparison of Peer and Lecturers' Evaluation on Communication skills in Primary Care Setting

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ABSTRACT

Introduction: Communication skills are an essential component in clinical practice. Primary care physicians deal with many consultations which includes counselling. The success of the counselling may depend on the communication skills of the doctor. Clinical evaluation has been a great challenge in medical education. On routine, teachers have been the sole evaluator. Involving students in the evaluation process (peer assessment) is a formative assessment strategy that encourages students to evaluate their peers and is also considered as part of the learning process.
Aim/Purpose/Objective: Therefore, this study aims to compare the peer and lecturers' evaluation in clinic consultation during family medicine posting.
Method: This was a cross-sectional study. Final year medical students attending senior family medicine were selected by a census method. They were evaluated by peers and teachers' evaluation. Their communication skills were assessed using a 27-items with likert scale (0-5) questionnaire that includes verbal and non verbal skills. The analyses were performed by SPSS-28 software using descriptive, Pearson correlation test and paired t-test.
Results: Among the 33 students recruited, one third were male. The mean and standard deviation of the evaluation scores of peers and teachers were 86.12 $\pm$ 8.42, and 76.39 $\pm$ 8.82, respectively. There was a weak negative correlation (r=-0.168) between the mean score of teacher and peer evaluation, which also showed no significant correlation (p= 0.351). However, the mean difference between peer and teacher evaluation mean scores was 9.727 and it showed significant difference (p<0.001) between both.
Conclusion: Despite the significant difference between the scores, however, the correlation between them was weak and negative, suggesting that there is little to no relationship between the scores even if they differ in terms of average scores. Hence, peer evaluation may not be used as an alternative for teacher evaluation but can be used as an additional learning method.

Keywords: Peer evaluation; communication skills; medical education; assessment; teaching learning

"The Rabies Saga" AR Game Board in Immunology Education: Perception among Primary School Students

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ABSTRACT

Introduction: Rabies is a viral disease that poses a significant threat to public health, particularly in regions with limited awareness of its transmission and prevention. Children, especially those between the ages of 6-12, are vulnerable to the dangers posed by rabid animals, such as dogs and cats, commonly found in playgrounds and other public spaces. The lack of understanding regarding the importance of vaccines in preventing such diseases further exacerbates this issue. To address these concerns, an innovative approach using augmented reality (AR) and artificial intelligence (AI) assisted videos were integrated into a traditional game board, providing an interactive and educational platform for children to learn about rabies and the role of vaccines.

Aim/Purpose/Objective: This game board aims to educate primary school students about rabies through the integration of AI and AR technology, enhancing engagement and understanding of disease prevention.

Method: The development of "The Rabies Saga" game board involved several stages. First, the conceptual design was aligned with the objectives of educating children about rabies and raising vaccine awareness. Augmented reality technology was incorporated to enhance the learning experience. Players use smartphones or tablets to scan checkpoints on the gameboard, triggering AI assisted videos that explain rabies transmission and prevention. Cross sectional surveys and feedback about students' perception were conducted via Google Form before and after executing the gameboard teaching tool.

Results: Feedback was gathered through pre- and post-surveys to assess user engagement and knowledge retention. Post-survey results highlighted the gameboard's effectiveness in engaging students and reinforcing key concepts. Students perceived the game as fun, easy to use, and user-friendly.

Conclusion: The integration of AR into educational games can effectively raise awareness and teach children about critical health issues like rabies. The success of this project

demonstrates the potential of combining technology with traditional learning methods to enhance public health education.

Keywords: Rabies; augmented reality; vaccination awareness; educational game; child health

Artificial Intelligence in Medical Education: Assessing AI-Generated MTFS Question - A Preliminary Study

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ABSTRACT

Introduction: Artificial intelligence (AI) is widely used in medical education to assist medical educators. The usage of AI in assessment is increasing. Nevertheless, it is important that the question provided meets the standards.

Aim/Purpose/Objective: This study aims to assess the quality of AI-generated true/false MCQs.

Method: This study evaluated AI-generated questions for a test for fourth-year medical undergraduate students. There were 54 students in total. GPT-4o was used to generate twenty MTFs with five options each. A specific prompt, including the learning outcome, structure of the MTFs, and references, was used. Item analysis was used to assess the quality of the question. Pearson correlation was used to assess the correlation between the difficulty and discriminatory indexes.

Results: The mean average score of the student is 59.25. With regards to the difficulty index (DIFI), most of the options (60%) were in the easy category and 38% had an average difficulty index (0.25-0.75). Regarding the discriminatory index (DI), 42% of the options obtained a DI of more than 0.20. There was a significant correlation between the difficulty index and discriminatory index, $r(98) = -.69$, $p=<0.01$.

Conclusion: AI has the potential to generate comparable quality MTFs for medical undergraduate assessment. Nevertheless, future research needs to assess AI's full potential for assessment to meet the educational standard.

Keywords: Item analysis; MTFs; articifial intelligence; medical education; assessment

Utilization of Artificial Intelligence Tools in Medical Education among Undergraduate Medical Students at a Public Medical School in Sarawak, Malaysia

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ABSTRACT

Introduction: Artificial Intelligence (AI) is increasingly becoming an integral part of medical education, offering potential opportunities for enhancing learning experiences. Despite its growing relevance, the utilization of AI tools in medical education among medical students in Sarawak, Malaysia, remains underexplored.
Aim/Purpose/Objective: The study aimed to explore the utilization of AI tools in medical education among undergraduate medical students at a public medical school in Sarawak Malaysia.
Method: A mixed-method cross-sectional survey was conducted from October 2023 to August 2024 among 185 undergraduate medical students from year one to year five at a public medical school in Sarawak. A convenience sampling method was employed. Data were collected using a self-designed, validated questionnaire to collect information on the utilization of AI tool in medical education. Quantitative responses were analysed descriptively while qualitative data from open-ended questions were thematically analysed.
Results: Among the 185 participants, 40.0% reported using AI tools, and 55.1% reported an understanding of the purpose of AI tools in medical education. ChatGPT was the most frequently used AI tool (56.79%), followed by Claude AI (6.17%) and Google Bard (4.94%). Qualitative thematic analysis identified three primary areas of AI tool use: educational purposes (45%), clinical applications (30%), and research assistance (25%)
Conclusion: This study showed that 40% of medical students utilized AI tools in medical education, with ChatGPT being the most common. These findings underscore the growing role of AI tools in medical education and highlight the need for further research to understand their long-term impact and to develop strategies to optimize their integration into medical education.

Keywords: Artificial intelligence tools; medical students; medical education

VR Based Education for Women undergoing Mammography

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ABSTRACT

Introduction: This study introduces an educational initiative using Virtual Reality (VR) to improve the mammography screening experience for women. Mammography, essential for early breast cancer detection, often triggers anxiety and fear, especially in women aged 40 and above.
Aim/Purpose/Objective: This study addresses the need for comprehensive education to empower women with knowledge and ease apprehensions about the screening process.
Method: The study method consists of three phases. Phase 1 involved developing a VR mammography simulation using Unity3D. In phase 2, a content validity questionnaire was distributed to 3 experts to assess the VR tool's suitability as an educational resource, leading to revisions for improvement. Phase 3 involves a pre-post cross-sectional study of 40 women aged 40 and above with no prior mammography experience at UKM, KL. Participants complete online questionnaires assessing their understanding of the breast cancer screening and mammograms before and after using the VR, along with their anxiety, discomfort, and satisfaction levels. So far, 11 participants have completed the questionnaires.
Results: Preliminary results show a significant increase in understanding after using the VR; 80% of participants understood the importance of mammography screening and breast self-examination compared to before VR use. Additionally, over 50% of participants reported greater satisfaction with the screening preparation experience. However, these results are based on responses from one-quarter of the target participants, as the study is ongoing.
Conclusions: VR-based education offers a novel, immersive approach that demystifies mammography, reducing anxiety and enhancing comfort. By simulating the procedure, VR enables women to familiarize themselves with each step, contributing to increased screening rates and earlier breast cancer detection, benefiting individuals and public health.

Keywords: VR based education; mammography screening; women empowerment, immersive approach

Association between Smartphone Screen Time and Smartphone Addiction Risk among Preclinical Medical Students in Sarawak, Malaysia: A Cross-Sectional Study

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ABSTRACT

Introduction: The digital transformation of medical education has increased reliance on smartphones for learning, making them indispensable for preclinical medical students. This shift raises concerns about the association between prolonged screen time and smartphone addiction risk. However, this association among preclinical medical students in Sarawak, Malaysia, remains underexplored.
Aim/Purpose/Objective: To determine the association between smartphone screen time and the risk of smartphone addiction among preclinical medical students.
Method: A quantitative cross-sectional study was conducted among 108 preclinical medical students (Years one and two) at a public medical school in Sarawak from January 2023 to January 2024. Simple random sampling was employed. Participants provided their daily screen time using the built-in "screen time" tab on their smartphones, with excessive screen time defined as more than six hours per day. Addiction risk was assessed using the validated Smartphone Addiction Scale-Short Version (SAS-SV). The SAS-SV consists of 10 items, yielding an overall score ranging from 10-60. The higher the score, the greater the risk of addiction to smartphones, with a cut-off point of 33. The prevalence of excessive screen time and smartphone addiction risk were described in percentages, and the Chi-square statistical analysis was used to determine their association.
Results: Among the 108 participants, 78.7% reported daily screen time of more than six hours (excessive daily screen time), while 21.3% reported six hours or less. 65.9% of participants with excessive daily screen time were at risk of smartphone addiction, compared to 56.5% of students with six hours or less. However, statistical analysis showed no significant association between screen time and smartphone addiction risk ($p=0.41$).
Conclusion: This study found a high prevalence of excessive daily smartphone screen time and smartphone addiction risk among preclinical medical students, but no significant association between the two. Further research is needed to identify other contributing factors to smartphone addiction risk and develop effective interventions.

Keywords: Digital; smartphone; addiction risk; preclinical medical students

Beyond the Classroom: How Immersive Learning Elevates ECG Training

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ABSTRACT

Introduction: The COVID-19 pandemic accelerated the digital transformation in medical education, leading to the adoption of immersive interactive learning tools that provide realistic environments for safe practice. This approach enhances student engagement and collaboration through interactive platforms. Creating relevant scenarios for this platform is crucial to align with students' learning objectives. In 2024, the Clinical Skills & Simulation Centre (CSSC) at IMU University launched an immersive interactive learning platform designed for preclinical medical students, including an electrocardiogram (ECG) placement scenario. The scenario, built using 360-degree video, depicted a patient with chest pain in the emergency room. This environment enhances learning by immersing students in realistic clinical situations, allowing them to interact with the platform to perform ECG tasks and assessments.

Aim/Purpose/Objective: The survey aims to evaluate students' experiences with the immersive learning platform and its impact on their understanding and performance of ECG procedures.

Method: An online survey conducted in 2024 collected 38 anonymous responses from year two and three medical students at IMU University.

Results: The results indicate a positive reception of the immersive learning experience. All agreed that the platform was easy to navigate, realistic, and enjoyable compared to the traditional learning method. Students found the immersive environment improved their understanding of the subject and felt the assessments were well-aligned with the topic. Open comments such as "...very new concept", "... interesting learning way", "the experience was very nice and helpful because it gave a true picture just like the OSCE station" and "...it was a really fun, interactive and informative session". However, students recommended adding more clinical scenarios, video demonstrations, and interactive notes on common ECG mistakes.

Conclusion: In conclusion, while the immersive interactive ECG learning tool received positive feedback from students, there is still room for improvement. Further enhancements can enrich the learning experience, leading to better clinical skills and improved patient outcomes.

Keywords: Immersive learning; ECG procedure; medical education

Development of a Mobile Health Application for Hypertension as a Health Promotion Media for Community Health Workers

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ABSTRACT

Introduction: Hypertension is a significant contributor to global mortality rates and critical public health challenges, including in Indonesia. There is an urgent need for more effective prevention and control strategies. Health promotion led by government, healthcare providers, and community health workers play a crucial role in addressing hypertension. WHO recognizes digital health promotion as an effective approach for reaching broader populations and reducing costs. In line with Indonesia's ongoing healthcare transformation, community health workers are increasingly expected to use digital health promotion tools to enhance public health awareness and intervention at the community
Method: This research involves 12 community health workers in Cipacing, Indonesia, using a qualitative method with in-depth interviews and purposive sampling. Conducted in October and November 2024, qualitative data will be coded, categorized, and themed. Data flow diagram will be developed to outline the initial application structure. Expert judgment will be requested from internal medicine specialist, nephrology and hypertension subspecialist, and information technology expert followed by the application development
Results: This study focuses on community health workers and app development for hypertension education. Although health workers have basic knowledge, they lack understanding of essential hypertension details like blood pressure limits, symptoms, and risk factors. Misinformation and myth within the community further complicates this. There is a clear need for a user-friendly digital tool, with simple design, visual aids, low storage usage, and offline functionality to support health workers in educating the community
Conclusion: The results of this study indicate that community health workers have limited knowledge about hypertension. A mobile health application for hypertension is needed as a digital health promotion tool to enable community health workers to deliver information in a structured and standardized approach and to enhance awareness within the community

Keywords: Hypertension; digital health promotion; community health workers; mobile health; healthcare transformation

Readiness towards the Use of Artificial Intelligence in Medicine and Associated Factors among Undergraduate Medical Students at a Public Medical School in Sarawak, Malaysia

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ABSTRACT

Introduction: Artificial intelligence (AI) is transforming healthcare and medical education, requiring future healthcare professionals to integrate AI effectively into clinical practice. Understanding the readiness of medical students to adopt AI is essential for curriculum development. However, the readiness of medical students in Sarawak, Malaysia, towards AI in medicine and the significant factors influencing it remain underexplored.
Aim/Purpose/Objective: This study aimed to assess the readiness of undergraduate medical students at a public medical school in Sarawak, Malaysia, towards AI in medicine and to identify the factors significantly associated with their readiness.
Method: A quantitative cross-sectional survey study was conducted from October 2023 to August 2024, involving 185 undergraduate medical students from year one to year five at a public medical school in Sarawak. A convenience sampling method was employed. Data were collected using a validated questionnaire adapted from the Medical Artificial Intelligence Readiness Scale for Medical Students (MAIRS-MS), covering four domains (cognition, ability, vision, and ethics) and related variables. Descriptive statistics were used to assess AI readiness, and statistical analyses were performed to identify significant factors associated with readiness ($p < 0.05$).
Results: The mean overall AI readiness score was 69.92%. Domain-specific mean scores were: vision (75.6%), ethics (73.48%), ability (72.56%), and cognition (63.82%). Gender, year of study, and AI training were significantly associated with higher AI readiness. Male students scored higher in ability ($p = 0.001$). Year four students had higher scores in ability ($p = 0.041$) and total AI readiness ($p = 0.049$). Students with AI training scored higher in vision ($p = 0.039$) and ethics ($p = 0.045$).
Conclusion: Undergraduate medical students from this study showed moderate readiness for AI in medicine. Gender, year of study, and AI training were significant associated factors. Early integration of targeted AI training is recommended to further enhance their readiness for an AI-driven healthcare system.

Keywords: Artificial intelligence; readiness; medicine; medical students; medical education

Artificial Intelligence: Boon for Medical Education, Bane for Population Education

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ABSTRACT

Introduction: The benefit of Artificial Intelligence (AI) in learning and teaching in Medical Education is being widely explored. Every advancement in technology has improved learning among medical students. Newer technology finds its place among general use ahead of medical education. Similarly, the power of AI as chat assistants have been available as a tool for the last few years. AI-chat assistants would simplify complex knowledge, including medicine related information, into user friendly terms for easier comprehension. Such unregulated availability of complex medical knowledge would lead to unfathomed consequences.
Aim/Purpose/Objective: We aim to understand the consequences of AI mediated medical information among the general population.
Method: This proposed KAP study would be one of the earliest studies to explore the flipside of AI where complex medical information was made available bypassing restricted access to scientific databases. A new survey instrument will be developed to capture the perception of medical students, doctors, and the general population in the use of AI in clinical medicine.
Results: Unrestricted availability of medical knowledge on the internet and AI chat assistant's ability to simplify the comprehension will lead to misinterpretation of medical information by untrained general population. The WHO has identified misinformation as a threat to public health in self-diagnosing and self-treatment. Sequentially, clinical decision-making would be affected when unregulated medical knowledge from AI-generated information is used to influence their reasoning. By the time AI finds its place in medical curriculum, novel public health concerns related to AI-led medical misinformation would be a plethora of bane for global health.
Conclusion: Studies project AI will greatly influence future clinical practice but its impact on clinical outcome is yet to be studied. Access to medical knowledge by AI should be restricted to expert use and strong disclaimer against the use of AI-generated medical information should be actively promoted.

Keywords: Misinformation; chatgpt; self-diagnosing; self-treatment; misinterpretation

Assessing Students' Psychomotor and Affective Domains in Undergraduate Medical Education Using AI-Generated Multiple-Choice Questions (MCQs): A Pilot Study

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ABSTRACT

Introduction: Whilst MCQs have the potential to assess higher-order cognitive skills, their role in assessing psychomotor and affective skills is limited. However, it is possible to complement traditionally used methods (written assessments, practical exams, and OSCEs) with well-designed MCQs to assess these skills. This approach may broaden the scope of assessment by reinforcing students' knowledge base for practical application. Creating many MCQs in these complex domains can be challenging.
Aim/Purpose/Objective: This exploratory study investigates whether Artificial Intelligence (AI) can help generate targeted MCQs by analyzing data and identifying key learning areas under psychomotor and affective domains.
Method: Using Microsoft Copilot (GPT-4), twenty MCQs were generated based on a clear and straightforward prompt to create questions of moderate difficulty, aimed at assessing students' psychomotor and affective skills at the end of their otolaryngology clerkship. The quality of these questions was evaluated through a three-way process involving students feedback, expert opinions, and AI-mediated statistical analysis.
Results: The 20 questions had no item-writing flaws per the SAQUET rubric, featuring clear stems and plausible distractors. Most questions appeared easy, with 30% showing moderate-to-good discrimination indices. One-third of students found the questions clear and moderately relevant, whilst most perceived them as of average difficulty. 86.6% of students found this MCQ-based assessment effective (from average to good). Experts rated 60% of questions as excellent, and the rest as good.
Conclusion: AI-generated MCQs can reliably complement traditional assessment methods to evaluate students' psychomotor and affective domains in undergraduate medical education. By focusing on the applied aspects of theoretical knowledge, they can help bridge the gap between theory and practice. The quality and structure of these questions can be further refined by adjusting the AI-prompts to meet specific learning objectives. However, the importance of human evaluation cannot be ignored to ensure clarity and precision.

Keywords: Psychomotor and affective skills; AI-generated MCQs; medical education; Otolaryngology clerkship; assessment quality

Digital Transformation in Nursing Education: Exploring the Knowledge, Attitudes, and Practices of Undergraduate Nursing Students using ChatGPT

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ABSTRACT

Introduction: The rapid digitisation of education has profoundly altered teaching, learning, and assessment methodologies, particularly in medical and nursing education. This study seeks to investigate the influence of AI-driven tools, specifically ChatGPT, on enhancing the educational experience of undergraduate nursing students.
Aim/Purpose/Objective: The primary objective of this study is to assess the knowledge, attitudes, and practices (KAP) concerning the use of ChatGPT among nursing students at the International Islamic University Malaysia (IIUM).
Method: A cross-sectional study utilised a convenience sample of 200 nursing students from various academic years. Data were gathered using a meticulously designed questionnaire (KAP-CQ39) derived from previous research on knowledge, attitudes, and practices (KAP) regarding artificial intelligence (AI) technologies.
Results: The results indicated that students have a high level of knowledge (99%) about the functions and potential of ChatGPT in academic environments. Attitudes regarding ChatGPT varied, with 54.5% of individuals expressing concerns about the ethical consequences, specifically related to academic honesty, while 45.5% recognised its advantages in promoting learning. The practical application of ChatGPT yielded highly favourable results, as 96% of students used it for remote learning and 87.5% diligently examined and modified the generated outputs before submission.
Conclusion: This study highlights the importance of incorporating AI literacy and ethical training into the nursing curriculum to maximise the advantages of digital technologies, such as ChatGPT, while addressing potential challenges. It underscores the necessity for explicit criteria and ethical frameworks to ensure the responsible application of AI technology in nursing education. This study advances the discourse on digital transformation in medical education, emphasising the need for the judicious integration of artificial intelligence (AI) to improve student learning outcomes.

Keywords: Digital transformation; nursing students; chatgpt; artificial intelligence (AI)

Perception of Malaysian Medical Students on the Use of Artificial Intelligence in Medical Education

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ABSTRACT

Introduction: The integration of artificial intelligence (AI) in medical education has not kept pace despite the impactful revolution of AI in healthcare. The lack of educators specialising in AI, the expensive cost of AI software, and ethical issues are among the factors that deter the integration of AI in medical education. Therefore, it is important to understand medical students' perceptions towards the use of AI in medical education to develop an effective AI medical curriculum.
Aim/Purpose/Objective: This study aimed to evaluate Malaysian medical students' perceptions towards the use of AI in teaching and learning of medical curriculum, the preferred AI teaching and learning methods and its effectiveness.
Method: This cross-sectional study was conducted amongst Universiti Kebangsaan Malaysia (UKM) medical students using a validated questionnaire, consisting of Likert and open-ended questions.
Results: A total of 156 UKM medical students were involved in this study. Majority of respondents were females (64%) and only a small number were in their clinical years (21%). More than half of the medical students (63%) did not receive any AI-related training prior. Most of the respondents (86%) agreed that AI can improve the overall effectiveness of teaching and learning by simplifying complex medical topics. Almost half of the respondents expressed that AI is especially useful in studying anatomical concepts. However, one-third of them were not confident in utilising AI tools for medical learning. Students also agreed that AI could not fully replace conventional teaching and learning methods, especially in the practice of medical procedures (35%) and case-based learning (30%).
Conclusion: A suitable AI-based medical curriculum should be developed as a complementary role in medical education since most medical students perceive AI-based teaching and learning methods as effective and convenient.

Keywords: Perception; artificial intelligence; medical education

Application of Mindfulness-Based Stress Reduction Combined with Multimodal Analgesia in Patients with Knee or Hip Replacement: Protocol Paper

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ABSTRACT

Introduction: Joint replacement is the preferred treatment for severe joint osteoarthritis (OA), however resulting some patients experience pain after surgery. Mindfulness-based stress reduction (MBSR) has been proved that can relieve patients' pain and anxiety and improve their quality of life.

Aim/Purpose/Objective: The objective of the research is evaluating the impact of combining MBSR with multimodal analgesia towards anxiety, arthritis symptoms and pain among patients undergoing knee or hip replacement.

Method: Based on the sample size calculated, 80 patients who received knee or hip replacement will be recruited and randomly be assigned to either a control group or an experimental group. The control group will receive standard multimodal analgesia, while the experimental group will receive MBSR module virtually and practically in conjunction with multimodal analgesia. Four post-intervention evaluations will be measured at one, two, three and six months and one year post-surgery.

Expected results: Effectiveness of MBSR with multimodal analgesia reduces anxiety, arthritis symptoms and pain assessment, eventually improving postoperative recovery quality, mindfulness, and overall quality of life.

Conclusion: This research will help knee or hip replacement patients reduce pain, anxiety and osteoarthritis symptoms, enhancing mindfulness levels and quality of life.

Keywords: MBSR; multimodal analgesia; joint replacement; quality of life

Assessing the Impact of a Novel Web-based Health Application for Adult Asthma Management: A Pilot Study

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ABSTRACT

Introduction: Effective management of chronic diseases largely relies on patients' ability to handle their conditions with support from healthcare providers. Currently, asthma impacts over 334 million individuals worldwide. Asthma affected about 4.5% of the population in 2002, with significant variations across countries;1.0% in Vietnam compared to 21.5% in Australia. In Malaysia, as per the National Health and Morbidity Survey 2006, adult asthma prevalence was 4.5%, but only 32.6% of patients adhered to follow-up care in clinics and hospitals.
Aim/Purpose/Objective: The objectives include, to develop a web-based health application for adult asthma patients and to evaluate the usability of the web-based health application among adult asthma.
Method: A cross-sectional study design was selected to evaluate the usability of a web-based medical health application aimed at asthma management. This web-based health application allowed participants to explore its features and assess usability. These activities were done during participants' clinic follow-up. Following this interactive experience, participants completed a self-administered questionnaire to assess their perceptions of the application's usability in empowering them to manage their asthma.
Results: All collected data was analysed using the latest version of Statistical Package for Social Science (SPSS) software. Fourthy seven participants were included in this pilot study. Their mean age was 40.79 years (SD 10.13). Most of them live with family 42 (89.4%) and married 39 (83%). MAUQ results showed the majority of the participants agreed that the web-based health application was easy to use and the web-based was easy to learn with the result 6.34 (0.76), 6.19 (0.99) respectively. Majority of the participants liked the interface of the web-based health application and felt that the information was well organized, easily finding the information that was needed with a mean MAUQ score of 5.98 (1.15), 6.09 (1.02) respectively.
Conclusion: The application demonstrated a good usability in facilitating asthma management. This innovative tool empowers patients to take charge of their condition,

monitor symptoms and their self-management strategies. It assists physicians for improved care and self-monitoring.

Keywords: Web-base health application; asthma management; self-care education; usability

Coping Strategies Specific to Personality Traits among Medical Students: A Scoping Review

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ABSTRACT

Introduction: Medical students need to learn coping mechanisms to succeed in their educational endeavors. Nevertheless, not every personality attribute correlates to positive coping strategies. While earlier research has examined the theoretical frameworks linking personality traits and coping strategies in the general population, comprehensive studies specifically targeting undergraduate medical students are lacking.
Aim/Purpose/Objective: This scoping review aims to explore coping strategies specific to personality traits among undergraduate medical students by reviewing the existing literature.
Methods: Using the keywords personality, coping, medical students, and undergraduate medical education, a search was conducted for articles published up until March 26, 2024, that were indexed in Scopus, Web of Science, and PubMed for this scoping review. This review covered all journal publications whose themes highlight coping mechanisms based on personality traits employed by undergraduate medical students of any age, gender, nationality, or race.
Results and Discussion: There were 2363 articles found in the initially performed search. After the article selection procedure, only nine papers were included in the review as they all met the inclusion criteria. With complete agreement, three reviewers independently evaluated the articles critically. Eight countries participated in the study, and scholars from Asia published most of the articles. Globally, undergraduate medical students emphasize the complex relationship between coping mechanisms and personality characteristics. It was discovered that some personality traits, such as conscientiousness, extraversion, and openness to new experiences, were linked to positive coping techniques. In contrast, other personality traits were linked to negative coping approaches.
Conclusion: The analysis emphasizes that while some personality characteristics may have vulnerabilities that could lead medical students to use inadequate coping techniques, other personality traits are also important in developing resilience and good stress management. These findings highlight the importance of individual differences in developing coping approaches and the need for customized interventions that address coping strategies based on personality characteristics to support the well-being of medical students.

Keywords: Coping strategies; personality traits; positive coping technique; negative coping technique

Attitude, Perception, and Practice of Anaesthetic Postgraduate Students on the Application of Artificial Intelligence in Continuing Medical Education

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ABSTRACT

Introduction: Continuing Medical Education (CME) is essential for anaesthetic postgraduate students to stay updated with anaesthetic advancements and enhance their clinical competencies. However, heavy workloads often limit time for education, highlighting the need for efficient learning strategies like incorporating Artificial Intelligence (AI) into their training.

Aim/Purpose/Objective: This study explores anaesthetic postgraduate students' attitudes, perceptions, and practices toward AI in CME.

Method: A survey was distributed via Google Forms to all Universiti Kebangsaan Malaysia (UKM) anaesthetic postgraduate students, covering demographics, attitudes, perceptions, practices, potential improvements, and personal experiences of AI use in CME.

Results: A total of 108 anaesthetic postgraduate students participated in this study. While 66.7% reported basic experience with AI-powered tools, 94.4% had never attended an AI training workshop. Only 6.5% frequently used AI tools for CME preparation and just 10.2% strongly agree the outputs from AI tools are highly trustworthy for CME presentation preparation. About 24.1% strongly believed AI improved CME presentation quality and 44.4% agreed that AI saved them time in preparing presentations. 25.9% strongly believe that AI will become a standard tool in medical education. Open-ended responses indicated a strong need for AI training in medical education, with recommendations that students be informed on reliable AI tools to ensure information validity. Furthermore, some respondents suggested that institutions should consider subscribing to or providing access to reputable AI platforms and tools.

Conclusion. This survey offers foundational insights into anaesthetic postgraduate students' engagement with AI in CME, highlighting a demand for AI training to support efficient and reliable CME integration. Addressing these needs may enhance their educational experience and professional development among anaesthetic postgraduate students.

Keywords: Medical education; artificial intelligence; anaesthesia; postgraduate

A Proposed Framework of AI Professional Development Empowerment using Branching Assessment for Medical Educators

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ABSTRACT

Introduction: Artificial Intelligence (AI) integration in medical education is transforming educator professional development in the digital era. Teaching strategies and assessment practices are critical for equipping educators to meet the evolving demands of modern medical education. However, a structured framework to diagnose and enhance competencies in these areas remains underdeveloped.
Aim/Purpose/Objective: This study proposes the AIDD-Med Framework, an AI-driven diagnostic tool for medical educators incorporating Diagnostic Branching Trees (DBTs). The framework provides adaptive, competency-based pathways to address gaps in pedagogical knowledge and assessment practices, aligning with the digitalization of 21st-century medical education.
Method: The AIDD-Med Framework adopts a flexible approach, grounded in the UNESCO AI Competency Framework (2024) for Teachers and theories of Computerized Adaptive Testing (CAT) (2000). It emphasizes adaptability to diverse educational settings and educator profiles, enabling personalized diagnostic pathways. DBTs identify competency gaps in teaching strategies and assessment practices, guiding educators through progressive development pathways. These include scenario-based teaching exercises and peer-reviewed feedback tasks for formative assessment, ensuring practical and scalable implementation. The framework's flexibility supports diverse institutional needs and aligns with SDG4 to empower quality education.
Results: The AIDD-Med Framework is expected to enhance educators' ability to deliver active learning strategies, integrate instructional technologies, and develop robust formative assessments. By offering personalized pathways based on diagnostic insights, the proposed framework aims to improve competency development and alignment with curriculum goals. Future evaluations and pilot testing will assess its efficacy and scalability in diverse educational settings.
Conclusions: The AIDD-Med Framework has a great potential to fill a practical knowledge gap in AI-enhanced professional development for medical educators. Its adaptable and diagnostic nature ensures personalized support for the diverse educator needs, nurturing improvements in teaching and assessment skills. Future implementation and testing will confirm its scalability and short- or long-term impact in medical educational institutions.

Keywords: AI application; AI in healthcare; technology-driven healthcare environment

Preparing for a Technology-Driven Future: Clinical Students' Insights on AI in Healthcare

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ABSTRACT

Introduction: Artificial Intelligence (AI) enhances healthcare through advances in diagnostics and predictive analytics, aiding clinicians in decision-making and patient care. For clinical students, understanding AI's applications, limitations, and ethical considerations is essential for future practice.
Aim/Purpose/Objective: This survey examines clinical students' knowledge and perceptions of AI in healthcare, aiming to guide AI integration into clinical education and better prepare students for a technology-driven healthcare environment.
Method: A 22-item questionnaire was distributed to all USIM's clinical-year students through an online form. The responses are anonymous.
Results: Ninety students participated: 31(34.4%) from year 4, 30 (33.3%) from year 6, and 29 (32.2%) from year 5. Most students (84.4%) were aware of AI, with 87.6% familiar with its educational applications, primarily from online resources (78.9%) and discussions with peers and faculty (47.8%). However, only 52.2% felt genuinely familiar with AI. In healthcare, students associated AI primarily with diagnostics (64.4%), treatment recommendations (51.1%), and administrative tasks (50%). Only 32.1% had hands-on experience with AI tools, though 60% felt AI improved clinical education. Most respondents (85.6%) believed AI could reduce human error (67.8%) and improve data management (66.7%). While 60% did not think AI would replace clinicians, 80% saw the need to understand AI technologies, and 81.1% expressed ethical concerns regarding privacy (70.1%) and accountability (63.2%). A majority (83.7%) supported strict AI regulations, with 72.2% desiring more formal AI training, preferring workshops (73.3%), case-based discussions (60%), and lectures (54.4%).
Conclusion: Clinical students recognise AI's potential but need more practical experience. They view AI as supportive, especially in diagnostics and data management, though they have ethical concerns, particularly around privacy and accountability. Most believe AI will not replace clinicians but reduce errors and administrative burdens. There is strong support for formal AI education, with workshops and case discussions favoured for preparing students for AI-integrated healthcare.

Keywords: AI application; AI in healthcare; technology-driven healthcare environment

Innovating Real-time Item Analysis of Assessment for Competency-based Biostatistics Education Using X-DAS Cloud System

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ABSTRACT

Introduction: Learning analytics and timely feedback are essentials for competency attainment. In response, we developed the copyrighted X-DAS system using Microsoft 365 cloud tools (Forms, OneDrive, SharePoint, Power Automate, and Excel Online 365) to deliver real-time item analysis in undergraduate biostatistics courses for medical sciences degree (BMHS) and nursing degree (NSD). X-DAS tracks attendance and provides immediate insights into the difficulty index, discrimination index, and distractor analysis of one-best answer (OBA) assessments, presented through Business-Intelligence (BI) dashboards. This study evaluates the effectiveness of this innovation.

Method: Two student groups, BMHS (n=58) and NSD (n=21), completed a 30-question OBA pre-test (30 minutes) and a post-test (15 minutes) to assess both competency and fluency. BI dashboards provided visual feedback on how students and their peers answered each question, enabling lecturers to identify strong distractors, challenging items, and high-quality questions for future high-stakes exams. The post-test contributed to continuous assessment grades for NSD but remained formative for BMHS. A repeated measures ANOVA with mixed models evaluated pre- and post-test differences and group interactions.

Results: All assumptions for repeated measures ANOVA were met. Pre-test scores showed no significant difference between BMHS (M = 18.4, SD = 4.9) and NSD (M = 19.6, SD = 5.4; P= 0.180). Post-test scores did not differ significantly between groups (BMHS: M = 28.1, SD = 4.2; NSD: M = 28.8, SD = 3.9; P = 0.112). Both groups significantly improved from pre-test to post-test ($P < 0.001$). Interaction effects indicated no significant difference in score gains between BMHS and NSD (P = 0.544), demonstrating comparable improvement in scores.

Conclusion: Real-time analytics with BI dashboards significantly enhance competency in biostatistics education by providing actionable insights for students and lecturers. The innovation offers rejuvenated technology-enhanced assessment and teaching for broader fields of study.

Keywords: Real-time item analysis: competency-based education; microsoft 365 cloud; biostatistics; feedback-driven learning

Knowledge, Perceptions and Preparedness of Undergraduate Medical Students on Artificial Intelligence in Medical Education

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ABSTRACT

Introduction: Artificial intelligence (AI) has emerged as a valuable supplementary tool in medical education, enhancing students' learning experiences through virtual simulations, diagnostic algorithms, and other applications that foster a deeper understanding of complex medical concepts and clinical skills. Despite AI's potential to enrich learning, the perceived effectiveness and usability of AI among medical students remain largely unexplored.
Aim/Purpose/Objective: This study investigates undergraduate medical students' knowledge, perceptions, and preparedness regarding AI-related content in medical education.
Method: A cross-sectional survey was conducted among undergraduate students at the Faculty of Medicine, Universiti Kebangsaan Malaysia (UKM), using convenience sampling. A structured questionnaire consisting of four sections-demographics, knowledge, perceptions, and preparedness-was distributed online via Google Forms.
Results: Out of 129 respondents, 88 were female and 41 were male, with a median age of 20 years. The majority (96.9%) were in the pre-clinical phase of their studies. Most students reported familiarity with specific AI tools utilized in teaching medical concepts and expressed that AI could enhance the quality of medical education. While students acknowledged that AI might reshape the role of educators, 80.6% had concerns about the reliability of AI-generated content. Additionally, 58.1% had not received formal training in AI, with many advocating for more AI-related education within the curriculum. Only one-third of the respondents felt confident in their ability to use AI tools for learning.
Conclusion: UKM medical students demonstrate adequate knowledge and positive perceptions of AI in medical education. However, the findings reveal significant gaps in preparedness and formal training, underscoring the need for early and comprehensive AI integration in medical curricula. Incorporating AI education can bridge these gaps, better equipping future medical professionals to navigate and benefit from AI technologies in their learning and practice.

Keywords: Perception; preparedness; artificial intelligence; medical education

A Comprehensive Framework for AI Attribute Mapping in Online Learning Environments in Undergraduate Medical Education

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ABSTRACT

Introduction: In the rapidly evolving landscape of medical education, artificial intelligence (AI) holds the potential to transform online learning environments by enhancing educational practices and outcomes.
Aim/Purpose/Objective: This scoping review explores how AI attributes-responsive, adaptive, decisive, proactive, and predictive-are integrated into undergraduate medical education to create dynamic, personalised, and efficient online learning environments.
Methods: The review draws from literature published between 2013 and 2023 following literature search in a predefined article selection criteria using the Revised Arksey O'Malley Framework. The Technology-enhanced Learning Environments in Medical Education (TELEMED) Model was taken as a guiding model for key components of online learning environments in medical education. Thematic Analysis was done to identify roles and subroles of AI in Medical Education along with AI attributes.
Results: The review identified 24 main roles and 47 sub-roles of AI in online medical education. The analysis revealed how each AI attribute contributes to improving student outcomes: responsive AI provides real-time feedback and engagement, adaptive AI customizes learning paths, decisive AI automates administrative tasks and assessment, proactive AI anticipates learning challenges, and predictive AI forecasts student performance and learning gaps.
Conclusion: By offering a comprehensive mapping of AI attributes across multiple components of online learning environments, this review provides a valuable framework for educators, institutions, and policymakers seeking to harness AI for digital transformation in undergraduate medical education. This holistic approach emphasizes the importance of AI-driven innovation in shaping the future of medical education, ensuring that learning experiences are not only more personalised but also more effective.

Keywords: Artificial intelligence; undergraduate medical education, digital transformation; adaptive learning; AI attributes; TELEMED framework

Bridging Education and Technology: Pakistani Medical Students' Perspectives on ChatGPT in Low-Resource Settings

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ABSTRACT

Introduction: The integration of artificial intelligence (AI) in education has the potential to transform learning experiences, particularly in low-resource settings.
Aim/Purpose/Objective: This study aims to assess the knowledge, attitudes, and practices (KAP) regarding the use of ChatGPT among undergraduate medical students at ABWA Medical College, Faisalabad, Pakistan.
Method: A cross-sectional survey was conducted involving 219 undergraduate medical students from diverse academic years. Data were collected through a pre-tested, structured survey administered via Google Forms after obtaining informed consent. The analysis was performed using SPSS software version 26.0.
Results: Of the 219 students invited, 198 completed the survey, yielding a response rate of 90.41%. The average age of participants was 22.48 ± 0.56 years. Notably, 92.4% were aware of ChatGPT, although only 25.9% had utilized it for educational purposes. While 1% reported frequent use, 44.2% used it occasionally. Students expressed positive perceptions: 61.6% felt it enhanced their understanding, 85.9% valued its immediate availability, and 81.3% recognized the importance of personalized instruction. Concerns included information accuracy (65.5%), privacy issues (48.7%), and potential overreliance (42.1%). Suggestions for improvement emphasized the need for real-time updates, increased accuracy, and better integration with educational systems. A significant 78.7% expressed intent to continue using ChatGPT.
Conclusion: The findings highlight the potential of ChatGPT to bridge educational gaps in low-resource settings, revealing both positive perceptions and notable concerns. Despite challenges, a majority of students are eager to integrate ChatGPT into their learning process. This study contributes to the ongoing dialogue on digital transformation in medical education, emphasizing the responsible use of AI technologies to enhance educational outcomes for future healthcare professionals.

Keywords: Artificial intelligence; ChatGPT; medical students; medical education

Wellness Tracker: An AI Integrated Solution for Monitoring and Mitigating Stress in Medical Education

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ABSTRACT

Introduction: The rise in academic demands has led to increased mental and physical burden among students and teachers, leading to stress and burnout. The major contributing factor is the uncalculated volume of work, often causing burnout and limiting productivity.
Aim/Purpose/Objective: This research proposal discusses the invention of an application named "Wellness Tracker", a digital tool designed to monitor and manage stress through real time feedback, aiming to enhance resilience and mental health in educational settings.
Method: Wellness Tracker uses a mixed method approach, integrating qualitative self-reports with quantitative facial analysis data, which are analyzed together to assess overall stress and well-being. Users log in and input details on their workload, with answering brief surveys following the completion of the work. The algorithm of the application will simultaneously use a third-party application called "Amazon Recokgnition", using its deep-learning module to analyze the user's emotional state through facial expressions. Wellness Tracker will analyze the correlation using the input from the user and the report by Amazon, generating a three-tiered stress indicator: low, moderate, or high. When stress level exceeds 50%, the app issues burnout alerts with tailored mediation exercises for immediate support.
Result: The expected outcome from the initial testing should demonstrate strong correlation between self-reported stress and facial analysis, validating the app's effectiveness. Productivity is expected to increase in users who receive burnout alerts and follow suggested exercises. Additionally, the users will be encouraged to make adjustments in their workload, promoting sustained engagement in the academic tasks.
Conclusion: Wellness Tracker has the potential to meet its purpose as a self-stress tracking and mitigating application that offers individuals to regulate their workload and combat stress in real time. Clinically, this may be improvised into a scalable approach in educational settings to foster a productive and healthy work environment.

Keywords: Academic; mental health; burnout alerts; workload monitoring; stress

Integration of Online Critical Incidents Registry in Postgraduate Pediatric Anesthesia Training: An Addie Model of Instructional Design

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ABSTRACT

Introduction: Critical incident reporting has been employed to identify emerging issues, recognize "near misses," and analyse factors or events contributing to adverse outcomes. In medical education, critical incident reports can be used as a tool to promote reflective learning and guide targeted interventions in clinical training.

Aim/Purpose/Objective: This study aims to evaluate the effectiveness of a focused clinical training program developed based on the trends on our pre-existing online critical incidents reporting system to reduce perioperative critical incidents for pediatric anesthesia and enhance clinical training.

Method: The critical incident reporting is an online reporting system started since the year 2019, in which all cases of pediatric anesthesia are recorded by the anesthetic team in-charge. All data was collected via entries for critical incident reporting in the Redcap database. Structured-training activities was developed using the ADDIE (Analysis-Design-Development Implementation-Evaluation) model framework by the Pediatric Anesthesiology based on the findings of the critical incident report, in line with the requirement of the curriculum of postgraduate training in Master of Anesthesiology.

Results: A total of 1897 pediatric cases were done between August 2023 to September 2024 and 179 critical incidents reported. The rate of critical incidents in August 2023 was (21.1%) and demonstrates a significant reduction in the percentage of critical incidents from September 2023 to September 2024 (10.7% to 4.22%).

Conclusion: Reflective learning through the reporting of perioperative anesthesia critical incidents using ADDIE Model reduces the occurrence of critical perioperative events and enhances patient safety. New intakes of trainees in June and December, often coincide with a rise in critical incidents likely due to adaptation challenges in a new environment. ADDIE model's flexibility allows for the integration of real-time data on incident rates and the implementation of customized, targeted training interventions.

Keywords: Real-time data; online registry; big data

Gamification in Action: Transforming Embryology Learning Experiences

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ABSTRACT

Introduction: Embryology is challenging due to its complexity that requires three-dimensional visualization and visuospatial abilities to understand the dynamic developmental processes. Didactic lectures often fail to engage students, while gamification has been proven to enhance interactivity, motivation, and critical thinking. However, poorly designed gamified activities may distract from learning, and some students find competitive environments demotivating.
Aim/Purpose/Objective: This study aims to evaluate student engagement in gamified embryology e-learning and explore whether gamification is perceived as distracting.
Method: This cross-sectional mixed-method study involved 65 first-year undergraduate medical students at Universiti Sultan Zainal Abidin. Gamification was implemented in two embryology e-learning topics, Gametogenesis and Fertilisation and Implantation, using the Adventure Breakout game on Genially.com, which allowed individual, non-competitive participation. Student engagement was measured quantitatively using mean Likert scale scores (1-5) from the Burch Engagement Survey for Students. Perceptions of gamification as a distraction were assessed with a binary (yes/no) question.
Results: The analysis showed that students' engagement for both topics were high. For "Gametogenesis", the mean scores for cognitive, physical and emotional engagement were 4.66, 4.60, and 4.77, respectively. For "Fertilisation and Implantation", the mean score for cognitive and physical engagement were 4.65, whilst the mean score for emotional engagement was 4.72. Additionally, 96.4% of students perceived that gamification did not distract their learning.
Conclusion: This study demonstrated that well-designed gamification could elevate students' cognitive, physical, and emotional engagement in challenging subjects, potentially leading to more effective learning. Future research could explore the broader impact of gamification by applying it to other topics and involving diverse student cohorts across multiple institutions.

Keywords: Embryology; gamification; engagement

Designing, Validating and Acceptance of Prototype Mobile Applications for Type 2 Diabetes (T2DM) Management: A Validation Study

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ABSTRACT

Introduction: Type 2 diabetes mellitus (T2DM) is a prevalent chronic disease that requires effective self-management. Mobile health (mHealth) applications support disease management by providing personalized health information, medication reminders, and self-monitoring tools.

Aim/Purpose/Objective: This study aimed to design, validate, and evaluate a prototype mobile application for managing T2DM patients in Malaysia.

Method: The study was conducted in three phases. Phase 1 involved developing a prototype app using Microsoft PowerPoint based on review and patient feedback. Phase 2 included validation by six subject experts using heuristic evaluation and calculating the content validity index (CVI). Phase 3 evaluated patient acceptance through a survey of 30 T2DM patients using the Technology Acceptance Model (TAM) and Health Belief Modal (HBM).

Results: Expert validation yielded high usability scores, with a CVI of 1.0. TAM results showed high acceptance, with perceived usefulness (mean = 4.11, SD = 0.37, Cronbach's alpha = 0.92) and ease of use (mean = 4.13, SD = 0.49, Cronbach's alpha = 0.97). HBM responses indicated a positive attitude towards using the app (mean = 2.67, SD = 0.28, Cronbach's alpha = 0.70). The high usability scores and positive patient acceptance suggest that the prototype app has significant potential to improve T2DM management among elderly patients. The app's features, such as medication reminders and dietary tracking, were well-received, indicating their value in enhancing self-management and patient engagement.

Conclusions: The prototype apps show promise for improving T2DM management with the potential to enhance self-management and overall health outcomes through increased patient engagement and adherence.

Keywords: Type 2 diabetes mellitus; mhealth application; self-management; patient adherence; elderly patients

AI-Powered Analysis for Tumor Infiltrating Lymphocytes (TILs) in Breast Cancer: How Close are We to Fully Automated Diagnostics? A Systematic Review

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ABSTRACT

Introduction: Tumour infiltrating lymphocytes (TILs) within the tumour microenvironment (TME) serve as valuable prognostic biomarkers for breast cancer, especially aggressive subtypes such as triple-negative breast cancer (TNBC). However, manual TILs assessment is hampered by subjectivity, high inter-observer variability, and time consuming, that limits its clinical utility. To overcome these challenges, the integration of artificial intelligence (AI) into TILs assessment offers improved accuracy, reproducibility, and efficiency in this field.
Aim/Purpose/Objective: This systematic review aimed to evaluate the performance and applicability of AI-powered automated TILs assessment in breast cancer.
Method: A comprehensive search across four databases (Web of Science, Scopus, Science Direct, and PubMed) was conducted using several key phrases, including "breast cancer", "artificial intelligence", and "tumour infiltrating lymphocytes". The results yielded 27 studies published between January 2017 and January 2024.
Results: Most studies (n=11, 41%) were conducted in the USA with 15 (56%) studies relying on private datasets. A significant number of studies (n=22, 82%) utilized machine-learning (ML) approach to develop the AI-model. All studies developed their own ground truth datasets that have demonstrated a moderate to strong correlation between the AI-powered automated and manual TILs assessments (R = 0.6 - 0.98), suggesting that the AI-model can replicate pathologist evaluations with high precision. A total of 16 (59%) studies assessed the prognostic value of the automated TILs assessment, of which 15 (95%) indicated a

significant correlation between high TIL density and improved survival outcomes in breast cancer patients.

Conclusion: In conclusion, this study proved that the AI-driven automated TILs assessment offers a highly reproducible and reliable alternative to manual methods, enhancing diagnostic accuracy for breast cancer. Nonetheless, a lack of standardized protocols and external validation limits their clinical adoptions. Future research should focus on developing a well-established guideline to validate the models and facilitate their integration into routine clinical practice.

Keywords: Automated scoring; breast cancer; tumor-infiltrating lymphocytes; digital pathology

AI-Powered Draw-A-Person Assessment: Connecting The Dots Between Education and Medical Education for Developmental Support

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ABSTRACT

Introduction: Developmental delays in primary school students represent a critical challenge in Malaysia's pursuit of inclusive education and alignment with Sustainable Development Goal 4 (SDG 4). Current assessment tools often lack adaptability and actionable insights, limiting effective support for these students.
Aim/Purpose/Objective: This study addresses these gaps by proposing the development of an AI-powered Draw-a-Person (DAP) assessment tool, leveraging deep learning sketch recognition to bridge educational and medical education fields and provide actionable insights for developmental support.
Method: This qualitative study involved in-depth interviews with five special education teachers, uncovering current challenges and demands for effective assessment tools in primary school settings. The analysis identified four key demands: adaptability to diverse developmental profiles, real-time data generation, interdisciplinary applicability and user-friendly design. Benchmarking studies highlighted the limited application of AI in tools integrating special education and medical fields, particularly for school-aged children. These findings informed the conceptualization of the AI-enhanced DAP tool.
Results: The proposed AI-driven DAP tool is designed to leverage deep learning sketch recognition to analyze children's drawings, offering real-time insights into developmental milestones and trajectories. These insights enable educators and healthcare professionals to make collaborative, data-driven decisions, reducing reliance on lengthy clinical appointment waiting times and facilitating timely interventions. Projected results include enhanced accessibility and improved inclusivity for students with developmental delays.
Conclusion: The AI-powered DAP tool connects educational and medical insights to support primary school students with developmental delays. It emphasizes inclusivity, data analytics and alignment with pediatric healthcare needs. Future research will refine the tool's adaptability and explore additional AI integrations to enhance interdisciplinary support. Its

development and commercialization hold potential for transformative advancements in special education and pediatric healthcare, empowering teachers and healthcare providers to better support students' developmental progress.

Keywords: AI-driven assessment; developmental trajectories deep learning sketch recognition; digital assessment tools; medical-educational collaboration

Immersive Virtual Simulated Patients for Training and Assessing History-taking Skills among Medical Students

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ABSTRACT

Introduction: In modern medical education, virtual simulated patients (vSPs) are valuable tools for training and assessing medical students' history-taking skills, addressing limitations of traditional simulated patients such as cost, availability, and exposure consistency. However, vSPs developed in other countries may not be culturally suitable for use in Malaysia due to differences in communication styles and cultural norms.
Aim/Purpose/Objective: This study aimed to design, develop, and implement a culturally tailored vSP prototype for Malaysia, incorporating local ethnicities and accents to create a more authentic learning experience.
Method: Three vSPs comprising Malay, Chinese, and Indian were created using artificial intelligence and natural language processing to provide realistic responses in diverse medical scenarios. The vSPs were programmed with simple verbal communication, non-verbal cues like eye contact and gestures, and polite, respectful, honest, friendly attitudes to encourage comfortable user interactions. A secure virtual reality consultation room was also developed to ensure patient data confidentiality.
Results: Validity assessments showed strong face validity and content validity, confirming the vSPs' relevance in history-taking training. However, low reliability was observed due to the limited number of medical students involved and the small number of objective structured clinical examination stations. Feedback from students and educators highlighted the benefits of vSPs, such as standardized responses, reduced anxiety, and fewer human resource requirements.
Conclusion: This innovative approach demonstrates potential in medical education, offering a cost-effective, controlled environment for students to practice history-taking. Future development will focus on improving question diversity and further integrating vSPs into medical curricula.

Keywords: Communication skills; virtual reality; virtual-simulated patients; medical education; cultural adaption

Exploring the Metaverse's Potential to Revolutionize Nursing Education and Clinical Training

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ABSTRACT

Introduction: Nursing education has gradually shifted from traditional hands-on methods to incorporating various aspects of digital learning methodologies, including computer-assisted learning, mobile applications, and web-based platforms. However, these advances have not entirely eliminated the challenges associated with clinical training emanating from limited access to clinical sites, geographical constraints, and concerns relating to safety the COVID-19 pandemic further raised. The metaverse is an immersive virtual environment developed by combining virtual reality, augmented reality, and mixed reality in rendering controlled environments for interactive practice by nursing students with clinical skills.

Aim/Purpose/Objective: This paper discusses how metaverse technologies can help resolve existing limitations in nursing education and improve experiential learning outcomes.

Method: This concept paper reviews the literature related to immersive technologies in nursing education to identify and develop a conceptual framework for introducing the metaverse into clinical training. In reviewing the literature, consideration is given to those various instances where the applications of virtual reality, augmented reality and mixed reality have been concerned with engagement, the acquisition of skills, and logistical constraints in undertaking clinical training.

Results: The proposed framework shows that immersive, interactive, and collaborative simulations of the metaverse applications support nursing students in developing their clinical skills and decision-making processes in a no-harm environment. Because the metaverse is flexible, it will permit continued practice with personalized feedback for improved learning outcomes. Advantages concerning enhanced interprofessional collaboration and increase in equitable access for less privileged regions add to the benefits of such exploration.

Conclusion: The integration of metaverse technologies in more effective, accessible, and appealing clinical training creates a sea change for nursing education. Future plans include incorporating artificial intelligence and haptic feedback to further elevate personalization and realism in virtual training environments. This paper has identified the areas of equitable access, ethics, and assessment frameworks that would ensure maximum impact from the metaverse in nursing education.

Keywords: Nursing education; metaverse; clinical training; immersive technology; virtual reality

Development and Content Validity of a Virtual Reality Game for Electronic Cigarette Cessation among Malaysian University Students

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ABSTRACT

Introduction: With the rising prevalence of electronic cigarette (e-cigarette) use among Malaysian university students, existing health education efforts are proving insufficient to address the gaps in cessation.

Aim/Purpose/Objective: This study aims to develop a theory-driven virtual reality (VR) serious game for e-cigarette cessation targeted at Malaysian university students and assess its content validity.

Method: The Transtheoretical Model of Behavioral Changes was used as the theoretical foundation of the e-cigarette cessation intervention along with the Decisional Balance Construct and the Self-Efficacy Theory. The Mindfulness Model was also taken into consideration to provide skill training for positive coping mechanisms. These theories, along with in-depth literature review, guided the ideation and brainstorming process of the intervention narration, designs, and mechanics. Seventeen experts within the field of smoking or e-cigarette cessation were purposely sampled to rate the relevance and provide feedback for the health education content. The content validity index (CVI) was calculated for each topic, and content with CVI >0.83 was considered acceptable.

Results: "Vaporized: The Journey to Freedom" is a VR serious game entailing a protagonist's journey to seek freedom from nicotine dependency in a dystopian setting where the E-cigarette and Vaping Associated Lung Injuries (EVALI) were extrapolated to depict a catastrophic impact of e-cigarettes to the public health. The intervention includes six checkpoints and presented eight infographics relevant to e-cigarette cessation, with acceptable CVI between 0.94 to 1.00.

Conclusions: This study demonstrates the potential of a theory-driven VR serious game to address gaps in e-cigarette cessation education among Malaysian university students. The intervention offers a structured, validated, and engaging approach that builds both awareness and practical skills for managing nicotine dependence. Pilot studies, randomized

controlled trials, and implementation studies are recommended to evaluate its effectiveness and implementation in real-world applications.

Keywords: Virtual reallity game; cigarette cessation; theory-driven virtual reality; mindfulness model

Comparison of Perception between Manual Grossing Handouts and Virtual Gross Sessions among The Pathology Master Students in HCTM: A Quasi-Experimental Study

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ABSTRACT

Introduction: Traditionally, grossing education has relied on hands-on experience. However, with the challenges posed by pandemics, alternative learning methods have become necessary.

Aim/Purpose/Objective: This study evaluates how effective virtual learning (videos) is compared to manual handouts for teaching grossing procedures to pathology trainees.

Method: A quasi-experimental study was conducted among pathology master's students at Hospital Canselor Tuanku Muhriz (HCTM) to compare the perceptions on grossing videos versus manual handouts. The scores were collected through questionnaires comparing both groups and analyzed using various statistical tests before and after interventions.

Results: Both groups showed significant improvements in perception scores after the intervention ($p < 0.001$ for the video group, $p = 0.002$ for the manual group). However, the difference between the two groups was not significant (p-values of 0.343 and 0.237 pre- and post-intervention). Although the video group had higher mean scores for grossing content and learning experience, the difference was not statistically significant ($p = 0.086$). A one-way ANOVA showed a significant difference in perception scores based on years of grossing experience, with students having 2 or more years of experience scoring higher than those with no experience ($p = 0.042$).

Conclusion: Both videos and handouts are effective for teaching grossing procedures. While videos may be slightly preferred, there is no significant difference in preferences between the methods. A flexible, blended approach to pathology education may best meet trainees' needs and preferences, enhancing their learning experience and outcomes.

Keywords: Grossing education; pathology trainees; virtual learning; manual handouts

AI Disaster: Opportunities, Challenges and Ethical Considerations on Enhancing Medical Education with AI

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ABSTRACT

Introduction: There are Health and WebMD Symptom Checkers, and Physicians, or even ChatGPT, are implementations of Large Language Models (LLM) in the medical world that can be used as companion diagnosis tools that allow students to learn the symptoms and diagnosis process. LLMs are designed to understand and generate text in natural language by utilizing deep learning algorithms that allow deriving relationships between words, phrases, and context in text. However, this process is considered highly susceptible to epistemic risk, which is the epistemic risk of AI hallucinations or even misleading information (known as "Bulshit") being generated by AI (Hicks, Humpries & Slater 2024). Ironically, despite these risks, a study by Civaner, Uncu, and Bulut (2022) found that 85.5% of medical students had a positive view of the role of AI, believing that this technology can help students access medical information.

Method: This research is a philosophical reflection with a qualitative approach, using literature study and interpretation of field observations (Kaelan, 2005: 66; 80). It seeks to understand the potential risks associated with using LLM in medical education. We will explain the risks that can occur and argue that realizing these risks, especially in its implementation in the medical world, can provide a thorough understanding.

Results: The paper consists of three mind aspects: (i) How Medical LLM works: Explains how LLM works, especially in managing inputs and outputs; (ii) Understanding the Epistemic Risks of LLM in Medical Education: explores the epistemic risks in the use of LLM in medical education, such as AI hallucinations and misleading information; (iii) Wise Steps Towards Safe Implementation of AI in Medical Education: The discussion includes recommendations on limitations of use, user training, and the importance of risk awareness to ensure AI is used responsibly as a medical education tool.

Conclusion: LLM technologies have great potential in medical education but present epistemic risks such as AI hallucinations. Awareness of these risks is important for AI to be used wisely so that its benefits can be optimized without compromising the accuracy and quality of medical learning. Future research should explore training methods for students to critically evaluate AI-generated data and investigate hybrid models combining AI with human oversight to ensure safe learning.

Keywords: Artificial intelligence; large language model; AI hallucination; epistemic risk; critical learning

Rejigging The Education of Medical Laboratory Science with Artificial Intelligence: A Survey-Based Study

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ABSTRACT

Introduction: Artificial intelligence (AI) has been transforming all spheres of life, from education to the economy and healthcare. AI is revamping diagnostic practice, simplifying complex processes, and magnifying laboratory capacity in healthcare. Since Medical Laboratory Science (MLS) is the bedrock of diagnostic medicine, there is an urgent need for a paradigm shift to AI and its adoption in the practice of MLS.

Aim/Purpose/Objective: This survey assessed the MLS community's knowledge and awareness of AI, using this information to advocate for its inclusion in the MLS training curriculum.

Method: A standard questionnaire was administered randomly to 213 MLS students and practitioners. The data were interpreted using percentages and charts.

Results: The respondents are mainly students (45.5%) and 97.7% advocated for AI inclusion in the MLS training curriculum. Their prior AI experience account is as follows: not at all (33 respondents), and basic understanding (familiar with concepts and applications) having the highest respondents (64). It is fascinating that 11.3% of respondents have over a decade of MLS practice experience. Nearly 80% wanted AI integration into the curriculum through practical sessions while sequentially, research projects, theoretical lectures, and case studies were recommended.

Conclusions: Knowledge is expanding, and technology is evolving at exponential rates. Revising the curriculum would ensure students are well-prepared for AI and better equipped with current knowledge for enhanced patient diagnostics. MLS students should not be left ill-prepared and fearful of the AI revolution. The curriculum committee can utilize the findings of this survey study to include AI in the MLS training curriculum. The incorporation will be an enhancement that will prepare students for innovations and challenges and make them swim with the tide.

Keywords: Artificial intelligence; curriculum; diagnosis; medical laboratory science

A Pilot Study to Determine Immersive Experience, Usability and Acceptability of A Virtual Reality (VR) Application in Promoting Workplace Wellbeing

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ABSTRACT

Introduction: The increasing demand for employee wellbeing in modern workplaces has led to innovative approaches for enhancing mental, physical, and emotional health. Virtual reality (VR) technology offers immersive experiences that can promote wellbeing to reduce stress and enhance relaxation.

Aim/Purpose/Objective: This study explores the potential of VR as a practical tool for fostering workplace wellness and examines its usability and acceptance among the employees. This pilot study explores the perception of immersion into the modules of WayangMind, examines its usability and acceptance among the employees.

Method: 10 employees of a teaching hospital were recruited via convenience sampling for the study. Participants engaged in a series of 15-minute WayangMind modules designed to create immersive and interactive experiences. Following the VR session, participants completed the Presence Questionnaire (PQ) to gather their insights and perception about the immersion they felt. Acceptance was measured using the Simulator Sickness Questionnaire (SSQ) by assessing the severity of motion sickness when using the VR in the subscale of nausea, oculomotor, and disorientation. Usability and experience were explored via a focus group discussion (FGD) with the participants.

Results: 60% of the participants indicated the WayangMind VR experience as immersive using the PQ. The SSQ score of above 300 is associated with increased sickness severity. Only 2/10 participants reported severe sickness (oculomotor discomfort) on the SSQ score. 8/10 participants reported low motion sickness. The FGD revealed that participants found the WayangMind environments as realistic, interactive and encouraging exploration of each module effectively. They suggest room for improvement in specific areas related to interface quality, haptic feedback, and self-perceived performance.

Conclusion: The results suggest an overall positive experience with WayangMind. It offers an immersive experience with agreeable usability and acceptability. It may be an effective tool for enhancing workplace wellbeing.

Keywords: Wellbeing; virtual reality; relaxation; acceptability

Malaria Parasite Detection from Human Blood Smear Images using Deep Learning Techniques

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ABSTRACT

Introduction: Malaria is a fatal disease caused by a parasite transmitted to humans through the bite of an infected mosquito. Traditional methods of diagnosing malaria typically rely on the microscopic examination of blood smears performed by medical experts. However, this approach depends heavily on the expertise and experience of the examiner, which can be lacking in rural areas. As healthcare training faces challenges in ensuring accurate diagnoses with limited access to skilled professionals, the potential of artificial intelligence (AI) to enhance diagnostic accuracy is becoming increasingly important.

Method: This study explored various deep-learning techniques to improve the detection of malaria parasites in blood cells. We developed a Convolutional Neural Network (CNN) model to automatically detect malaria through image classification of medical cell images. Our approach focused on key processes, including image preprocessing, feature extraction, and classification. By reducing reliance on manual examination, we aimed to enhance diagnostic accuracy.

Results: The CNN model demonstrated promising results in accurately identifying malaria parasites in blood images, potentially offering a reliable alternative to traditional diagnostic methods. The model achieved a training accuracy of 90.76%, meaning it correctly classified nearly 91% of the training data. The validation accuracy was 93.56%, indicating that the model correctly classified almost 94% of the validation set. Additionally, the training loss of 0.2855 and validation loss of 0.2381 suggest that the model performs well, with high accuracy and relatively low error, particularly on unseen data.

Conclusion: These results show that AI can improve diagnostic accuracy and reduce human error in healthcare. Future work should focus on expanding these technologies for wider use in medical education and healthcare.

Keywords: Artificial intelligence; malaria parasite detection

The Relationship between Students' Preferred Anatomy Learning Media (Anatomage and Cadaver) and Students' Anatomy Practical Exam Results

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ABSTRACT

Introduction: Anatomy knowledge is a very important basis of science and clinical skills. The level of knowledge and exam results can be influenced by the selection of the right learning media such as Anatomage, a computer-based learning media, and cadavers that rely on direct experience.
Aim/Purpose/Objective: The purpose of this study was to determine the anatomy learning method that was more preferred by students between Anatomage and cadaver, the results of the practical exam obtained by students and the relationship between the anatomy learning media that students were interested in with the results of the student's practical exam scores.
Method: This study was a correlative analytical study using a cohort retrospective approach. All the respondents were medical students of batch 2022 who took part in anatomy practicums through the learning media of Anatomage and using cadavers as well. Students were then asked to fill out a questionnaire about the anatomy learning media they were interested in. After that, an analysis was conducted on the results of the anatomy practicum exam in the Gastroenterohepatology Block.
Results: Anatomage as a technology-based learning media, is more popular among students than cadavers. Based on the results of the Chi-Square hypothesis test, a significant relationship was found between the anatomy learning media that students were interested in and the results of the anatomy practical exam with a P-value <0.05.
Conclusion: There was a correlation between the learning media (Anatomage and Cadaver) that students were interested in and the practical exam scores obtained by students. High pass rate was obtained in students who have high interest in Anatomage media. It showed that technological media such as Anatomage are more effective in improving students' understanding and practical skills and are considered to be more interesting for students' learning interests.

Keywords: Anatomy; student interest; anatomage; cadaver; practical exam score

Utilizing ChatGPT and Gagne's Nine Events of Instruction in Lesson Plans Development for Part 2 Psychiatry OSCE Preparatory Workshop 2024

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ABSTRACT

Introduction: The Part 2 examination is a high-stakes assessment for trainees in Malaysia's Master of Psychiatry program. In 2024, Objective Structured Clinical Examination (OSCE) components were introduced, focusing on 6 psychiatric subspecialties such as child and adolescent psychiatry, addiction psychiatry, and geriatric psychiatry. To align with the National Curriculum, a streamlined lesson plan was needed for subject-matter experts, ensuring coherence with outlined objectives. Additionally, using an effective educational framework is crucial to support retention and understanding for course participants.
Aim/Purpose/Objective: This abstract describes how ChatGPT, an Artificial Intelligence (AI) tool, was utilized to create lesson plans according to the Gagne's Nine Events of Instruction framework for the inaugural Part 2 Psychiatry OSCE Preparatory Workshop 2024 at the National University of Malaysia. Currently, no other study explores the use of AI tools for medical curriculum development, highlighting this study's unique contribution.
Method: ChatGPT, a conversational AI product, generated lesson plans for each psychiatric subspecialty in the course using the GPT-4-turbo model, an optimized version of GPT-4. Prompt engineering techniques, including instructional prompts, persona-based prompting, and iterative refinement, were employed to ensure accuracy. Lesson plans were developed in alignment with Gagne's Nine Events of Instruction to facilitate comprehension and retention.
Results: The use of ChatGPT produced a Speaker Handbook covering the 6 psychiatric subspecialties. Feedback from speakers and participants was overwhelmingly positive, with the speakers especially appreciating the lesson plans' concise and structured format.
Conclusion: ChatGPT has proven valuable in this preliminary study in developing lesson plans for this important course, providing lesson plans that align well with learning objectives. Future applications of AI-driven tools should be explored to create accurate, cohesive yet intuitive lesson plans, and even curriculums, that support effective learning outcomes.

Keywords: ChatGPT; Gagne's nine events of instruction; psychiatric education

From Dissection to Digital: The Impact of Virtual Practical in 'MyVAP' (My Virtual Anatomy Practical Classroom) on Students' Engagement

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ABSTRACT

Introduction: The integration of digital technology into education has transformed how we approach teaching and learning. In the field of anatomy, the shift toward online learning has presented both exciting opportunities and new challenges. 'MyVAP' (My Virtual Anatomy Practical Classroom), which utilizes the 2D Gather Town platform, offers an engaging and interactive virtual environment for anatomy education. This virtual platform offers a fresh way to engage students, but also require us to rethink how we maintain engagement and ensure meaningful learning experiences.
Aim/Purpose/Objective: This study explores how 'MyVAP' affects students' engagement in relation to skill, emotion, participation and performance.
Method: A cross sectional study was conducted among Year 2 preclinical medical students at Faculty of Medicine, Universiti Sultan Zainal Abidin. Students participated in virtual anatomy practical sessions using 'MyVAP'. Online Student Engagement (OSE) questionnaires were used to measure students' engagement to online learning classes. The OSE provides a measure of the learning environment, therefore can be used as an indirect measure of teaching effectiveness. Descriptive statistics were used to analyse the data.
Results: The study showed a high level of engagement in students' skill, emotion, participation and performance. The increased emotional and participatory engagement indicates a shift in learning preferences, with students likely favoring methods that allow for more interaction and self-paced learning. Students appreciated the flexibility of online learning and found the interactive nature of virtual dissections particularly satisfying.
Conclusion: Digital technology like 'MyVAP' showed a clear positive impact on students' engagement in anatomy education. The 'MAC' online anatomy practical learning modality has proven to be an effective tool in engaging students and enhancing their learning experience. While online learning offers flexibility and accessibility, a hybrid approach that blends virtual tools with physical, hands-on experiences may provide the best environment for deep, lasting learning.

Keywords: Online learning; student engagement; Anatomy education; virtual practical; student motivation

The Role of Large Language Models in MCQ Generation for Medical students: Potential, Challenges and Future Directions

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ABSTRACT

Introduction: The increasing demand for high quality assessments in medical education has led to the development of AI for generating multiple choice questions (MCQs).
Aim/Purpose/Objective: This review examines the applicability of large language models (LLMs), for developing MCQs and its capacity to assist educators.
Method: This is a narrative review of 16 papers published between November 2022 and September 2024. The sources were identified through searches in PubMed, Google Scholar and other academic search engines. Key findings regarding the quality, accuracy, and effectiveness of the MCQs created by AI are summarized and analysed.
Results: ChatGPT was found to be the most investigated, and it was used in over 90% of the studies; the other models included Bing, Bard, and ChatPDF. ChatGPT performed very well in the creation of MCQs for text and logical reasoning exercises. The review shows that LLMs are capable of generating MCQs with difficulty levels similar to human generated ones, and in certain cases acceptable validity and discrimination coefficients. But some of the issues raised include inaccuracy, unrealistic distractors, and the questions may require the input of an expert to review them to align with learning
Conclusions: Incorporation of AI into medical education is still evolving but the study points to a promising future for this technology. There is still a need for human intervention to fix problems and enhance the quality of questions. Some studies suggest using a hybrid approach, where educators work with AI – using the LLMs in the first draft and relying on human knowledge in the second phase of validation and refinement. More studies are required to fine-tune the AI applications in assessment writing: the effects of different AI types, prompt engineering on question quality and developing AI models specifically trained on medical knowledge to improve accuracy and relevance.

Keywords: Multiple choice questions; artificial intelligence; medical education; ChatGPT; large language models

Embracing the Digital Era: Technology's Impact on Medical Education Curricula

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ABSTRACT

Introduction: The domain of medical education consistently faces the imperative to adjust to a rapidly evolving healthcare landscape. Artificial intelligence (AI) reduces the time needed to evaluate curricula, addresses complex problems more effectively, improves classification accuracy, and identifies correlations in curriculum assessment.

Aim/Purpose/Objective: The purpose of this study was to characterize the potential uses of AI in curriculum development and its impact on enhancing educational experience.

Method: This descriptive review commenced with formulating specific research questions. A comprehensive search was conducted across academic databases like PubMed, Google Scholar, and Web of Science. Inclusion criteria focused on studies examining the role of artificial intelligence in curriculum development, employing sound methodologies, and published recently. Data on study design, outcomes, and findings were extracted and critically analyzed to evaluate the research's strengths, weaknesses, biases, and methodological limitations.

Results: A database search found over 52 articles on PubMed, around 17,000 results on Google Scholar, and four articles in Web of Science as of 2023. Following the screening process, a total of ten articles were chosen in accordance with the established inclusion criteria. The investigation revealed that instructional design creates medical educational materials, while learning technology enhances learning with tech tools. Their integration results in dynamic educational experiences, with learning technology increasingly popular among learners. Research shows that AI can transform curriculum development by automating syllabus creation, generating quizzes and assignments, optimizing class schedules, managing gradebooks, tracking student progress, and assisting with budget management. AI-powered tutoring platforms provide personalized support, and chatbots enhance student engagement. Additionally, AI aids in faculty evaluations and helps educators manage workloads, promoting collaboration.

Conclusion: Learning and instructional design are essential for effective education, creating engaging opportunities that inspire students. Integrating artificial intelligence can streamline administrative tasks for medical educators, saving time, reducing errors, and improving curriculum assessment and development.

Keywords: Artificial intelligence; medical education; curriculum development; automation

Monitoring Stress Analysis of Sexual Harassment in the Education Sector using Large Language Models

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ABSTRACT

Introduction: Worldwide, the number of incidents involving sexual misconduct against children keeps rising each year. This troubling issue encompasses not only physical and emotional exploitation but also an ongoing risk of sexual abuse that affects children regardless of their background or socioeconomic. Children face the threat of sexual misconduct in spaces where they should feel safest-whether at home, in school, or within their communities. Several studies have been conducted on sexual harassment on social media services such as Facebook, Instagram, TikTok, and Twitter, which are widely used around the world. However, research on monitoring, detection and evaluation of stress caused by sexual harassment on social media still on going and lacking in Malaysia. An effective method of monitoring and analysis is needed to help assess and reduce the stress levels experienced by victims.

Method: To address this issue, this research study proposes the use of Large Language Models (LLMs). LLMs represent AI technology designed for analyzing diverse text types. LLMs have demonstrated impressive success across different sectors, improving work efficiency by allowing machines to comprehend human language. The findings from this study present a LLMs methodology for the monitoring and analysis of stress experienced by victims of sexual harassment within the education sector. LLMs capable of processing large volumes of text data from social media, detecting patterns and occurrences of harassment, and offering recommendations for the education sector.

Results: The outcomes of this stress analysis monitoring can enable stakeholders to address the issue of stress related to sexual harassment proactively, offering counseling as an early intervention for victims.

Conclusion: This approach may contribute to lowering stress levels among students.

Keywords: Stress monitoring; sexual harassment; large language models (LLMs); sentiment analysis

Harnessing Artificial Intelligence and Augmented Reality Integration in Anatomy Learning: A Current Systematic Review

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ABSTRACT

Introduction: The integration of artificial intelligence (AI) and augmented reality (AR) in anatomy education is revolutionizing traditional teaching methods, offering immersive, interactive learning experiences that enhance comprehension and engagement. As technology advances, the need to evaluate its effectiveness in educational settings becomes increasingly important, particularly in complex fields like anatomy learning. This systematic literature review aims to explore the impact of AI and AR on anatomy learning by synthesizing findings from various academic studies.
Aim/Purpose/Objective: The review addresses the growing challenges in traditional anatomy education, such as limited access to cadavers and the difficulty in replicating hands-on experiences. By leveraging AI's data-driven capabilities and AR's immersive visualizations, educators can create interactive and engaging learning environments that improve student comprehension and engagement.
Method: To ensure methodological rigor, this systematic literature review (SLR) followed the PRISMA framework guidelines. A comprehensive search was conducted across reputable databases, including Scopus, Web of Science, and ERIC. The research question was structured using the Population, Intervention, Comparison, and Outcomes (PICO) framework. Inclusion and exclusion criteria were established based on publication timeline, document type, language, and a focus on empirical evidence studies. Study quality was assessed using the Mixed Method Appraisal Tool (MMAT), and thematic analysis was employed for data extraction and analysis. The database found (n=21) final primary data was analysed.
Results: The finding was divided into three themes which is (i) AI and immersive technologies in medical education, (ii) transformation of medical and health science curricula and (iii) emerging educational technologies and innovative teaching methodologies.
Conclusion: In conclusion, the integration of AI and AR holds great promise for revolutionizing anatomy education, but strategic efforts are required to address existing challenges and optimize the use of these technologies in academic settings.

Keywords: Artificial intelligence; augmented reality; Anatomy learning; medical education

dDAP-SSC: Enhancing Digital Pathology Education through Domain-Adaptive Assessment of Breast Cancer WSIs Analysis

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ABSTRACT

Introduction: Whole slide images (WSIs) of breast cancer exhibit significant domain variations across institutions due to differences in imaging devices, staining protocols, and scanning specifications. These disparities compromise automated assessment systems and impact standardized digital evaluation of pathology education. Traditional domain adaptation methods like GANs show limitations in preserving diagnostic features.

Aim/Purpose/Objective: This research proposes DDAP-SSC (Dual-Domain Adaptive Perturbation with Semantic and Structural Consistency), an adaptive testing framework that enables consistent digital assessment across institutional boundaries.

Method: The DDAP-SSC framework employs dual-domain adaptive perturbation to reduce domain discrepancy while maintaining breast cancer tissue features. The approach integrates both semantic and structural constraints: semantic consistency is enforced through cross-domain shared feature mapping at the class level, while structural integrity is preserved through constraints on class boundaries and tissue morphology. Through unsupervised learning, domain-invariant features are extracted, enabling automated grading and real-time performance analytics. This dual-constraint standardization allows educators to implement objective digital assessments regardless of WSI source variations while maintaining the completeness of critical diagnostic features needed for educational evaluation.

Results: The framework demonstrates superior performance in the automated assessment of breast cancer WSI analysis skills. The standardized digital evaluation platform helps educators track student progress through quantitative metrics, identify learning gaps, and provide data-driven feedback. This advancement significantly improves the objectivity and efficiency of pathology education assessment across varied institutional data sources.

Conclusion: Validation on the TIGER breast cancer dataset and private datasets show high accuracy, achieving Dice coefficients of 0.88/0.83 (tumor/stroma) and 0.91 respectively. The DDAP-SSC effectively bridges domain gaps while maintaining diagnostic feature integrity, establishing a robust digital assessment platform that standardizes evaluation criteria and enables automated tracking of students' pathological diagnostic skill development.

Keywords: Digital assessment; breast cancer WSIs; domain adaptation; deep learning; tissue segmentation; pathology education

AI and VR-Driven Digital Ecosystem for Enhancing School Physical Education

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ABSTRACT

Introduction: Traditional school physical education (PE) struggles with limited personalised feedback, real-time data analysis, and engagement.
Aim/Purpose/Objective: This study presents a digital ecosystem integrating artificial intelligence (AI) and virtual reality (VR) to address these challenges, aiming to optimise PE practices and improve students' physical activity behaviours.
Method: A randomised controlled trial (RCT) evaluated the system's impact. Wearable devices collected real-time physiological and activity data, such as heart rate and exercise intensity. AI algorithms, including machine learning models, analysed the data to generate personalised insights. VR environments simulated engaging scenarios, providing immediate feedback to enhance motivation. Quantitative data on activity levels and motivation were combined with qualitative feedback from students and instructors.
Results: The digital ecosystem consists of three interconnected components: (i) Data Collection and Analysis: Wearable devices and sensors capture real-time metrics, such as heart rate and movement intensity. AI algorithms personalised behavioural models, identifying individual patterns and preferences. (ii) Behavioral Feedback: AI-driven insights provided tailored recommendations, helping students improve their performance and optimize behaviours. (iii) Interactive Experiences: VR environments simulated immersive scenarios, such as sports fields and race tracks, delivering real-time feedback and enhancing engagement. The pilot study demonstrated significant improvements in student activity levels, motivation, and overall engagement compared to the control group. The system's adaptability and scalability were confirmed across diverse educational settings.
Conclusion: The AI and VR-driven ecosystem offers a groundbreaking approach to modernising PE by integrating personalised data analysis with engaging, immersive environments. It addresses key challenges in traditional practices, enhancing both effectiveness and sustainability. Future research should explore expanding accessibility in low-resource contexts, refining data privacy protocols, and developing cost-effective implementations.

Keywords: Artificial intelligence; virtual reality; physical education; digital ecosystem; personalized learning

Association between Smartphone Screen Time and Perceived Stress Levels among Preclinical Medical Students in Sarawak, Malaysia: A Cross-Sectional Study

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ABSTRACT

Introduction: The digital transformation of medical education has increased reliance on smartphones for learning, making them vital tools for preclinical medical students. This shift raises concerns about the association between prolonged screen time and students' stress levels. However, the association between smartphone screen time and perceived stress levels among preclinical medical students in Sarawak, Malaysia, remains underexplored.
Aim/Purpose/Objective: To determine the association between smartphone screen time and perceived stress levels among preclinical medical students at a public medical school in Sarawak, Malaysia.
Method; A quantitative cross-sectional study was conducted among 108 preclinical medical students (Years one and two) at a public medical school in Sarawak from January 2023 to January 2024. Simple random sampling was employed. Participants provided their daily screen time using the built-in "screen time" tab on their smartphones, with excessive daily screen time defined as more than six hours per day. The validated Perceived Stress Scale-10 (PSS-10) was used to determine perceived stress levels, with scores ranging from low (0-13), moderate (14-26), to high (27-40) stress. The prevalence of excessive screen time and perceived stress levels were described in percentages, and the Chi-square statistical analysis was used to determine their association.
Results: Among the 108 participants, 78.7% reported daily screen time of more than six hours (excessive daily screen time), while 21.3% reported six hours or less. The study found that 93.5% of students experienced moderate stress levels, 3.7% experienced low stress levels, and 2.8% experienced high stress levels. Statistical analysis showed no significant association between smartphone screen time and perceived stress levels ($p=0.25$).
Conclusion: While excessive daily screen time and moderate stress levels are prevalent among preclinical medical students, no significant association was found between the two. Further research is needed to explore other factors contributing to stress and potential interventions to manage screen time and stress among them.

Keywords: Digital; smartphone; screen time; stress; preclinical medical students

Personalised Learning in Higher Education for Health Sciences: A Scoping Review

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ABSTRACT

Introduction: Personalised learning approaches have gained increasing attention in higher education, particularly in health sciences, due to their potential to enhance student engagement and learning outcomes. However, the implementation and effectiveness of personalized learning strategies in health sciences higher education remain unclear.

Aim/Purpose/Objective: This scoping review aims to map the existing literature on personalised learning in health sciences higher education, identifying key concepts, gaps in knowledge, and areas for future research.

Method: We conducted a comprehensive search of five electronic databases: PubMed, Scopus, Google Scholar, Educational Research Complete, and JSTOR. The search strategy employed various combinations of keywords related to personalised learning and health sciences higher education. Studies published in English between 2000 and 2024 were included. Two independent reviewers screened titles, abstracts, and full texts. Data were extracted using a data extraction form. The review followed the methodological framework outlined by Arksey and O'Malley and adhered to the PRISMA-ScR guidelines.

Results: The initial search yielded 1,247 records, with an additional 15 identified through other sources. After removing duplicates, 983 records were screened, resulting in 92 full-text articles assessed for eligibility. Ultimately, 12 studies met the inclusion criteria and were included in the qualitative synthesis. The review identified various personalised learning approaches implemented across different health science disciplines, including medicine, nursing, pharmacy, and dentistry. Key themes emerged around adaptive learning technologies, individualised feedback mechanisms, and student-centred curriculum design. Challenges in the implementation and assessment of personalised learning strategies were also highlighted.

Conclusions: This scoping review provides a comprehensive overview of personalised learning approaches in health sciences higher education. While the findings suggest potential benefits of personalized learning, they also reveal a need for more rigorous

research to evaluate its effectiveness and long-term impact on student outcomes. Future studies should focus on standardizing assessment methods, exploring the role of technology in facilitating personalised learning, and investigating the scalability of these approaches across different health science disciplines.

Keywords: Personalised learning; customised learning; individualised learning; adaptive learning; tailored learning

ROGAYAH JAAFAR AWARD FOR INNOVATION IN HEALTH PROFESSIONS EDUCATION

Enhancing Students' Learning Process through the "e-learning for Renal Anatomy & Pharmacology" (e-RAP)

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ABSTRACT

Introduction: The COVID-19 pandemic has accelerated the adoption of e-learning in medical education.
Aim/Purpose/Objective: Owing to the lack of relevant and effective e-learning tools to support online-based learning in medical education, we developed the "e-learning for Renal Anatomy & Pharmacology" (e-RAP) which integrates two major disciplines – Anatomy and Pharmacology – into a single, interactive tool.
Method: The e-RAP tool uses a nephron image embedded with quick response (QR) codes, covering the topics of nephron's functional microanatomy and pharmacology of diuretics. These QR codes are linked to various online educational resources such as lecture notes, animation and videos prepared by the teachers based on the intended learning outcomes. Additionally, e-RAP includes a QR code linking to a case study, allowing students to do a self-assessment by answering case-related questions. This approach helps students correlate basic science knowledge with clinical applications, fostering deeper understanding and life-long learning. The tool is accessible anytime and anywhere, promoting student-centred learning and personalised learning experience. Having developed the e-RAP tool, a user acceptance test (UAT) was conducted with 20 undergraduate students from Bachelor of Medicine and Bachelor of Surgery (MBBS) and Bachelor of Medical and Health Sciences (Hons) (Session 2022/2023).
Results: Results from the UAT indicated that the e-RAP tool is user-friendly and promotes independent learning. Following these favourable responses, a quasi-experimental study involving 105 preclinical medical students (Session 2023/2024) was conducted to investigate its impact on students' learning process. The results demonstrated that students using the e-RAP tool showed significantly improved cognitive scores, learning engagement and motivation compared to those who had conventional teaching methods.
Conclusion: In conclusion, the e-RAP tool is an impactful innovation that leverages technology to enhance students' learning process.

Keywords: e-learning; e-RAP tool; innovation

Innovative Basic Life Support Training: An App-Enhanced Educational Toolkit for Malaysian Lay Rescuers

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ABSTRACT

Introduction: The out-of-hospital cardiac arrest (OHCA) survival rate in Malaysia is critically low, reported to be as low as 0.5%. Lay rescuers play a vital role in initiating the chain of survival before paramedics arrive. However, basic life support (BLS) knowledge and skills among the Malaysian public, particularly youths, remain inadequate.
Aim/Purpose/Objective: This study aimed to develop a bilingual BLS Learning Toolkit to train the public, with a focus on students, to become competent lay rescuers.
Method: The BLS Learning Toolkit included an interactive module covering cardiopulmonary resuscitation (CPR) and the use of an automated external defibrillator (AED), along with a CPR pillow for practical hands-on training. A pre-post study was conducted in five secondary schools in Klang Valley, assessing the toolkit's effectiveness in improving BLS knowledge and skills. The study was conducted in two phases: Phase I consisted of instructor-led training, while Phase II involved an e-learning module delivered via the MyResQ app.
Results: Of the 203 participants, 68% (n=138) completed both study phases. Phase I results showed a 58% improvement in knowledge and a 115% increase in practical skills. After six months, students who continued using the e-learning module (n=71) scored 28% higher in knowledge and 18% higher in practical skills than those who did not use the app (n=67). 91% of participants expressed high confidence in performing CPR, and 88% felt confident sharing their knowledge with family and communities.
Conclusion: The hybrid BLS Learning Toolkit effectively enhanced life-saving skills among students. This initiative has the potential to standardise BLS training for young people, promoting a culture of first rescuers in their communities.

Keywords: Basic life support; CPR training; lay rescuers; e-learning

Game on for Learning: Innovative Education through Play

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ABSTRACT

Introduction: In medical education, games foster engaging learning for patient care skills, yet mobile and web-based options are rare.
Aim/Purpose/Objective: To address this, we developed educational games in a gamebook format and studied their effectiveness for undergraduates.
Method: Gamebook materials were crafted aligned with faculty-defined learning outcomes based on common Obstetrics and Gynecology topics. We created eight mobile-friendly, web-based games using Twine 2 (https://twinery.org/), an open-source game engine by the Interactive Fiction Technology Foundation (Twine, 2009), ideal for producing engaging text-based games with vivid images and dynamic sound effects. The games are hosted on a free web-hosting service (neocities.org). A quasi-experimental study compared two teaching methods: conventional case-based learning (CBL) and game-based learning (GBL) with the same learning materials. In GBL, Participants accessed a mobile-friendly game site of a patient. Players can navigate multiple pathways to reach correct management. Wrong choices ended the game, but players could take a step back. Those on the correct path advanced through increasingly complex levels, aiming to diagnose and treat the case accurately. The participant reaching the highest level within the allotted time was deemed the game winner. Effectiveness was measured by comparing the performance of students in both groups via single-best-answer seven days after training. Student perceptions were rated on a 5-point Likert scale.
Results: Out of 128 participants, Chi-squared tests showed no significant difference in post-intervention MCQ scores between the GBL and CBL groups. However, GBL students found learning more enjoyable and felt more confident in managing patients theoretically and practically.
Conclusion: This innovation highlights an underutilized avenue: the integration of mobile and web-based games within medical curricula, especially in complex subjects like O&G. This aligns with educational innovation principles, addressing learner engagement, motivation, and skill acquisition in high-stakes settings. In conclusion, GBL is comparable to conventional CBL in achieving desired knowledge. In addition, students reported a more positive perception towards GBL.

Keywords: Game-based learning; medical student; Obstetrics and Gynecology; undergraduate MBBS; conventional teaching-learning