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Abstracts

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Future Ready and Future Proof Anatomy Education

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ABSTRACT

The COVID-19 pandemic has had severe effects on the teaching of anatomy. The sudden pandemic has resulted in a bombshell and left students in a lurch. This may have severe consequences in medical education. The suspension of body donations added to the agony, fearing the risk of receiving bodies infected with COVID-19. Fortunately, anatomists have quickly resolved these issues using 3D models, pre-recorded videos, and virtual classrooms, creating mixed-reality anatomy studios, virtual dissections, and human patient simulators. Using ''whiteboarding", drawing play-doh, and body painting has also added to the innovation. This may be the future of anatomy.

Strategizing the Future Anatomy Education in Malaysia

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ABSTRACT

In Malaysia, the demand for Anatomy Teachers in the medical field continues, but the salary and working conditions have been less appealing. To attract new practitioners, a more dynamic approach to Anatomy education is necessary. Comprehensive teaching is crucial to mastering Gross Anatomy, Histology, Embryology, and Neuroanatomy. Enhanced technology can accelerate proficiency in anatomical skills. Traditionally, we study cadavers in a lying position, but digital anatomy now allows for easy rotation of the human body, offering flexible learning from various angles. Improving the salary scheme, both in the public and private sectors, will incentivize more individuals to pursue careers as Anatomists. Registering Anatomists as clinical specialists in the Malaysian National Specialists Registry is essential. By working alongside radiologists and imaging specialists, Anatomists can apply their knowledge in clinical settings, benefiting surgical planning, collaboration with surgeons, and staying updated with advancements in patient care. Invasive and non-invasive cardiology relies heavily on imaging technology, where Anatomists' involvement enhances awareness of anatomical variations. Challenges in current surgical practice involve identifying appropriate sites for local anaesthetic blocks, a task that Anatomists can play a crucial role in. They also contribute to sports medicine and sports science research, nurturing champions in Malaysian sports. Anatomists' training equips them to practice as embryologists in reproductive clinics and conduct specialized sperm analysis related to histological diagnostic work. Anatomists must also engage in close-up anatomy using endoscopes, as observing organs through scope cameras offers an amazing view. Including endoscopic atlases and video collections in textbooks and training will enable Anatomists to recognize structures accurately. Through strategic approaches and advancements, the future of Anatomy education in Malaysia can attract skilled practitioners and foster excellence in medical care. By incorporating cutting-edge technology, facilitating clinical collaboration, and promoting specialized roles in various medical fields, Malaysia can create a vibrant and rewarding environment for Anatomy education and practice. This will not only address the demand for Anatomy Teachers but also contribute to advancements in medical research and patient care, ultimately benefiting the healthcare sector as a whole.

Artificial Intelligence in Anatomy Education Challenges and Future Direction

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ABSTRACT

Does the integration of artificial intelligence (AI) into anatomy education have the potential to revolutionise and redefine current teaching, learning, and assessment practises? The release of readily accessible AI tools such as ChatGPT, Bing, DALL-E 2, and others has triggered this discussion. This presentation will provide insight into the benefits and drawbacks of AI tools, particularly large language models (LLM) such as Generative Pre-trained Transformers (GPT) in anatomy education, specifically aspects of curriculum development, teaching and assessment methods, personalised learning, and customised Chatbots. To completely leverage the potential of LLM tools, it is necessary to understand both the opportunities and challenges they present. This knowledge is crucial for both teachers and students to utilise these tools effectively and appropriately, maximising benefits and enabling discussions on future directions.

Generating Defective Bones Utilising Autodesk Meshmixer for Forensic Anthropology Teaching

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ABSTRACT

The Covid-19 pandemic has forced online teaching on everyone. As part of the training and educational curriculum for forensic anthropology, it is essential to provide students with realistic and hands-on practical experiences to enhance their understanding of bone pathologies and defects commonly encountered in forensic contexts. This research aims to explore the application of Autodesk Meshmixer, a 3D modeling software, for generating defective bones in the context of forensic anthropology teaching. Normal bones were first scanned with Revopoint 3D scanner to generate a 3D file. Utilising the sculpt features of Autodesk Meshmixer, virtual bones were manipulated to showcase bone defects and incorporated into a 3D online software viewer (p3d.in). The 3D viewer is incorporated into the e-learning platform as practical specimens and exam deployment. Regardless of the pandemic, results indicate that the exact same laboratory hands-on practical can be conducted online without any drawbacks. Students only required internet-connected devices and the 3D models are universally accessible and do not require specific operating systems and/or powerful computing devices. 3D models were also included in final exam questions which previously cannot be achieved in conventional settings. Feedback was also obtained from staff and students. 31 of the 33 students responded favourably to the online teaching interface and the course has been selected as one of the courses to implement digital competency skills incorporated in the Research Infuse Experiential Learning (REAL), part of the Experience Learning and Competency-based Education Landscape (EXCEL) framework guideline provided by Ministry of Higher Education (MoE) Malaysia.

Keywords: Autodesk Meshmixer; defect 3D bones; Forensic anthropology; teaching

From Pedagogy to Andragogy: Enhancing Students' Creativity Through Independent Anatomy Learning

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ABSTRACT

The development of creativity in medical education especially in the field of Anatomy is crucial. Pedagogical technique has long been implemented in anatomy teaching making it a dry subject. Recent studies have attempted to introduce innovative teaching methods to incorporate Andragogical learning whereby students are trained to be creative, independent, and self-driven. We aimed to explore the extent to which independent learning encourages students' creativity and how this impacts their understanding of human anatomy. Self-directed practical sessions on the Overview of the Upper Limb were conducted to identify its effect on anatomy learning among the students. Students were divided into (i) group 1 and (ii) group 2. All students had a one-hour didactic lecture, followed by a three-hour practical session. However, only group 1 had an additional independent learning session prior to the practical session to create anatomical models using recycled materials. Students were separated into smaller groups for peer learning sessions using the anatomical models created, followed by a topic presentation during the practical session. The accuracy of the anatomical models produced and the topic understanding were assessed. The students demonstrated high levels of creativity and critical skills during independent learning in Anatomy of the Upper Limb. Students in Group 1 achieved higher marks in the assessments (>70%) in comparison to Group 2 (<50%). The study provides valuable insights into the importance of promoting creativity and innovation in anatomy education. Further research could explore effective teaching strategies to enhance creativity and critical thinking among undergraduate pre-clinical students.

Keywords: Anatomy; didactic teaching; independent learning; recycle material; upper limb

Revitalizing Brain Tissue Preservation: Achieving Longevity and Improved Visual Clarity with Epoxy Resin Casting

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ABSTRACT

Preserving the brain allows educators to provide students with hands-on learning experiences, allowing them to examine and explore the different regions and structures. Its preservation however presents a significant challenge. It requires proper storage conditions to maintain integrity and prevent deterioration, which over a period of time can be costly and technically demanding and may still undergo decay and degradation. Preserving brain tissue using epoxy resin casting presents a promising and innovative solution for long-term preservation. This is done by encapsulating the delicate brain tissue within a durable resin matrix. First, the brain was dried from the formalin and sliced accordingly. A mould measuring 16 cm by 16 cm was made from acrylic sheets. Different parts of EpoxAcast™ 690 epoxy resin was then mixed and vacuumed to remove any air bubble before being poured into the mould which was then followed by the brain slice before totally submerged with the resin mixture. The cast was left to cure at room temperature for 48 hours before being removed from the mould. Results showed that the brain remain intact without shrinking, and the outline between the grey and white matter was clearly visible. The resin acts as a robust and stable barrier, safeguarding the delicate brain tissue from environmental factors, enzymatic activity and microbial growth. This ensures the brain tissue remains intact and retains its structural integrity. In conclusion, epoxy resin casting offers superior preservation, low cost, enhanced visual accessibility and practical handling, and is a viable and transformative solution for brain tissue preservation.

Keywords: Brain; epoxy resin; preservation

Augmented Reality (AR) for Anatomy Education of Pre-Medical Students in Manipal University College Malaysia (MUCM) – A Pilot Study

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ABSTRACT

As global education advances and students' utilisation of technology evolves; researchers are interested in exploring novel opportunities in human anatomy learning. Pre-medical students frequently struggle to v the transition from 2D to 3D materials when studying anatomy using textbooks and statue models. Since it is not feasible to use cadavers for pre-medical students' anatomy study, this research suggests employing augmented reality (AR) to assist their learning. This research sought to determine whether AR, a cutting-edge learning innovation, may improve pre-medical students' interactive learning experience. Hence, a pilot study was conducted. Seventeen pre-medical students of MUCM participated in this study and were introduced to an AR application during a Basic Human Anatomy class. Students were put into groups of two and later, a student from each group donned a garment that, when scanned with a smartphone, revealed dynamic anatomical graphics which helped them better grasp the structures of the internal organs. After the one-hour class session, students evaluated their learning experience using a survey questionnaire. On a five-point Likert scale, the mean score of the evaluation findings was 4.25 ($\pm$0.79), and it was deemed high. Participants gave the teaching materials domain the highest rating, with a score of 4.35 ($\pm$0.74). The domain of practicability received the lowest score, which was 4.20 ($\pm$0.84). AR helps in visualization and comprehension of anatomical information, besides stimulating interactive learning among pre-medical students. It may have the potential in improving students' educational experience.

Enhancing Anatomy Practical Learning: Integrating Physical Specimens in an Online Library Platform

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ABSTRACT

Anatomy dissection plays a crucial role in understanding the structure of the human body and its intricate systems. Traditionally, dissection of the cadaver has been a cornerstone of anatomy education. However, with the advent of online platforms, there is a growing opportunity to enhance the learning experience by integrating the wet prosected, plastinated, and jarred specimens of the human body into a digital platform. We aim to create an online platform for human anatomy specimens. We uploaded the wet prosected, plastinated, and jarred specimens, including the detailed description and the labelled photographs of these specimens, into the online library database. We grouped the specimens according to the systems of the human body in the database. The student could have access to all the specimens during the practical session from this online database. Each digital image was given a code similar to the physical specimen, which allows the students to also learned using these specimens in the museum or the dissection hall for self-revision, before or after the practical session. The students also can request specific specimens for revision at the dissection hall through this online system. The online platform allows students to view and study the specimens during their anatomy studies, thus enhancing their understanding of the subject. This approach combines virtual and physical methods to offer a comprehensive learning experience. Furthermore, the online system facilitates easy monitoring and updating of the specimen inventory, ensuring its accuracy and availability.

Keywords: Anatomy; inventory; museum; online; practical; specimen

Integrating ChatGPT in Anatomy Education: A Study amongst UiTM Dental Preclinical Undergraduates

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ABSTRACT

The release of ChatGPT, a chat-based natural language processing tool driven by artificial intelligence (AI), has impacted education sectors worldwide. The efficiency of ChatGPT in generating instant replies has impacted how university students search for information. This study aims to analyse the extent and reliability of ChatGPT in helping undergraduate students study human anatomy. 80 first-year dental students were divided into 7 groups and assigned a self-study exercise module. All students were given a 1-hour didactic lecture beforehand to ensure they understood the basics of the topic of interest. Students were given 2 hours to self-study in small groups using ChatGPT alongside their lecture notes and textbooks. Students were then required to present the information they have gathered to the respective lecturers to ensure the reliability of the information. Knowledge assessment was conducted using ChatGPT generated Single Correct Answer questions. Clinical applications of the structures of interest were discussed via ChatGPT-generated clinical scenarios. ChatGPT-generated responses were validated by lecturers throughout the activity. Feedback from lecturers and students confirms the efficiency of ChatGPT as a reliable teaching aid for undergraduate human anatomy teaching and learning. Lecturers find ChatGPT as being reliable in generating correct information in a short amount of time whilst promoting student-centred discussions. Students find the activity as beneficial as ChatGPT is easily accessible via their mobile gadgets. Though ChatGPT is relatively new, it offers a glimpse of what AI has to offer. Integrating AI in tertiary education is necessary in order to design future-proof education.

Keywords: Anatomy education; Artificial Intelligence; ChatGPT; human Anatomy

'Jamboarding' Anatomy: An Interactive Online Anatomy Learning

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ABSTRACT

Interactive learning approach allows students to fully engage in learning activities and actively participate in discussions, enhancing their understanding of anatomical concepts. Google Jamboard, a web-based application, provides a flexible and interactive approach that fosters group discussions and thus promotes a dynamic learning experience. It enables students to explore and manipulate learning concepts, fostering a hands-on approach. By leveraging this application, educators can create interactive learning sessions to accommodate diverse learning styles. The study explored the feasibility and practicality of Google Jamboard, in several small group anatomy discussion sessions, which were conducted synchronously in an online anatomy class. A qualitative phenomenological study involving 116 students from two public universities in Malaysia was conducted. The study utilized a teleconference application for real-time collaboration activities among the students. The students were divided into ten groups and provided access to Jamboard slides containing anatomical diagrams and related questions. After completing the tasks, each group presented their answers. Feedback forms with open-ended questions were distributed to collect the students' experiences and opinions on the use of the application. The students perceived that the Google Jamboard is a convenient digital learning tool as it is fun, user friendly, and allowed them to actively engage with the discussion and learning activities. The findings revealed that Google Jamboard is a feasible and practical learning tool for stimulating an interactive online anatomy group discussion. It facilitates active student participation and engagement, as well as promotes collaborative learning in an online environment.

Keywords: Active learning; anatomy; collaborative learning; google jamboard; online learning

Effectiveness and Student's Perception of e-Anatomy Kit as a Tool for Gross Anatomy of Respiratory System Virtual Practical during COVID-19 Pandemic

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ABSTRACT

Anatomy is perceived to be an onerous subject as it contains complex information that necessitates three-dimensional visualization to comprehend. During the COVID-19 pandemic, there was a paradigm shift to online distance learning including practical sessions. Innovative instructional techniques for learning anatomy are clearly needed. An e-Anatomy kit composed of 5 components: (i) pre-recorded cadaveric demonstrations, (ii) Complete Anatomy application, (iii) interactive diagram labelling, (iv) schematic diagram, and (v) mnemonics were designed to improve the Respiratory Module virtual practical experience of medical students from Faculty of Medicine, Universiti Teknologi MARA, Malaysia. The students were divided into 2 groups: the control group had regular discussions and the experimental group received an e-Anatomy kit. Pre- and post-test containing Anatomy questions as well as questionnaires regarding student perceptions were also given to the students. There was a significant difference between the means of pre- and post-test assessment in both the control and e-Anatomy kit groups. There were no differences in post-test assessments between the control and e-Anatomy kit groups. However, in post-test assessments, the mean percentage difference of the e-Anatomy kit group is higher (15.8%) in comparison to the control group (10.3%). The students perceived the e-Anatomy kit as engaging, interesting and effective. In conclusion, e-Anatomy kit is an efficient and engaging approach as an alternative or adjunct to face-to-face anatomy teaching, especially after the COVID-19 pandemic.

Keywords: Anatomy; e-Anatomy kit; effectiveness; medical student's perception; virtual practical

A Novel 2D Animation Approach-An Embryology Made Easy

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ABSTRACT

Embryology knowledge plays a crucial role in understanding physiological foetal development and birth abnormalities. Typically, medical schools incorporate embryology into their curriculum as lecture-based courses, often lacking a laboratory component and providing varying quantities of handouts. Understanding embryology poses challenges due to the complexity of visualising the progressive changes of an embryo in three dimensions. To address this problem, we have introduced a novel embryology learning method using a 2-dimension (2D) animation approach. This innovative approach aims to enhance the teaching and learning experience for medical students at Universiti Putra Malaysia by providing visual representations that could facilitate comprehension of embryological concepts. In the initial stage, anatomists gathered and vetted ideas and scripts to create an impactful storyboard. We focused on early embryogenesis, from fertilisation to the third week of development, as it involves significant changes in the embryo. Illustration and drawing of the embryology structures were carried out using Adobe Illustrator, ensuring the images aligned with standard textbook comprehension. Adobe Photoshop was utilised for image editing, cropping and picture converting. Subsequently, 2D motions and photo labelling were assembled in Cap Cut applications, incorporating voiceovers and background music to ensure synchronised movements and smooth flow, especially during implantation and gastrulation. Finally, the post-production video was finalised and edited. In conclusion, integrating 2D animation into anatomy education holds excellent potential for improving student learning outcomes. It is highly recommended to

adapt this animation approach across nationwide medical schools and incorporate it into other medical subjects.

Keywords: 2D animation; anatomy; embryology; embryogenesis; medical education; medical students

Empowering Transformative Virtual Histology Learning Experience through Guided Self Learning

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ABSTRACT

Anatomy is perceived as a cognitively challenging subject by preclinical students. Among the branches of anatomy, histology received the least attention causing a decline in motivation and engagement in histology learning. Various pedagogical methods including virtual histology (VH) have been embedded in the teaching and learning of histology. However, a lack of self-learning guides could lead to failure in utter comprehension of the topics learned, thus causing a loss of interest and demotivation among students. Hence, the aim of this study was to explore the benefits of incorporating self-learning guides using this platform. A qualitative phenomenology study was carried out on 105 first-year students at Universiti Sains Malaysia. This pilot study was constructed based on VH slides of the adrenal and thyroid glands. The study guide (SG) consists of short notes and a schematic diagram drawn based on the actual histological structures seen in the slides. The students were requested to respond to questionnaires after completing their self-revision using this platform. Thematic analysis of students' responses was generated based on four domains: ease and accessibility, understanding, motivation, and suggestions for improvement. The results of the analysis showed that more than 80% of the students strongly agreed that learning using this platform was easy, easily accessible, and improved their understanding and motivation. More than 95% of students were expecting that this project should be extended to cover more topics and agreed that this platform was worth to be recommended to others. These results suggest that the virtual SG is beneficial in improving students' understanding and motivation, hence, this project should be expanded to cover more topics for students' benefit.

Keywords: Learning experience; study guide; virtual histology

Measuring Cognitive Load in Anatomy Practical Session: A Cross-Comparison between Medical and Biomedical Sciences Programmes

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ABSTRACT

A thorough understanding of the workings of the brain and the constraint of working memory is essential in designing an instructional method that promotes effective learning. The cognitive load scale is a valuable tool in this regard, as it enables the measurement of three crucial domains of cognitive load: intrinsic load, extraneous load, and self-perceived learning. This study aims to evaluate the cognitive load incurred during anatomy practical sessions in two undergraduate programmes offered at Newcastle University Medicine Malaysia and to compare the two programmes. First-year Medical (MBBS) and second-year Biomedical Sciences (BMS) students participated in small-group peer-teaching sessions on the same topic. The practical sessions facilitated hands-on activities and interactive forums, with supplementary instructional materials accessible on the e-learning platform prior to the session. To enhance self-revision, students were encouraged to utilise the 3D anatomy software. The cognitive load scale was compared between the two programmes using the independent t-test. MBBS students scored higher in the intrinsic load domain compared to BMS students (t=3.43, p=0.001), indicating a higher content complexity level amongst the MBBS students. However, no significant differences were observed between the two programmes in the extraneous load domain (t=-0.819, p=0.415) and the self-perceived learning domain (t=-1.714, p=0.090). This indicates similar levels of distracting elements and the motivation to learn between the two programmes. In conclusion, future research endeavours will be carried out to investigate the intrinsic load domain between the two programmes and to formulate intervention plans with a larger sample size.

Keywords: 3D anatomy software; cognitive load scale; extraneous load; intrinsic load; self-perceived learning; peer-group teaching session

Feasibility and Students' Acceptance of Histology Drawing using iPads during Open and Distance Learning

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ABSTRACT

Hands-on experience is vital in practical disciplines such as human anatomy. In response to challenges during the Covid-19 pandemic, the integration of digital tools such as iPads, has emerged in the adaptation of teaching methodologies towards open and distance learning (ODL). This study explored the feasibility and students' acceptance of utilising iPads for histology drawing during ODL in Dental Faculty UiTM. A cohort of 80 Year 1 students attended several online practical sessions on four histology topics: (i) Epithelium and Glands, (ii) Connective Tissue and Skin, (iii) Cartilages and Bones, and iv) Muscle and Nervous Tissues. Students were divided into several small groups and were asked to draw and present the histological diagrams using iPads. At the end of the module, students' feedback towards the implementation of iPad-based histology drawing sessions was assessed through a survey with a focus on practicality, learning environment, lecturers' guidance, and preference for digital drawing in comparison to manual drawing. The students managed to produce detailed histological diagrams. A majority of the students expressed satisfaction with the learning environment (64%) and highly acknowledged the guidance provided by the lecturers (75%). Most notably, 89% of them expressed a preference for digital drawing using iPads over manual drawing on the Anatomy Workbook, while 89% enjoyed listening to the presentations. The implementation of iPad-based histology drawing is both feasible and well-accepted by the students. The preference for digital drawing indicates its potential as a valuable tool for enhancing learning experiences. Further research should explore its long-term effects on student learning outcomes.

Keywords: Digital tools; histology diagram; open and distance learning

Analysis on the Impact of the Modified Teaching

Delivery in Anatomy in Response to the COVID-19 Pandemic on Students' Performance in Universiti Sains Islam Malaysia (USIM)

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ABSTRACT

The coronavirus disease (COVID-19) pandemic gives a direct impact on the anatomy teaching and learning in USIM leading to an abrupt transition from full face-to-face to online. Thus, exploration of the impact of COVID-19 on the methods of teaching delivery in anatomy is crucial. The aim of this study was to investigate the impact of modified teaching delivery in anatomy on preclinical students' academic performance at USIM. Data on preclinical USIM students' formative assessment based on the marks obtained from the Anatomy Professional Examinations of the three cohorts from the year 2019 to 2022 were taken (n=240). The cohort includes the pre-pandemic (PP) cohort, transition-to-pandemic (TP) cohort, and pandemic (P) cohort. Assessment of the cognitive skills performance reflects on the modes of lecture delivery. Meanwhile, the assessment of practical skills reflects on the modes of practical delivery. The analysis between each cohort was performed using one-way ANOVA. Students' academic performance in practical skills indicates a significant difference between PP cohort and P cohort ($p<0.05$). The mean marks reveal a descending trend, with the highest mean mark of PP cohort (59.5%) and the lowest mean mark of P cohort (54.2%). Nevertheless, there was also a significant difference in student cognitive performance between PP cohort and TP cohort ($p<0.05$). In conclusion, traditional face-to-face delivery, particularly in practical skills, remains the most effective strategy in anatomy teaching among USIM students. However, the use of digitalised technologies in anatomy education should be encouraged to enhance a good learning experience for the students.

Keywords: Anatomy education; COVID-19; online learning

Unveiling the Knowledge and Perception of 2D Embryology Animation-Are We Up to The Challenge?

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ABSTRACT

The lack of hands-on or practical sessions during embryology classes makes it challenging for students to grasp the knowledge and reduces their perception of the subject compared to other anatomy topics. Therefore, this study aimed to introduce one of the interactive embryology teachings, 2D animation, a novel approach in our country and Southeast Asia. Purposive sampling was used to recruit undergraduate medical students at Universiti Putra Malaysia (UPM) across years and phases of the study, whereby the students were given unlimited access to 2D animation software. The questionnaire consisted of two sections focusing on knowledge and perception. Ten vetted single-best-answer questions assessed students' knowledge while modified questionnaires with a 5-point Likert scale measured perception. The response rate was 86.9%, and the sociodemographic distribution included variables such as gender (male and female), ethnicity (Malay, Chinese, Indian, and other races), and phase of the clinical study (preclinical and clinical). An Independent t-test was performed using the SPSS version 27 to compare the knowledge and perception at the post-intervention level. Overall, Chinese students scored significantly higher in the knowledge component compared to Malay students, which could be attributed to better visuospatial ability. Additionally, perception scores were significantly higher in preclinical students compared to clinical students because they had just completed their embryology syllabus during the preclinical years. Our research findings proved that the newly developed embryogenesis 2D animation improved the embryology knowledge and perception of medical students at UPM.

Keywords: 2D animation; anatomy; embryology; knowledge; medical students; perception

Students Feedback on Anatomy Spotter's Examination

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ABSTRACT

The spotter can be used as a formative assessment tool to measure anatomy knowledge in practical class. The medical programme in Newcastle University Medicine Malaysia (NUMED) utilises a case-based learning approach, and a total 25 clinical cases are discussed throughout the first two years of preclinical phases. A two-hour anatomy practical class was scheduled in each case to cover the anatomy learning outcomes. The aim of this study is to evaluate the medical students' feedback on anatomy spotter questions as a formative assessment tool. The detailed teaching plans of the anatomy practical and self-directed learning package are uploaded to the university virtual learning platform, one week before the class. A total of 10 spotter questions were prepared according to the learning outcomes and were answered by 102 year-2 medical students at the end of the anatomy practical session. 84% of students agreed that answering the spotter as a formative assessment is helpful in understanding anatomy and 69% of students agreed that answering the spotter inspired their reasoning skills. However, 2.1% and 1.3% of the students had neutral and negative responses towards spotter questions respectively. Free text comments are: "answering spotter question in the anatomy practical benefit in memorising anatomy", "encourage to study anatomy" and "more similar style of anatomy practical in future". This study disclosed that the spotter questions as a formative assessment in anatomy practical is beneficial for anatomy learning. Further work should explore the use of higher-level taxonomy spotter questions that could enhance the clinical reasoning skills.

Keywords: Anatomy learning; formative assessment; spotter questions

Exploring the Anatomy-Related Competency Among Junior Doctors: A Qualitative Study

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ABSTRACT

Anatomy is a fundamental basic medical science that has direct links to clinical practice. As a consequence of the Medical Education revamp in the early 20th century, a significant reduction in the anatomy content and teaching hours was recorded. Anatomists worldwide are currently conducting research to determine the importance of anatomy elements to be taught to medical students. Despite this, clinicians have observed that medical graduates lack the essential anatomy knowledge to work effectively as safe junior doctors. Our study aims to explore anatomy-related competencies necessary for junior doctors to ensure safe clinical practice. A qualitative phenomenology study was performed by conducting several sessions of semi-structured interviews with 19 house officers and medical officers to explore their anatomy learning experience and its impact on their clinical practice. Each session lasted approximately 30 to 60 minutes. The interview transcript was analysed thematically using ATLAS.ti version 23 software. The thematic analysis of the participants' responses generated 283 open codes, 11 axial codes, and four themes (i.e. cognitive, psychomotor, affective, and personal skill competencies) that reflect the essential anatomy competency for a medical student to achieve. Notwithstanding the relatively limited sample, this work offers valuable insights into how anatomists can plan and design their syllabus, teaching, and assessment methods. However, further work is required to profile and validate these competencies elements to ensure their functionality and practicality.

Keywords: Affective competency; anatomy-related competency; cognitive competency; personal skill competency; psychomotor competency

Formation of Medical Students' Professional Identity through Anatomy Dissection and Related Customs

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ABSTRACT

The establishment of medical professionalism is a critical component of medical education. It is widely recognized that the practice of anatomy dissection plays a significant role in cultivating an early sense of professional identity among medical students, as it instils core values of compassion and professionalism. This study aimed to investigate the changes in attitudes and values acquired through anatomy dissection and the associated customs. A written questionnaire was distributed to 235 first-year students at the beginning and conclusion of their cadaver dissection experience, spanning two consecutive years. Additionally, qualitative responses were gathered on the first day of interaction with the cadaver and during the annual cadaver memorial ceremony. By comparing the survey responses before and after cadaver dissection, a larger proportion of students expressed the belief that cadaver dissection is indispensable for becoming a doctor. They recognized its role in teaching them how to interact with patients and developing the appropriate mindset. Furthermore, an increasing number of students regarded the cadaver as their inaugural patient, indicating a significant improvement in their attitudes towards patients. Students also reported that symbolic gestures such as the final word gesture, a moment of silence, and the yearly ceremony for donors had a positive impact on humanistic values like integrity, reliability, and selflessness. These findings indicate that the practice of cadaveric dissection and its associated customs enable medical students to acknowledge the humanity of body donors and contemplate their own perspectives towards a medical career. As a result, this contributes to the formation of their early professional identity.

Keywords: Cadaver dissection; medical students; memorial ceremony; professional identity formation

Young Anatomist ExploRACE: Learning Anatomy Through Play for Young Children

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ABSTRACT

Young Anatomist ExploRACE is a program, which sparked young children's curiosity in exploring and racing for Anatomy knowledge through a series of plays. This program aimed to expose young Anatomists of age 5-12 years old with various branches of Anatomy knowledge including gross Anatomy, Histology, and Embryology through interactive games. The program's objective is aligned with the Science, Technology, Engineering, Art, and Mathematics (STEAM) Education Guide set by the Ministry of Education which aimed to improve early childhood education. The young Anatomists were divided into several small groups, which received a treasure map illustrating the locations of 10 Anatomy station games. After playing each station game, quizzes and explanations were given by the station game master to enhance the anatomy knowledge of the young Anatomists. At the end of the program, the young Anatomists were gathered for a re-evaluation of Anatomy knowledge through a short question-and-answer (Q&A) session, and the best group were given the 'Young Anatomist Award'. Short interviews and questionnaires were given to the young Anatomists and their parents during and after the program. 100% of the parents stated that the Young Anatomist ExploRACE program has high educational value and yet fun. Young Anatomists could answer the Q&A at the end of the program. 68.1% of young anatomists love the station called "Body in the Jar" the most. To our best knowledge, this program is the first in Malaysia that outreached young children through interactive game-based method as an effort to inculcate their interest in Anatomy subject.

Keywords: Anatomy; early childhood education; learning through play; Young Anatomist ExploRACE, young anatomist

Gross Anatomy Learning Using Radiological Images (GALERI): Exploring Its Effect on Students' Cognitive Load, Engagement and Comprehension

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ABSTRACT

The incorporation of clinical context into gross anatomy learning has been perceived as engaging and effective by students. In light of the expanding role of radiology in clinical practice, it is deemed appropriate to use radiological images as a method for students to improve their understanding of gross anatomy while appreciating its application. This study aims to determine the effect of Gross Anatomy Learning Using Radiological Images (GALERI) supplementary e-learning on the cognitive load, engagement, and comprehension of first-year medical students. Based on the E-learning Engagement Design (ELED) Framework, two types of supplementary e-learning (with and without radiological pictures) were produced. The effect of this two e-learning was studied and compared using a randomised controlled trial involving 82 first-year students from the Doctor of Medicine (MD) program in Universiti Sains Malaysia. No significant difference was seen between the two types of e-learning in terms of improving students' cognitive load, engagement, and comprehension. However, GALERI has enhanced emotional engagement, cognitive engagement, and students' perceived value of learning. In summary, although the integration of radiological images as the clinical context has a positive effect on emotional engagement, cognitive engagement, and students' perceived value of learning, it is not proven to be superior to the control e-learning in enhancing students' cognitive load, engagement, and comprehension. Further studies are needed to determine the effect of GALERI on a wider population of medical students and to investigate the long-term effect of GALERI on students' memory.

Keywords: Anatomy education; cognitive load; comprehension; e-learning; engagement; radiological images

'Team-Taught' Method in Anatomy Practical Session: Does it Affect Students' Engagement?

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ABSTRACT

The field of anatomy education is constantly evolving to meet the diverse needs of students, but the question remains: do we need a method that fits everyone? The 'team-taught' method has been employed at Newcastle University Medicine Malaysia as a successful method for conducting anatomy practical sessions for both medical and biomedical students. This study aimed to investigate the differences in students' engagement between Year 1 Medical students and Year 2 Biomedical Sciences students after attending a 'team-taught' anatomy practical session. Both groups of students separately attended a 'team-taught' practical session (one lecturer as practical lead and two other lecturers as facilitating lecturer) and had a peer-discussion facilitated by lecturers. By the end of the session, a validated questionnaire on learning engagement was distributed to the students. The mean and standard deviation of students' engagement was computed, and an independent t-test was conducted to obtain the mean difference between the groups. The 'team-taught' method was found to be equally engaging for both medical and biomedical groups ($t=1.764$, $p>0.05$). The data indicates that Medical students perceived the 'team-taught' method as more intrinsically interesting ($t=2.010$, $p=0.048$), as it facilitated more absorption in peer discussion ($t=2.252$, $p=0.027$) and increased attention during the session ($t=2.907$, $p=0.005$) compared to Biomedical Sciences students. These findings suggest that the 'team-taught' method may be an effective approach for enhancing anatomy practical sessions, particularly for medical students. Future studies will incorporate focus group discussions to gain further understanding of the significant three items which differ between the two groups.

Keywords: Anatomy practical session; biomedical sciences students; engagement; medical students; 'team-taught' method

Three-dimensional (3D) Printing Technology in the Teaching of Human Anatomy

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Three-dimensional (3D) printing is a new technology allowing rapid prototyping, from the 3D computer model to be transformed into a physical object. It is becoming a favourable choice in medical education; nevertheless, its role in human anatomy education requires further investigation. We aim to employ a 3D printing approach as an educational tool in the teaching of human anatomy. All 3D designs of anatomical models licensed under the Creative Commons were obtained from the Ultimaker Thingiverse database. These 3D designs were generated from 3D images from magnetic resonance imaging and computerized tomography scans of targeted organs such as internal organs and bones of humans. We simulated the 3D design of the targeted organ using Ultimaker software, before printing it with a 3D printer (Creality). Using polylactic acid material, we printed the model layer-by-layer approach, until the physical matches the blueprint of the 3D design on the computer. We have printed 3D-printed lumbar and thoracic vertebrae, femur, heart, brain, kidney and others. The 3D-printed anatomical models are then used as an educational tool in teaching anatomy to students. Students could draw the blood vessels and nerves supplying the organs, and do labelling and colouring on the 3D-printed models. Our finding reveals that the 3D printing approach replicates the 3D structure which could be utilised as an educational tool for human anatomy teaching. The future of 3D printing seems to involve printing realistic models using different materials.

Keywords: 3D printing; anatomical model; biomaterial

Formulation of 3D Anatomy Tool based on Learning Theory and 3D Technology Disconnection

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ABSTRACT

In international education guidelines, emerging technology has a dominant position, and these guidelines often require developmental needs. Three-dimensional technology and artificial intelligence (AI) are promising technology in medical education, with an increasing trend in the use of 3D technologies in instructional materials. However, the current body of literature lacks evidence to support the effectiveness of 3D technology with regard to the alignment of learning theories, curriculum design, utilisation of technology, and outcome evaluation. This study aims to investigate how students' knowledge acquisition is associated with intrinsic motivation and satisfaction using a 3-dimensional anatomy learning tool. This study is a randomised controlled study, which was executed in five stages: (i) Designing and developing a 3D Hologram, (ii) recruitment, (iii) intervention and data collection, (iv) analysis and (v) write-up. The total sample size calculated is 160 students. Purposive sampling will be used to recruit first-year medical students and stratified random sampling will be done to divide the students into two homogenous groups. Five measurement tools will be used in this research: Pre-practical OSPE questions, post-practical OSPE questions, intrinsic motivation inventory, lecturer's satisfaction survey and student satisfaction survey. The data from this research will provide more insight into the learning behaviour of the current generation and thus serve as a template to design effective 3D technology learning tools to improve medical education, healthcare education, and education around the world.

Keywords: 3D technology; anatomy; augmented reality; hologram; intrinsic motivation; knowledge acquisition

Student Perception of Online Teaching and Learning Anatomy during the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic has caused disruptions in the educational systems. Anatomy teaching and learning (TnL) methods were no exception, hence online teaching was implemented. A significant decline in the quantity and quality of anatomical TnL due to COVID-19 was observed, and this poor performance seems in line with most findings that students prefer traditional anatomy TnL methods. This study aimed to explore students' perception of online TnL human anatomy courses during the COVID-19 pandemic among IIUM Kuantan undergraduate students. By using convenience sampling, a total of 282 students from IIUM Kuantan Campus were recruited through face-to-face and online surveys. The data shows that most of the participants (82.6%) had a neutral perception of online TnL human anatomy courses during the COVID-19 pandemic, which is contradictory to previous studies. Although 60.3% of them had a positive perception of the online learning environment, they believed that the virtual anatomy classes and practicals cannot substitute the traditional approaches. This is mainly because of the limited interaction with instructors and coursemates, along with reduced interactivity and participation in online TnL methods. A high total perception scores among Nursing students, and among those who used iTa'leEM ($p<0.001$) were also observed, which warrants further investigation. In summary, the findings suggest that implementing a hybrid approach, while incorporating online applications and platforms that elicit a positive perception, can offer a balanced and flexible learning experience catering to diverse student needs along with enhancing the interactivity between the course and students.

Keywords: Anatomy; COVID-19; online; pandemic; student perception; TnL

Visualizing Goats' Kidneys Using Celebrity Tomato (*Solanum lycopersicum* L.) as Anatomy Model

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ABSTRACT

Since the ancient period, cadavers have been used for the teaching of human anatomy in medical schools. However, due to the establishment of medical schools and some acts related to human dissection and body procurement, getting access to human tissues is becoming difficult, which had resulted in the development of plastinated specimens and digital tools for anatomy teachings. A new teaching model comparing the anatomy of a tomato to that of a goat's kidneys was developed for demonstration purposes in medical schools. The tomato was sliced transversely, while the kidneys longitudinally to show their inner structures. Using same-coloured pins, the anatomical structures of the kidneys were labelled, while structures in the tomato that resembles the identified kidney structures were also labelled. The following parts of the kidneys were successfully compared to the anatomy of the tomato; renal capsule, cortex, medulla, pyramids, major calyx, minor calyx, and hilum. Additionally, students gave positive feedback after the learning sessions. This innovation showed that anatomy can be learned even using vegetables such as tomatoes. Hence, more natural products should be explored for the enhancement of anatomy teaching and learning.

Keywords: Anatomy; cadavers; goat; kidney; medical school; tomato

A Spectacular Hand Music Video-Anatomy at Your Fingertips

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ABSTRACT

Media serve as valuable tools for educators to deliver messages and educational content effectively and efficiently to students. A fascinating demonstration of music videos employed in gross anatomy teaching can be seen in the creation of music videos that focus on hand anatomy in Universiti Putra Malaysia (UPM). Three essential phases must be completed: pre-production, followed by production, and lastly post-production. The initial stage encompasses tasks such as determining the music video's genre, writing the script, composing the song, recording music and vocals, and creating storyboards. The production stage involves shooting the video and selecting the appropriate mood, with some adjustments as necessary. Finally, the post-production stage involves editing the video. The integration of visual, auditory, and kinesthetic components in hand music videos has been proven advantageous in imparting anatomical knowledge. As a result, music videos can offer an alternative approach to instruction, especially in demanding subjects that necessitate extensive memorization for medical students. In general, the process of video production proved to be an intriguing learning experience that required a significant amount of time and was also quite enjoyable.

Keywords: Anatomy education; anatomy teaching; hand anatomy; medical students; music video

Body in the Jar

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ABSTRACT

'Body in the Jar' was one of the 10 games carried out in the first-ever Young Anatomy ExploRACE (YAE) organised by UiTM (Universiti Teknologi MARA). It was voted by 68% of participants as the most exciting game of YAE. During the games, the participants learned basic macroscopic anatomy by observing the dissected organs kept in formalin-filled jars and answering quizzes. The aim of this study is to explore the response and knowledge-gaining experience of children between the ages of 5 and 12 years old via observation of the organs displayed in the jar. The participants were categorised into two aged groups; 5-9 and 10-13 years old. For each category, each group was given tasks in accordance with their age category. The younger participants were asked to identify 10 different organs via a multiple-choice approach while quizzes for the older groups were in the format of short answer questions. A score between 90% to 100% was recorded by the younger participants while the older groups obtained 60-100% marks, with the best achievement accomplished by the group consisting of 12-year-old participants. In conclusion, 'Body in the Jar' is a creative approach to encourage younger generations to learn anatomy, which is an important basic medical science subject.

Keywords: Anatomy; dissected organs; jar; young anatomy ExploRACE

Lecture by the Field: An Alternative Approach to Teaching

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ABSTRACT

Lecture by the field is an alternative approach that involves taking students outside of the classroom and into the field, where they can see and experience the concepts that are being taught. Students can see and experience the concepts first-hand, so they are more likely to remember them. It can help students to develop critical thinking skills when they are asked to make observations and draw conclusions. Lecture by the field is appropriately applied in the musculoskeletal module. A conventional lecture was conducted using PowerPoint in the classroom before the lecture by the field. A total of 50 students participated in the lecture by the field. Pre- and post-lecture-by-the-field questionnaires were given to the students. The task was to identify the location and to demonstrate the movement of the muscles of the upper limb and lower limb including their attachment, innervation, and blood supply. Then, we performed peer teaching where the student explained to the other student. Post-lecture showed that 44 (88%) students gained good knowledge an increment of 72% from the pre-lecture where only 8 (16%) students claimed had good knowledge of the musculoskeletal system. These results are strongly supported by the average score of the student's post-lecture quiz of 11 out of 18 whereby in the pre-lecture the average score was 9. Lecture by the field is a valuable tool that can help you to improve your teaching if you are looking for a way to make your lectures more interactive, engaging, and effective.

Keywords: Alternative teaching; field; interactive; knowledge; musculoskeletal; peer teaching

Alternative Virtual Assessment using VAPER (Virtual Anatomy Practical Escape Room) among Year 2 Medical Students in Faculty of Medicine, Universiti Sultan Zainal Abidin

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ABSTRACT

Ever since the COVID-19 pandemic, the teaching and learning process in anatomy has undergone significant changes. Together with the growing number of medical students and resource constraints such as the scarcity of cadavers, many medical schools began implementing new and creative teaching and assessment methods. The escape room game is one of the popular games where players can "escape the room" within a set amount of time by working in teams to solve clues and riddles. Gamification in education requires cognitive effort from the students; hence, encouraging them to perform to their best ability level is a pertinent move in ensuring the achievement of higher learning outcomes of Bloom's taxonomy. The objective of this study is to assess the viability of implementing an innovative escape room for anatomy practical assessment called VAPER as an alternative formative assessment method using an online platform. The VAPER was utilized by the Year 2 medical students of the Faculty of Medicine, UniSZA to solve challenging tasks (such as image recognition and item matching) in identifying structures from anatomy models' images. Questionnaires regarding perceived utilisaty and satisfaction with VAPER using a Likert scale were employed. Overall, students were really happy with the session, enjoyed playing, and felt completely involved in the VAPER. The activity was best for consolidating knowledge and putting their communication skills to the test. In conclusion, students enjoyed the assessment session using the VAPER with very positive feedback. We would like to further construct a gamified, active assessment tool that can be used to reinforce anatomy practical topics in an entertaining, competitive, and team-building method.

Keywords: Anatomy education; escape room; game platform; online teaching

TikTok: A New Way to Learn Anatomy

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ABSTRACT

The growth of social media platforms has revolutionized the way people interact, share information, and learn. TikTok is a platform for sharing short videos that have become very popular, especially among younger generations. In recent years, TikTok has become a popular platform for educational content, including anatomy education. Anatomy, the study of the structure of living organisms, has traditionally been a complex subject that requires atlas, diagrams, and laboratory dissections. However, TikTok has provided a unique opportunity for anatomists, medical students, and educators to communicate complex anatomical concepts in a concise and engaging manner. IHeartAnatomy, a TikTok account, was created as a part of anatomy teaching and learning activity. The aim of this study is to assess students' perception towards using TikTok and IHeartAnatomy as learning tools to learn anatomy. A total of 35 year-one medical students participated in this study. The majority of students found that TikTok in general (89%) and IHeartAnatomy (86%) are helpful in learning anatomy. All students recommended the use of TikTok in helping them to study Anatomy subject. As a conclusion, TikTok is a valuable tool for students learning Anatomy. However, the use of conventional resources such as textbooks and lectures is essential in conjunction with TikTok.

Keywords: TikTok, Anatomy education, IHeartAnatomy

Anatomy Learning Environment with Islamic Perspective

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ABSTRACT

Human anatomy is one of the foundational subjects learned by medical students. The integration of Islamic concepts, teachings, and values in educational settings promotes a greater understanding of the human body. The survey was done using a questionnaire on the effectiveness of an anatomy learning environment with an Islamic perspective in USIM. The recitation of doa and tazkirah was introduced 5 minutes before the class began. At the end of the syllabus, students are allowed to give feedback to the lecturer. There is also a slot for a Seminar where students need to discuss and present the topic of anatomy and integration from an Islamic perspective. 100% of the students felt blessed by the innovation that we introduced. They are very happy and motivated with the integration of naqli and aqli in anatomy subjects. The learning environment for anatomy can be transformed into one that promotes academic success and spiritual development through the integration of Islamic principles and teachings.

Keywords: Anatomy; Islamic perspective; learning environment

Impacts of Technology-Mediated Learning on Student's Engagement and Motivation during Anatomy Practical Session

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The incorporation of technology-enhanced tools alongside cadaveric-based learning has gained prominence in anatomy teaching. These tools utilize persuasive engaging elements that could influence students' learning motivation and engagement. This study aims to evaluate the perception of first-year medical students from Newcastle University Medicine Malaysia on their learning engagement and motivation during an anatomy practical session that utilized 3D anatomy software. Instructional materials were distributed via the e-learning platform and the students assessed the software for self-revision prior to the practical session. The students were involved in a small group peer-teaching, hands-on activity, and an interactive forum during the practical session. A validated learning engagement and motivation questionnaire was distributed after the session and the means and standard deviations of engagement and motivation domains were calculated. The overall engagement score was 5.16 $\pm$ 1.16 indicating that the software was an engaging learning tool. Students perceived the session as interesting (5.35 $\pm$ 1.28) and were aware of the importance of anatomy comprehension (6.05 $\pm$ 1.038). The mean scores for two motivation subscales (effort and value) were 5.34 $\pm$ 0.9 and 5.80 $\pm$ 0.96 respectively. However, the students perceived investing more energy (2.92 $\pm$ 1.707) and mental effort to comprehend anatomy contents (2.98 $\pm$ 1.501), which makes the practical session an important learning activity (5.84 $\pm$ 1.139). These results indicate the positive influence of 3D anatomy software on student's learning engagement and motivation. Nevertheless, future research using controlled trials is needed to ensure its efficacy in promoting students' learning performance.

Keywords: 3D anatomy software; Anatomy practical sessions; students' engagement; students' motivation

Executing Virtual Anatomy Practical in 'My Anatomy Class' (MAC) of Gather.Town among Year 1 Medical Students in Faculty of Medicine, Universiti Sultan Zainal Abidin

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ABSTRACT

A student-centered approach has been observed in the teaching and learning of anatomy in recent years through the use of creative and interactive instructional methods and approaches. A recent example of a virtual gathering platform utilised for educational purposes is Gather.Town that has a video conferencing (VC) programme mixes 2D gaming features. Users can interact informally with one another by using avatars on a 2D map by utilising built-in assessment, multimedia content, proximity-based virtual collaboration, document sharing, and direct messaging. The objective of this study was to assess the viability, applicability, motivation, and online environment of MAC at Gather.Town, as an alternative teaching method using online platform. Due to resource shortages and the rising number of medical students, My Anatomy Class (MAC) at Gather.Town was developed by providing proximity chat meetings for virtual practical anatomy sessions with small group discussions and assignments. The design of the MAC is intended to accommodate the Year 1 medical students of the Faculty of Medicine, UniSZA, consisting of classrooms with indoor and outdoor settings. Questionnaires regarding User Acceptance Test and the Self-Regulation for Learning Online using a Likert scale were employed. Students enjoy MAC because it emphasizes on peer interactions, accessibility, and practicability with a sense of participation. In conclusion, MAC at Gather.Town, a substitute virtual approach for the practical anatomy class and assignment, provides an exceptional chance for students to communicate with lecturers and peers at their own pace for a flexible learning experience and forge these connections in a distance online learning environment.

Keywords: Anatomy education, game platform, Gather.Town, virtual classroom

Profiling Human Anatomical Variation Cases in Malaysia: A Systematic Review

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ABSTRACT

Anatomy teaching is a fundamental component of medical education in Malaysia. Incorporation of structural variations input into anatomy teaching enriches clinical reasoning and improves surgical outcomes. Currently, there is gap in the literature on anatomical variation studies in Malaysia. The present study aimed to systematically review human anatomical variation based on the case report published between year of 2013-2023. The study referred Reporting Items for Systematic Review and Meta-analyses (PRISMA) as guideline. Scopus and PubMed databases were used to search the articles following the stipulated inclusion and exclusion criteria. The keywords such as "anatomy variation", "anatomical variation", "Malaysia", "case report" were included with exclusion of "animal" and "plant" anatomy. Only cases reported in Malaysia or studies published by researchers affiliated in Malaysian institutions were included. The outcomes in terms of number of publications, scope of studies and institutions involved were reported. Total of 20 out of 41 papers were selected after removal of duplication and scrutinization. The scope of reported cases includes the anatomy of head and neck, upper limb, abdomen, and lower limb. Head and neck anatomy contributed to highest number of case reports (7 papers). In 2015, slightly higher number of anatomical variations compared to all other years (4 cases). In terms of affiliation, Universiti Sains Malaysia published highest number of case reports with regard to human anatomical variations (5 cases). In conclusion, it is hope that the findings will be of interest to Malaysian anatomists in incorporating relevant input of anatomical variation in their teaching materials.

Keywords: Anatomical variation; anatomy variation; Malaysia