

PROGRAMME AND ABSTRACT BOOK

ICEMS 2024 in conjunction with 12th IPCSM

**INTERNATIONAL CONFERENCE
ON EDUCATION, MATHEMATICS
AND SCIENCE (ICEMS)**
in conjunction with
**12th INTERNATIONAL POSTGRADUATE
CONFERENCE ON SCIENCE AND
MATHEMATICS (IPCSM) 2024**

**"FROM THEORY TO PRACTICE:
EMPOWERING DATA SCIENCE FOR
SUSTAINABLE DEVELOPMENT"**

**10-11
OCTOBER
2024**



**VIRTUAL
Presentation**



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2024**

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**MESSAGE FROM
THE VICE CHANCELLOR
UNIVERSITI PENDIDIKAN SULTAN IDRIS**



Assalamualaikum Warahmatullahi Wabarakatuh and Salam Malaysia Madani.

The International Conference on Education, Mathematics, and Science (ICEMS), alongside the 12th International Postgraduate Conference on Science and Mathematics, underscores the escalating significance of data science in tackling global challenges. The conference theme, "From Theory to Practice: Empowering Data Science for Sustainable Development," aptly highlights the pivotal role of data-driven methodologies in fostering a sustainable future.

As the nexus of technology and science continually reshapes the contours of knowledge, integrating data science into education, mathematics, and the sciences has become indispensable. This conference serves as a vital forum for exchanging groundbreaking ideas, presenting pioneering research, and cultivating collaborations poised to advance sustainable development significantly.

Our focus on bridging the gap between theory and practice echoes a pressing need for insights that can propel us toward achieving sustainable development goals. The research and knowledge shared here hold the potential to transform educational practices, inform policy decisions, and inspire creative solutions to some of today's most urgent issues.

At Universiti Pendidikan Sultan Idris, renowned for its commitment to educational excellence in Malaysia, we are dedicated to embedding data science into our academic framework. By integrating data science into our curriculum and research endeavours, we aspire to equip educators and learners with the tools to navigate complex challenges effectively. This commitment reflects our belief that 'impossible is nothing,' demonstrating our resolve to harness education as a powerful catalyst for sustainable development.

PROFESOR DATO' DR. MD AMIN BIN MD TAFF

Vice Chancellor

Universiti Pendidikan Sultan Idris (UPSI)





**MESSAGE FROM
THE DEAN
FACULTY OF SCIENCE AND MATHEMATICS
UNIVERSITI PENDIDIKAN SULTAN IDRIS**



Assalamu'alaikum Warahmatullahi Wabarakatuh and Salam Sejahtera.

All praise is due to Allah for His countless blessings and mercies upon us. It is my distinct pleasure to welcome you to the International Conference on Education, Mathematics and Science (ICEMS) in conjunction with 12th International Postgraduate Conference on Science and Mathematics (IPCSM) 2024, centered on the theme "This gathering stands as a testament to the pivotal role that data science plays in addressing some of the most pressing challenges of our time.

In an era where information and data are abundant, the ability to transform theoretical knowledge into practical solutions is more critical than ever. Data science serves as the bridge between vast datasets and actionable insights, fostering innovations that can drive sustainable development across various sectors. This conference brings together brilliant minds from around the globe to share their research, insights, and experiences, contributing to a collective understanding and advancement in this vital field.

Our theme underscores the importance of applying scientific principles to real-world problems, promoting a synergy between academic research and practical implementation. As we navigate through topics ranging from environmental sustainability to economic growth and social equity, it is our hope that this conference will inspire collaborations, spark new ideas, and pave the way for groundbreaking advancements.

I extend my deepest gratitude to the organizers, speakers, and participants whose dedication and passion make this event possible. May your time here be both intellectually stimulating and personally rewarding, as we work together to harness the power of data science for the betterment of our world.

Welcome, and let us embark on this journey from theory to practice, towards a future of sustainable development.

Thank you.

ASSOC. PROF. DR. MOHD FAIZAL NIZAM LEE BIN ABDULLAH





**MESSAGE FROM
CONFERENCE CHAIR
ICEMS in conjunction with 12th IPCSM 2024**



Assalamu'alaikum Warahmatullahi Wabarakatuh and Salam Sejahtera.

Alhamdulillah, we praise Allah for His infinite blessings and favours. International Conference on Education, Mathematics and Science (ICEMS) in conjunction with 12th International Postgraduate Conference on Science and Mathematics (IPCSM) 2024, where we delve into the theme "From Theory to Practice: Empowering Data Science for Sustainable Development." It is an honor to introduce this prestigious event, which gathers scholars, practitioners, and enthusiasts from around the world to explore the transformative power of data science.

In today's data-driven world, the potential to address global challenges through data science is immense. From environmental conservation to healthcare improvement and economic development, the applications are limitless. This conference is designed to foster dialogue, exchange ideas, and showcase cutting-edge research that bridges the gap between theoretical frameworks and practical applications.

Our theme highlights the crucial journey from conceptual understanding to real-world impact. By leveraging data science, we can create sustainable solutions that enhance the quality of life and promote a balanced coexistence with our environment. The presentations, workshops, and discussions planned for this conference aim to equip attendees with the knowledge and tools needed to drive meaningful change.

I would like to express my heartfelt appreciation to all the contributors who have worked tirelessly to make this event a success. Your dedication and expertise are the cornerstones of this conference. To all participants, I encourage you to engage fully, network with your peers, and immerse yourselves in the wealth of knowledge shared over these days.

Together, let us embrace the challenge of turning theory into practice and harness the power of data science to pave the way for a sustainable future.

Warm regards,

ASSOC. PROF. DR. NOR AZAH BINTI SAMOT @ SAMAT



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KEYNOTE SPEAKER 1

Dato' Sri Dr. Mohd Uzir bin Mahidin

Chief Statistician Malaysia

Department of Statistics Malaysia



YBhg. Dato' Sri Dr. Mohd Uzir Mahidin has been the Chief Statistician of the Department of Statistics Malaysia (DOSM) since February 14, 2017, with 34 years of service in the department, starting as a Statistician in 1990. He holds a Bachelor's degree in Analytical Economics from University Malaya (1989), a Master of Arts in Economics from Vanderbilt University, USA (2003), and a PhD in Economics from the University of Sheffield, UK (2013).

He played a significant role as the Commissioner of Census for Malaysia's 2020 Population and Housing Census (MyCensus 2020), the sixth of its kind. He is recognized for his efforts in transforming the dissemination of statistical data through active engagement on social media, reaching out to a younger audience and diverse stakeholders.

He also serves as an Adjunct Professor at several institutions, including Universiti Utara Malaysia (2021-2023), Universiti Teknologi MARA (2021-2023), and Management and Science University (2022-2024), while holding committee positions at UTeM, University Putra Malaysia, and other academic bodies. He is a member of the International Statistical Institute and the EXCO of the Institute Statistics Malaysia.

Internationally, YBhg. Dato' Sri Dr. Mohd Uzir Mahidin is a Co-chair of the Bureau of ESCAP's Committee on Statistics (2020-2022) and represents Asia in the International Comparison Program Governing Board (2021-2024). He is a member of the United Nations Committee of Experts on International Statistical Classifications (UN CEISC) and contributes to various global statistical initiatives, including the ASEAN Community Statistical System and OIC-StatCom.

Previously, he held the position of Chairman of the Bureau of ESCAP's Committee on Statistics (2018-2020) and led the 7th and 8th OIC Statistical Commission sessions. He also chaired the 62nd ISI World Statistics Congress held in Kuala Lumpur in 2019, underlining his leadership in promoting the development and use of statistics at both national and international levels.





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Data Analytics for National Sustainable Development

YBhg. Dato' Sri Dr. Mohd Uzir bin Mahidin

Chief Statistician Malaysia

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Abstract. Data plays a crucial role in advancing Malaysia's sustainable development by optimizing resource allocation, improving public services and enhancing development planning. Data have been used in nation's development since the formation of the Federation of Malaya, early stage of the independence of the Federation of Malaya and the formation of Malaysia. In recent years, the importance of data is increasingly felt with the development of technology and the need to support evidence based- policy. The United Nations had recognized the Sustainable Development Goals (SDGs) has created data revolution that need to be addressed as an important element to support the measurement of SDGs progress and achievement. The rush and rapid demand for comprehensive data is a call for urgent action to mobilize resources from all segment of data producers to produce relevant data for SDGs indicators measurement. Data analytics play an important role in terms of use and reuse of diversified data sources, to ensure data quality and completeness, to develop analytical models that suit for user's demand, to facilitate real-time monitoring and evaluation, to optimise data integration and fostering the use of data science in policy making processes. Among the efforts to ensure data availability and to institute data standards are facilitating collaboration and coordination among data producers which bearing fruits to the availability of Malaysia's SDGs indicators. Thus, this paper discussed about the role of data analytics and addressing issues and challenges on data readiness to support Malaysia sustainable development.

Keywords: Data revolution, Sustainable Development Goals (SDGs), Malaysia, data analytics, data readiness, evidence-based policy





KEYNOTE SPEAKER 2

Professor Dr. Upmanu Lall

Director of the Columbia Water Center;
Alan and Carol Silberstein Professor of Engineering



Professor Dr. Upmanu Lall is the Director of the Columbia Water Center and the Alan and Carol Silberstein Professor of Engineering. He has broad interests in hydrology, climate dynamics, water resource systems analysis, risk management and sustainability. He is motivated by challenging questions at the intersection of these fields, especially where they have relevance to societal outcomes or to the advancement of science towards innovative application. He did his B. Tech. Civil Engineering at Indian Institute of Technology Kanpur, U.P., India (1976), M.S. Civil & Environmental Engineering at University of Texas @ Austin, TX (1980) and PhD. Civil & Environmental Engineering at University of Texas @ Austin, TX (1981).

His current research covers 3 major initiatives that are developed through the Columbia Water Center. The Global Water Sustainability Initiative addresses global water scarcity and risk. The Global Flood Initiative is motivated by the need to predict, mitigate and manage floods at a global scale recognizing their climate drivers, and supply chain impacts. America's Water seeks to develop sustainable water management and infrastructure design paradigms for the 21st century recognizing the linkages between urban functioning, food, water, energy and climate. These programmatic initiatives are backed by research on systems level modeling of hydrology, climate, agronomy and economics.

He has pioneered the application of techniques from (a) nonlinear dynamical systems, (b) nonparametric methods of function estimation and their application to spatio-temporal dynamical systems, (c) Hierarchical Bayesian models, (d) systems optimization and simulation and (e) the study of multi-scale climate variability and change as an integral component of hydrologic systems.

He has published in journals that focus on hydrology, water resources, climate, physics, applied mathematics and statistics, risk, economic development, policy and management science. He is the current editor-in-chief of the journal "Water Security".

He has been engaged in high level public and scientific discussion through the media, the World Economic Forum, and with governments, foundations, development banks, and corporations interested in sustainability. He has served on several national and international panels. He was one of the originators of the Consortium of Universities for the Advancement of Hydrologic Science, and is a past President of the Natural Hazards Focus Group of the American Geophysical Union.



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He is a Fellow of the American Geophysical Union, a Fellow of the American Association for the Advancement of Science, and was awarded the Henry Darcy Medal by the European Geosciences Union, and the Ven Te Chow and Arid Lands Hydrology Awards by the American Society of Civil Engineers.

A K-nearest Neighbor Space-Time Simulator (KSTS) with Applications to Climate Sensitive Renewable Energy Fields

Professor Dr. Upmanu Lall

Department of Earth & Environmental Eng. & Dept. of Civil Eng. & Eng. Mechanics

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Abstract. A novel statistical simulation model that can produce realistic, synthetic realizations of hydroclimatic fields across a region is developed. This k-nearest neighbor-based space-time simulator can be applied to single or multiple variable hydroclimatic fields across a large domain. The algorithm facilitates the estimation of the probability of extreme events that are not necessarily represented in relatively short observational records. We apply this algorithm to wind and solar fields. Many regions plan to integrate more wind and solar generation into the energy grid, increasing power supply variability that can pose risks of undersupply. This simulation tool facilitates the estimation of the probability of regional wind and solar energy "droughts" and hence allows for the estimation of the storage needed to achieve desired supply side reliability.





INVITED SPEAKER 1

Dr. Farida Nurhasanah

Universitas Sebelas Maret, Indonesia



Dr. Farida Nurhasanah is a lecturer and researcher in the Mathematics Education Department at the Faculty of Education and Teacher Training, Universitas Sebelas Maret. Her research focuses on basic natural phenomena and mathematical thinking: Mathematical abstraction, representation, reasoning, problem-solving, and proportional thinking. She is also interested in information technology and human knowledge technology: Media and technology for teaching mathematics, Teachers Professional Development Program, Learning, Teaching and Interaction. Additionally, she explores the roles of games for teaching mathematics, STEM and STEAM activities using natural and cultural context, mathematics for special needs education in Southeast Asia region. She did her B. A., Mathematics Education at Universitas Sebelas Maret (2004), M. Ed., Mathematics Education at Universitas Pendidikan Indonesia (2010) and PhD. Mathematics Education at Universitas Pendidikan Indonesia (2018).

She was recognized with the Academic Excellence Award as the best graduate student of the School of Post Graduate at Universitas Pendidikan Indonesia in 2018. Her extensive teaching and training experience includes teaching elementary students at Al Azhar International Islamic School from 2004 to 2005 and pre-service mathematics teachers at the Mathematics Education Department of Sebelas Maret University from 2005 to the present. She has also been involved in various training programs for elementary and secondary school teachers. Notably, from 2018 to 2019, she promoted active learning through the Tanoto Foundation Institution in five provinces of Indonesia. From 2019 to 2020, she designed and guided classroom action research for these teachers. Additionally, she contributed to the teacher certification program organized by Indonesia's Ministry of Education and Culture from 2019 to 2020 and has been leading STEM education training for mathematics teachers in Southeast Asia through SEAQIM since 2020.



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Innovating Mathematics Learning Through Edutainment: A Pathway to 21st Century Skills

Dr. Farida Nurhasanah

Mathematics Education Department

Faculty of Education and Teacher Training

Universitas Sebelas Maret

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Abstracts. The commonly held view of mathematics as a challenging subject and its critical importance for students' future achievements necessitate innovative pedagogical approaches that make mathematical learning engaging and accessible. With Generation Z's strong preference for digital, interactive learning, edutainment has emerged as a groundbreaking method, combining education with entertainment to suit the learning styles of this tech-savvy generation. Grounded in constructivist theories and motivational principles, edutainment in mathematics enhances student engagement and motivation by promoting active participation. This paradigm shift towards interactive, student-centered learning environments prioritizes immersive and meaningful experiences. This paper delves into the potential of edutainment in mathematics education to develop students' mathematical literacy in enjoyable and meaningful ways. By examining the integration of games, storytelling, and innovative learning environment theories, we illustrate how these edutainment tools can foster 21st-century skills among Generation Z students in Indonesia. By leveraging the constructivist paradigm, this approach transforms traditional learning spaces into dynamic, interactive experiences where students actively engage with mathematical concepts through play and exploration. The synergy of education and entertainment is particularly effective in maintaining student interest and promoting deeper understanding. The paper concludes by showcasing the practical application of edutainment tools like Marica and Wortelmatika. These tools exemplify how edutainment can revolutionize mathematics education, making learning both fun and effective. Through real-world examples, we demonstrate the significant impact of these tools in enhancing students' mathematical literacy and developing essential 21st-century skills. This innovative approach not only addresses the challenges of traditional mathematics education but also prepares students for future academic and professional success.

Keywords: edutainment, mathematics, 21st century skills, Marica, Wortelmatika.





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INVITED SPEAKER 2

Mr. Afwan Syahmi bin Ahmad Nazari

AmBank Group Malaysia



Mr. Afwan Syahmi is an accomplished professional with expertise in SQL, Python, Shell Scripting, and Data Engineering. He has a strong background in data architecture, design, and optimization, and is passionate about Agile methodologies that promote collaboration and transparency. As a skilled Solution Architect, he designs scalable, maintainable software solutions, while also excelling in process automation to drive efficiency.

His diverse experience spans Business Analysis, System Operations, DevOps, and software engineering in multiple programming languages. He holds a Bachelor's in Electrical and Electronic Engineering, Computer Engineering (2006 – 2011) and has held leadership roles, including Vice President positions at Ambank Group (Sept 2023 – Present) and Affin Hwang Investment Bank (Oct 2021 – Sept 2023). Mr. Afwan's certifications include Data Science Analyst (Fusionex Group) 2022, Professional Technologist (IT) (Malaysian Board of Technologist) 2022, and Digital Leadership Development (PEOPLeGy Group) 2022.

Centralized Data Management: Strategies and Challenges in Malaysian Banking Industries

Afwan Syahmi Ahmad Nazari

AmBank Group Malaysia

Abstract. In the Malaysian banking sector, the move towards centralized data management is becoming increasingly crucial to drive digital transformation, enhance regulatory compliance, and deliver superior customer experiences. This knowledge-sharing session will delve into the key components of designing and implementing a centralized data management strategy, including process and governance strategies, while highlighting the challenges faced in the unique landscape of the Malaysian banking industry.



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INVITED SPEAKER 3

Associate Professor Dr. Masitah Shahrill

Universiti Brunei Darussalam, Brunei



Associate Professor Dr. Masitah Shahrill has an extensive academic background in mathematics and education. She earned her Doctor of Education (D Ed) in Mathematics Education from the University of Melbourne, Australia, in 2009, following her Master of Education (M Ed) in the same field from the same university in 2005. Prior to that, she completed her Master of Science (M Sc) in Numerical Solutions of Differential Equations at the University of Reading, UK, in 2000. She began her academic journey with a Bachelor of Science (B Sc) (Hons) in Mathematics from the University of Northumbria at Newcastle, UK, in 1999.

Her research interests lies in teacher and teacher education, mathematics education, higher education, 21st Century teaching and learning, school based assessment, classroom research, and shadow education. Her current research areas are exploring shadow education in the subject of mathematics in Brunei Darussalam, connecting visual representations (such as comics) in the teaching and learning of mathematics and designing, and implementing PISA-like problems in the mathematics classrooms.



The Pedagogical Transformation in the Implementation of Learning Activity Packages to Enhance Mathematics Instruction

Associate Professor Dr. Masitah Shahrill

Sultan Hassanal Bolkiah Institute of Education (SHBIE)

Universiti Brunei Darussalam (UBD)

email: masitah.shahrill@ubd.edu.bn

Facilitating active student learning, shaping classroom behaviours, fostering participation, and enhancing attentiveness represent pivotal objectives in contemporary educational contexts. This study adopted a phenomenographic approach to comprehensively explore the transformative journey of 21 graduate teacher candidates who crafted and executed diverse learning activities within their primary or secondary mathematics classes. These activities encompassed multimedia resources, including instructional videos and manuals designed to augment proficiency in STEM or STEAM, financial literacy, and digital learning tools. The teacher candidates assumed the roles of instructors, facilitators, and promoters of their methodically devised learning activity packages during their school placements. Their submitted reports underwent detailed analyses, complemented by examining the written reflections that captured the nuances of their instructional enactment. The subsequent phase of this research involved a questionnaire with the teacher candidates to gain insights into their experiences and perceptions of the alignment between task design and its real-world implementation. Additionally, the questionnaire aims to uncover nuanced observations on student learning and participation behaviours and classroom learning dynamics. This comprehensive investigation into implementing learning activity packages in mathematics education seeks to enrich our understanding of fostering active learning, enhancing student participation, and refining instructional practices in the 21st-century classroom.



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"FROM THEORY TO PRACTICE:
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10-11
OCTOBER
2024

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WORKSHOP PANELIST



WORKSHOP 1

Dr. Muhamad Hariz bin Muhamad Adnan
Title: Generative AI Maestro: Mastering the latest technology



Assoc. Prof. Dr. Bahbibi binti Rahmatullah
Title: Unlocking AI: Your Essential Primer on Artificial Intelligence



WORKSHOP 2

Ts. Dr. Muhammad Noorazlan bin Abd Azis
Title: Unleashing the Secrets of ChatGPT in Scientific Research Writing



Ts. Dr. Shuhaida binti Ismail
Title: Data storytelling and Visualization with Power BI





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Presentation

**10-11
OCTOBER
2024**

CONFERENCE PROGRAMME SCHEDULE

TENTATIVE DAY 1 (OCTOBER 10TH 2024 / THURSDAY)

TIME	PROGRAM
Main Room	
8.00 am - 9.00 am	Registration
9.00 am – 9.15 am	Opening Session National Anthem Kebesaran Negeri Perak Prayer Recitation
9.15 am – 9.20 am	Welcoming Speech by Associate Professor Dr. Mohd Faizal Nizam Lee bin Abdullah Dean Faculty of Science and Mathematics Universiti Pendidikan Sultan Idris, Malaysia
9.20 am – 9.25 am	Montage Presentation
9.25 am – 9.30 am	Officiating Speech by Professor Dato' Dr. Md Amin bin Md Taff Vice Chancellor Universiti Pendidikan Sultan Idris, Malaysia
9.30 am – 10.30 am	Keynote Speaker I DATA ANALYTICS by Dato' Sri Dr. Mohd Uzir bin Mahidin Chief Statistician Malaysia Department of Statistics Malaysia (Chairperson: Dr. Noor Wahida binti Md. Junus)
10.30 am - 10.35 am	Break
10.40 am – 11.40 am	Main Room Invited Speaker I MATHEMATICS EDUCATION by Dr. Farida Nurhasanah Universitas Sebelas Maret, Indonesia (Chairperson: Dr. Nurihan binti Nasir)





11.40 am - 11.45 am	Break and Networking			
11.45 am - 1.00 pm	Parallel Session I <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Session 1a Mathematics Education Room 1 Chairperson: Ms. Amirah Fatihah Mohd Zulkiflee IPCSM: 053-051 Ms. Amirah Fatihah Mohd Zulkiflee IPCSM: 012-012 Ms. Vimala Devi Subramaniam IPCSM: 023-044 Mrs. Nur Haslisa Isa </td><td style="width: 50%;"> Session 1b Mathematics Education Room 2 Chairperson: Ms. Nesshalini Muralitharan IPCSM: 024-022 Ms. Nesshalini Muralitharan IPCSM: 007-008 Mrs. Qamarina Dayana Shahrul IPCSM: 008-015 Ms. Nur Yusra Binti Rahizan </td></tr> </table>		Session 1a Mathematics Education Room 1 Chairperson: Ms. Amirah Fatihah Mohd Zulkiflee IPCSM: 053-051 Ms. Amirah Fatihah Mohd Zulkiflee IPCSM: 012-012 Ms. Vimala Devi Subramaniam IPCSM: 023-044 Mrs. Nur Haslisa Isa	Session 1b Mathematics Education Room 2 Chairperson: Ms. Nesshalini Muralitharan IPCSM: 024-022 Ms. Nesshalini Muralitharan IPCSM: 007-008 Mrs. Qamarina Dayana Shahrul IPCSM: 008-015 Ms. Nur Yusra Binti Rahizan
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1.00 pm - 2.30 pm	Poster Presentation Lunch Break			
2.30 pm - 3.30 pm	Parallel Session II <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> Session 2a STEM Room 1 Chairperson: Mr. Adli Hakimi Mohamad IPCSM: 001-013 Dr. Zhaofeng Zeng IPCSM: 003-002 Mr. Adli Hakimi Mohamad IPCSM: 027-031 Mr. Renol Afrizon </td><td style="width: 50%;"> Session 2b STEM Room 2 Chairperson: Mr. Muhammad Firdaus bin Zamuri IPCSM: 057-054 Mr. Muhammad Firdaus bin Zamuri IPCSM: 034-033 Mrs. Sri Rejeki IPCSM: 038-038 Ms. Nur 'Adilah Husna Termizi </td></tr> </table>		Session 2a STEM Room 1 Chairperson: Mr. Adli Hakimi Mohamad IPCSM: 001-013 Dr. Zhaofeng Zeng IPCSM: 003-002 Mr. Adli Hakimi Mohamad IPCSM: 027-031 Mr. Renol Afrizon	Session 2b STEM Room 2 Chairperson: Mr. Muhammad Firdaus bin Zamuri IPCSM: 057-054 Mr. Muhammad Firdaus bin Zamuri IPCSM: 034-033 Mrs. Sri Rejeki IPCSM: 038-038 Ms. Nur 'Adilah Husna Termizi
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2024**

Workshop	
3.30 pm - 5.30 pm	<p>Workshop 1</p> <p>Slot 1 (3.30 pm – 4.30 pm) by Dr. Muhamad Hariz bin Muhamad Adnan Title: Generative AI Maestro: Mastering the latest technology (Moderator: Associate Professor Dr. Annie A/P Gorgey)</p> <p>Slot 2 (4.30 pm – 5.30 pm) by Associate Professor Dr. Bahbibi binti Rahmatullah Title: Unlocking AI: Your Essential Primer on Artificial Intelligence (Moderator: Dr. Riswan Effendi)</p> <p>Workshop 2</p> <p>Slot 1 (3.30 pm – 4.30 pm) by Ts. Dr. Muhammad Noorazlan bin Abd Azis Title: Unleashing the Secrets of ChatGPT in Scientific Research Writing (Moderator: Dr. Muhammad Ibrahim bin Muhammad Damanhuri)</p> <p>Slot 2 (4.30 pm – 5.30 pm) by Ts. Dr. Shuhaida binti Ismail Title: Data storytelling and Visualization with Power BI (Moderator: Dr Nur Izwani Mohd Shapri)</p>
5.30 pm	End of Day 1



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TENTATIVE DAY 2 (OCTOBER 11TH 2024 / FRIDAY)

TIME	PROGRAM			
Main Room				
8.30 am - 9.00 am	Registration			
9.00 am - 10.00 am	Keynote Speaker II HYDRO CLIMATE MODELING AND DATA ANALYSIS by Professor Dr. Upmanu Lall Columbia University, United States (Chairperson: Dr. Nurul Hila binti Zainuddin)			
10.00 am - 10.15 am	Break and Networking			
10.15 am - 11.30 am	Parallel Session III <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; padding: 5px; vertical-align: top;"> Session 3a Physics Education Room 1 Chairperson: Mr. Muhammad Azzam Mujahideen Abu Bakar IPCSM: 020-017 Mr. Muhammad Azzam Mujahideen Abu Bakar IPCSM: 025-020 Mr. Ahmad Shukur Arifin IPCSM: 030-027 Mr. Muhammad Nur Fitri Noraffendi IPCSM: 032-028 Ms. Siti Noorul Aliya Abd Manaf </td> <td style="width: 33%; padding: 5px; vertical-align: top;"> Session 3b Physics Education Room 2 Chairperson: Mrs. Nurazreen Mohd Ghazali IPCSM: 033-029 Mrs. Nurazreen Mohd Ghazali IPCSM: 035-032 Mrs. Silvi Yulia Sari IPCSM: 029-024 Mr. Muhammad Razak </td> <td style="width: 33%; padding: 5px; vertical-align: top;"> Session 3c Mathematics Room 3 Chairperson: Mrs. Yulia Retno Sari IPCSM: 039-037 Mrs. Yulia Retno Sari IPCSM: 043-039 Ms. Ika Metiza Maris IPCSM: 049-047 Ms. Marha Qismina Binti Rosman Rosman IPCSM: 050-048 Ms. Nurfadilah Baharuddin </td> </tr> </table>	Session 3a Physics Education Room 1 Chairperson: Mr. Muhammad Azzam Mujahideen Abu Bakar IPCSM: 020-017 Mr. Muhammad Azzam Mujahideen Abu Bakar IPCSM: 025-020 Mr. Ahmad Shukur Arifin IPCSM: 030-027 Mr. Muhammad Nur Fitri Noraffendi IPCSM: 032-028 Ms. Siti Noorul Aliya Abd Manaf	Session 3b Physics Education Room 2 Chairperson: Mrs. Nurazreen Mohd Ghazali IPCSM: 033-029 Mrs. Nurazreen Mohd Ghazali IPCSM: 035-032 Mrs. Silvi Yulia Sari IPCSM: 029-024 Mr. Muhammad Razak	Session 3c Mathematics Room 3 Chairperson: Mrs. Yulia Retno Sari IPCSM: 039-037 Mrs. Yulia Retno Sari IPCSM: 043-039 Ms. Ika Metiza Maris IPCSM: 049-047 Ms. Marha Qismina Binti Rosman Rosman IPCSM: 050-048 Ms. Nurfadilah Baharuddin
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11.30 am - 12.45 pm	Parallel Session IV		
	Session 4a Statistics Room 1 Chairperson: Ms. Nurulhayah Muhamad IPCSM: 021-030 Ms. Nurulhayah Muhamad IPCSM: 031-035 Mrs. Hazmira Yozza IPCSM: 040-040 Mrs. Lely Kurnia IPCSM: 041-041 Mrs. Amalina	Session 4b Physics Room 2 Chairperson: Ms. Siti Nurfatinah Bt Mohd Asseri IPCSM: 017-014 Ms. Siti Nurfatinah Bt Mohd Asseri IPCSM: 018-018 Mrs. Rika Noor Safitri IPCSM: 022-026 Mr. Farish Armani Hamidon IPCSM: 037-036 Ms. Febriani	Session 4c Data Science Chemistry Room 3 Chairperson: Halimatumn Sa'adiah Md Salehan IPCSM: 009-006 Ms. Halimatumn Sa'adiah Md Salehan IPCSM: 051-049 Mrs. Soraya Ishak
	Lunch Break		
	Room 1 Invited Speaker II BIG DATA by Mr. Afwan Syahmi bin Ahmad Nazari Vice President Data Strategy and Management AmBank Group Malaysia (Chairperson: Associate Professor Dr. Shazlyn Milleana binti Shaharudin)	Room 2 Invited Speaker III MATHEMATICS EDUCATION by Associate Professor Dr. Masitah Shahrill Universiti Brunei Darussalam, Brunei (Chairperson: Associate Professor Dr. Mazlini binti Adnan)	



3.45 pm – 3.55 pm	Main Room Closing Session National Anthem Kebesaran Negeri Perak Prayer Recitation
3.55 pm – 4.00 pm	Montage Presentation
4.00 pm – 4.05 pm	Closing Speech by Associate Professor Dr. Nor Azah binti Samat Chairman ICEMS in conjunction with the 12th IPCSM 2024
4.05 pm – 4.25 pm	Award Presentation: Best Presenter Award
4.25 pm – 4.30 pm	Announcement of Next Organizer
4.30 pm – 4.40 pm	Closing of ICEMS in conjunction with the 12th IPCSM 2024
4.40 pm	End of Conference



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PARALLEL SESSION I

Day 1 (October 10th 2024 / Thursday)

Time: 11.45 am – 1.00 pm

Room 1

Session 1a

Mathematics Education

Chairperson:

Ms. Amirah Fatihah Mohd Zulkiflee

Paper ID	Paper Title	Author
IPCSM: 053-051	Need Analysis For Development Of Circle Kit For Form 2 Circle Topic	Ms. Amirah Fatihah Mohd Zulkiflee
IPCSM: 012-012	Need Analysis For Developing A Problem-Based Learning E-Module In Mathematics With Integrated Global Citizenship Education	Ms. Vimala Devi Subramaniam
IPCSM: 023-044	Analisis Keperluan Pembangunan Model Pembelajaran Kemahiran Berfikir Aras Tinggi (KBAT) Berasaskan Aktiviti-Inkuiri bagi Pendidikan Matematik Sekolah Menengah	Mrs. Nur Haslisa Isa

Room 2

Session 1b

Mathematics Education

Chairperson:

Ms. Nesshalini Muralitharan

Paper ID	Paper Title	Author
IPCSM: 024-022	Generative Learning Strategy in Mathematics Education: A Systematic Literature Review	Ms. Nesshalini Muralitharan
IPCSM: 007-008	Halangan Pembelajaran Ontogeni dalam Topik Graf Fungsi berdasarkan Buku Teks Matematik Tingkatan Dua di Malaysia	Mrs. Qamarina Dayana Shahrul
IPCSM: 008-015	Kesan Penggunaan Jubin Algebra Terhadap Pencapaian Pengetahuan Konseptual, Pengetahuan Prosedural Dan Usaha Mental Pelajar Tingkatan Empat Bagi Topik Persamaan Kuadratik	Ms. Nur Yusra Binti Rahizan





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PARALLEL SESSION II

Day 1 (October 10th 2024 / Thursday)

Time: 2.30 pm – 3.30 pm

Room 1

**Session 2a
STEM**

**Chairperson:
Mr. Adli Hakimi Mohamad**

Paper ID	Paper Title	Author
IPCSM: 001-013	The Impact of STEM Teaching Model on Physics Student Teachers' Awareness and Readiness	Dr. Zhaofeng Zeng
IPCSM: 003-002	Kajian Literatur Secara Komprehensif Pembelajaran Berasaskan Teknologi Menggunakan Kecerdasan Buatan Bagi Mata Pelajaran Sains dan Implikasinya dalam Pengajaran dan Pembelajaran	Mr. Adli Hakimi Mohamad
IPCSM: 027-031	Development of the Fuzzy Delphi Instrument for Identifying Elements of the PhyARECi-STEM Learning Module	Mr. Renol Afrizon

Room 2

**Session 2b
STEM**

**Chairperson:
Mr. Muhammad Firdaus bin Zamuri**

Paper ID	Paper Title	Author
IPCSM: 057-054	Achievement Level of Form Two Students in the Introduction to Mechanical Topic in the Design and Technology (RBT) Subject	Mr. Muhammad Firdaus bin Zamuri
IPCSM: 034-033	Validity Assessment of An Integrated Realistic Mathematics Education and Project-based Inquiry Learning Module	Mrs. Sri Rejeki
IPCSM: 038-038	An Analysis of Primary School Teachers' Perceptions, Readiness and Willingness towards Development of Comprehensive Sexuality Education in Malaysia	Ms. Nur 'Adilah Husna Termizi





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PARALLEL SESSION III

Day 2 (October 11th 2024 / Friday)

Time: 10.15 am – 11.30 am

Room 1

**Session 3a
Physics Education**

Chairperson:

Mr. Muhammad Azzam Mujahideen Abu Bakar

Paper ID	Paper Title	Author
IPCSM: 020-017	Analisis Keperluan: Pembangunan Aplikasi Mudah Alih Berbantuan Kecerdasan Buatan Bagi Menyelesaikan Masalah Fizik Dalam Topik Daya dan Gerakan	Mr. Muhammad Azzam Mujahideen Abu Bakar
IPCSM: 025-020	Kajian Literatur Secara Komprehensif: Penggunaan E-Modul Berasaskan Kecerdasan Buatan dalam Subjek Sains dan Implikasinya Terhadap Pengajaran dan Pembelajaran	Mr. Ahmad Shukur Arifen
IPCSM: 030-027	Pembelajaran dan Kecerdasan Buatan Dalam Pendidikan Fizik: Sebuah Tinjauan Literatur	Mr. Muhammad Nur Fitri Noraffendi
IPCSM: 032-028	Kajian Literatur secara Komprehensif: Integrasi Teknologi Digital berdasarkan Kecerdasan Buatan bagi Memperkasakan Kaedah Pengajaran dan Pembelajaran Fizik Kuantum	Ms. Siti Noorul Aliya Abd Manaf

Room 2

**Session 3b
Physics Education**

Chairperson:

Mrs. Nurazreen Mohd Ghazali

Paper ID	Paper Title	Author
IPCSM: 033-029	Pembelajaran Menggunakan Komik dan Kecerdasan Buatan Dalam Subjek Fizik serta Implikasinya dalam Pengajaran dan Pembelajaran : Tinjauan Literatur	Mrs. Nurazreen Mohd Ghazali
IPCSM: 035-032	Development of the Physicist-Muslim Comic for Newton's Law of Motion concept: A Need Analysis from Teachers' and Students' Perspectives	Mrs. Silvi Yulia Sari
IPCSM: 029-024	Komik Pembelajaran Berasaskan Kecerdasan Buatan Bagi Topik Haba dalam Kalangan Murid Tingkatan Empat: Analisis Keperluan	Mr. Muhammad Razak



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Room 3

Session 3c

Mathematics

Chairperson:

Mrs. Yulia Retno Sari

Paper ID	Paper Title	Author
IPCSM: 039-037	The BStID Mathematical Model for Prevalence of Stunting	Mrs. Yulia Retno Sari
IPCSM: 043-039	The Connectivity and The Structure of The Power Graph of Symmetric Group	Ms. Ika Metiza Maris
IPCSM: 049-047	Mengesan Kehadiran Dinamik Kalut Ke Atas Siri Masa Suhu Di Kawasan Populasi Penduduk Tinggi Di Petaling, Selangor	Ms. Marha Qismina Binti Rosman Rosman
IPCSM: 050-048	Analisis Kewujudan Dinamik Kalut Terhadap Siri Masa Kelajuan Angin Di Pelabuhan Klang, Malaysia	Ms. Nurfadilah Baharuddin





PARALLEL SESSION IV

Day 2 (October 11th 2024 / Friday)

Time: 11.30 am – 12.45 pm

Room 1

Session 4a

Statistics

Chairperson:

Ms. Nurulhayah Muhamad

Paper ID	Paper Title	Author
IPCSM: 021-030	Kaedah PLS-SEM Atau CB-SEM Bagi Data Kesetiaan Pelanggan Terhadap Pembekal Perkhidmatan Mudah Alih	Ms. Nurulhayah Muhamad
IPCSM: 031-035	K-nearest Neighbor Regression for Estimating Song Popularity Using Gower Distance	Mrs. Hazmita Yozza
IPCSM: 040-040	Geographic Weighted Panel Regression Models For Contraceptive Use in West Sumatera	Mrs. Lely Kurnia
IPCSM: 041-041	Translation, Validation, and Reliability of The Smartphone Addiction Instrument in The Indonesian Version for Early Childhood	Mrs. Amalina

Room 2

Session 4b

Physics

Chairperson:

Ms. Siti Nurfatihah Bt Mohd Asseri

Paper ID	Paper Title	Author
IPCSM: 017-014	Vibration Analysis Of The Ditrributed Optical Vibration Sensor (DOVS) On Various Surrounding Material And Water Content	Ms. Siti Nurfatihah Bt Mohd Asseri
IPCSM: 018-018	Review on graphene/silver nanoparticles hybrid as supercapacitor	Mrs. Rika Noor Safitri
IPCSM: 022-026	A Comprehensive Study of 4-Sulfocalix[4]arene Thin Films with Atomic Force Microscopy: Thickness and Topographical Analysis	Mr. Farish Armani Hamidon
IPCSM: 037-036	Comprehensive Review of Superhydrophobic/Superoleophilic vs. Superhydrophilic/Superoleophobic Membranes for Treating Oilfield-Produced Water	Ms. Febriani



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Room 3

Session 4c

Data Science

Chemistry Education

Chairperson:

Ms. Halimatum Sa'adiah Md Salehan

Paper ID	Paper Title	Author
IPCSM: 009-006	Forecasting Land Use Trends using Long Short-Term Memory Networks for Rubber Plantations in Johor	Ms. Halimatum Sa'adiah Md Salehan
IPCSM: 051-049	Development of Chemistry Domain Assessment Instrument to Test Higher Level Thinking Skills Form 2 Students	Mrs. Soraya Ishak



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POSTER PRESENTATION

Day 1 (October 10th 2024 / Thursday)

Time: 1.00 am – 2.30 pm

Poster Room		
Paper ID	Paper Title	Author
IPCSM: 010-019	Pemodelan Dinamik Penyebaran dan Strategik Kawalan Penyakit Rabies di Asia Tengara: Kajian Literatur Bersistematisik (2019-2023)	Mr. Muhammad Zahiruddin Bin Mohamad Hussin
IPCSM: 014-007	Topology in Motion: Advancements in Pure Mathematical Theory and Applications	Ms. Divina Estacio
IPCSM: 019-016	Analisis Keperluan Untuk Pembangunan Aplikasi Pembelajaran Berasaskan Permainan Matematik Tambahan Tingkatan 4	Mrs. Indirani A/P Munusamy
IPCSM: 059-056	Analisis Keperluan Pembangunan Dan Keberkesanan Modul Pembelajaran Heutagogi Terhadap Pencapaian Dan Motivasi Murid Pintar Cerdas Dalam Pembelajaran Subjek Fizik	Mrs. Nurul Nabila Binti Nawawi
IPCSM: 060-058	Enhanced E. Coli expression of membrane protein FLL1 originated from oil palm	Ms. Fatin Fathiah Safiudin
IPCSM: 005-004	Development and Usability of The Geometry Kit Integrating Inquiry Learning Based Project in The Topic of Space Year Four	Mrs. Nurdiana Elina Nurdin



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IPCSM: 007 – 008

Halangan Pembelajaran Ontogeni dalam Topik Graf Fungsi berdasarkan Buku Teks Matematik Tingkatan Dua di Malaysia

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Abstrak. Buku teks yang digunakan kini merupakan suatu rujukan utama para guru dan murid dalam mengikuti pembelajaran yang telah ditetapkan oleh Kementerian Pendidikan Malaysia (KPM). Kajian ini dijalankan bertujuan untuk meneroka kandungan bagi topik Graf Fungsi di dalam Buku Teks Matematik Tingkatan Dua Kurikulum Standard Sekolah Menengah keluaran Kementerian Pendidikan Malaysia pada tahun 2017. Objektif kajian ini adalah meneroka Halangan Pembelajaran Ontogeni yang dihadapi oleh murid dalam mempelajari topik Graf Fungsi. Penyelidik menggunakan reka bentuk kualitatif dengan menjalani temu bual separa berstruktur terhadap enam orang responden yang merupakan murid tingkatan dua yang sudah menjalani pembelajaran topik Graf Fungsi. Temu bual yang dijalankan adalah berdasarkan pengalaman murid dan jawapan terhadap ujian bertulis yang diberikan. Keseluruhan temu bual dirakam dengan perakam audio. Ujian bertulis sesi pertama dijalankan melibatkan 22 orang murid yang mempelajari topik Graf Fungsi dengan guru matematik yang sama. Kemudian, ujian bertulis sesi kedua dijalankan melibatkan enam orang responden yang telah dipilih berdasarkan kriteria jawapan murid ujian sesi pertama. Langkah seterusnya adalah apabila ujian bertulis selesai disemak, temu bual dijalankan terhadap enam orang responden tersebut. Terdapat kategori Halangan Pembelajaran Ontogeni yang dilihat terhadap murid iaitu mengenai persediaan, minat, motivasi, pengetahuan sedia ada dan pengalaman pembelajaran. Dapatkan kajian menunjukkan bahawa terdapat murid mengalami Halangan Pembelajaran Ontogeni paling ketara apabila mengalami kesemua kategori Halangan Pembelajaran Ontogeni, namun terdapat juga murid yang hanya mengalami beberapa kategori bagi Halangan Pembelajaran Ontogeni iaitu berkaitan motivasi, persediaan mempelajari topik Graf Fungsi, minat, pengetahuan sedia ada atau pengalaman pembelajaran. Kesimpulannya, dapat dilihat bahawa setiap responden menghadapi halangan pembelajaran sekurang-kurangnya pada satu kategori. Berdasarkan dapatan kajian, ia dapat membantu guru dalam mewujudkan suatu alternatif bagi mengurangkan kemungkinan murid mengalami Halangan Pembelajaran Ontogeni dalam mempelajari topik Graf Fungsi Tingkatan Dua.

Kata Kunci: Halangan Pembelajaran Ontogeni, topik Graf Fungsi, kualitatif, ujian bertulis, temu bual separa berstruktur



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Kesan Penggunaan Jubin Algebra Terhadap Pencapaian Pengetahuan Konseptual, Pengetahuan Prosedural Dan Usaha Mental Pelajar Tingkatan Empat Bagi Topik Persamaan Kuadratik

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Abstrak. Tujuan kajian ini dijalankan adalah untuk mengkaji keberkesanan penggunaan alat manipulatif Jubin Algebra dalam kalangan murid Tingkatan Empat terhadap pencapaian keseluruhan, pencapaian pengetahuan konseptual, pencapaian pengetahuan prosedural dan usaha mental bagi topik Persamaan Kuadratik. Kajian ini merupakan kajian kuantitatif dengan menggunakan reka bentuk kuasi-eksperimen yang dijalankan terhadap murid Tingkatan Empat dari sebuah sekolah menengah kebangsaan harian di daerah Shah Alam, Selangor. Dua kelas diagihkan secara rawak iaitu kumpulan rawatan ($n=60$) yang menjalani pengajaran Jubin Algebra (PJA) dan kumpulan kawalan ($n=60$) yang menjalani pengajaran konvensional (PK) bagi topik Persamaan Kuadratik. Terdapat dua instrumen yang digunakan di dalam kajian ini iaitu Ujian Percapaian Persamaan Kuadratik (UPPK) dan Skala Perkadaran Usaha Mental (SPUM). Data dianalisis menggunakan analisis deskriptif yang melibatkan penentuan min dan sisihan piawai manakala bagi analisis inferensi pula melibatkan ujian – t sampel bebas dan MANOVA. Dapatkan kajian menunjukkan bahawa terdapat perbezaan yang signifikan antara kumpulan PK dan kumpulan PJA terhadap pencapaian keseluruhan, pencapaian pengetahuan konseptual, pencapaian pengetahuan prosedural dan usaha mental [$F(4,115) = 3576.75, p < 0.05$]. Min tahap pencapaian keseluruhan, pencapaian pengetahuan konseptual dan pencapaian pengetahuan prosedural bagi kumpulan PJA adalah lebih tinggi berbanding dengan min untuk kumpulan PK. Manakala min bagi usaha mental bagi kumpulan PJA adalah lebih rendah berbanding kumpulan PK. Kesimpulannya, PJA memberikan kesan yang positif kepada tahap pencapaian keseluruhan terutama sekali pencapaian pengetahuan konseptual dan pencapaian pengetahuan prosedural mereka dalam menyelesaikan soalan Persamaan Kuadratik. Melalui penggunaan Jubin Algebra, murid dapat membezakan dan memahami konsep dan prosedural bagi topik Persamaan Kuadratik. Bukan itu sahaja, dapatkan kajian menunjukkan penggunaan Jubin Algebra juga dapat mengurangkan beban kognitif dalam menyelesaikan masalah Persamaan Kuadratik. Implikasinya, penggunaan Jubin Algebra dapat menyumbang dalam mempelbagaikan strategi pengajaran yang menarik ke arah mempertingkatkan kefahaman murid dalam topik Persamaan Kuadratik.

Kata Kunci: Jubin Algebra, Persamaan Kuadratik, Pengetahuan Prosedural, Pengetahuan Konseptual, Usaha Mental



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Need Analysis for Developing a Problem-Based Learning E-Module in Mathematics with Integrated Global Citizenship Education

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Abstract. Global Citizenship Education is a framework that aims to develop citizens willing to take responsibility, and respect for values such as justice and equality and contributes to a more peaceful and sustainable world. Exposing our primary school students to global issues will help them understand world issues, especially the eradication of global poverty, climate change and peace which can shape them to become a better global citizen. However, elements of Global Citizenship Education are not emphasized in primary mathematics. Hence, this study aims to identify the perception of mathematics teachers on implementing a problem-based learning e-module with integrated Global Citizenship Education on the topic of Data Handling and also to identify the hindering factors in learning the topic of Data Handling. This study used an online questionnaire (google form) involving 52 respondents of primary school mathematics teachers from the state of Negeri Sembilan. The findings of the study revealed that 40% of them had no knowledge about Global Citizenship Education and 70% of them never had integrated Global Citizenship Education into Mathematics education. However, 80% of the teachers agreed that integrating Global Citizenship Education themes in mathematics classrooms will enhance students' global awareness and at the same time will motivate students to learn mathematics. This study also found that the Problem-Based Learning approach enables students to generate new knowledge of real-world problems in mathematics. It was concluded that there is a need to develop a problem-based learning e-module in Mathematics with Integrated Global Citizenship Education.

Keywords: Problem-based Learning, Global Citizenship Education, global awareness, teachers' perception, mathematics





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Analisis Keperluan Pembangunan Model Pembelajaran Kemahiran Berfikir Aras Tinggi (KBAT) Berasaskan Aktiviti-Inkuiri bagi Pendidikan Matematik Sekolah Menengah

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Abstrak. Kajian ini merupakan kajian analisis keperluan bertujuan untuk mendapatkan maklumat tentang keperluan terhadap komponen Model Pembelajaran Kemahiran Berfikir Aras Tinggi (MyHots) Berasaskan Aktiviti-Inkuiri bagi Pendidikan Matematik Sekolah Menengah dalam melahirkan profil murid bertaraf global. Seramai 207 orang guru sekolah menengah yang dipilih melalui kaedah persampelan bertujuan. Borang selidik kajian mengandungi empat konstruk berkaitan tahap amalan kemahiran terhadap konstruk pembangunan Model MyHots berdasarkan aktiviti inkuiri bagi pendidikan matematik sekolah menengah dalam melahirkan profil murid bertaraf global. Data yang diperolehi dianalisis menerusi statistic deskriptif menggunakan perisian Pakej Statistik (SPSS) versi 24.0. Dapatan kajian menunjukkan bahawa tahap amalan terhadap konstruk reka bentuk model adalah sederhana iaitu 3.40 (SP=0.61), kemahiran mengaplikasi 3.59 (SP=0.65), kemahiran menganalisis 3.83 (SP=0.63), kemahiran menilai 3.48 (SP=0.61) dan kemahiran mencipta 3.27 (0.58). Hasil kajian akan digunakan untuk merancang dan mengembangkan model dan fasa seterusnya. Fokus kajian melihat kepada komponen yang membina amalan pembelajaran bagi melahirkan profil murid bertaraf global. Dapatan ini diharapkan dapat membantu guru menghasilkan model yang mampu mendepani Revolusi Industri 4.0.

Kata Kunci : Penyelidikan Pembangunan, Reka Bentuk Model, Profil Global, Analisis Keperluan





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Generative Learning Strategy in Mathematics Education: A Systematic Literature Review

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Abstract. Generative Learning is a strategy that learners actively engage with the material to construct their own understanding. However, not many instructors use this strategy in teaching and learning process and need to expose to the proper way to execute this strategy in classroom. The objective of this article is to reveal a systematic literature review about generative learning strategies in Mathematics teaching and learning process by providing an overview of the benefits and correct ways in using this strategy in teaching and learning process. The review processes included five methodological steps, namely guided by review protocol, formulation of research questions, systematic searching strategies based on identification, screening, and eligibility based on several well-known electronic databases such as Scopus, Springer Link, Sage Journals and Taylor Francis. The review process was then followed by quality appraisal, data extraction and analysis. The findings showed how the generative learning affects individuals in learning process. There are also several elements found in generative learning strategy such as mapping, questioning, predicting, drawing, explaining, and testing that help students to understand the topic better. These findings can be used as a reference for teachers to implement as a learning strategy that can involve students in cognitive aspects to enable meaningful learning. These findings provide educators with insight into the information processing occurring in a person's cognition and reveal several learning strategies that align with information processing theory and also have the potential to guide future research in this field.

Keywords: Generative Learning strategy, teaching and learning strategies, active learning, constructive learning





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Validity Assessment of An Integrated Realistic Mathematics Education and Project-based Inquiry Learning Module

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Abstract. Text-based learning resources are critical for helping pupils learn mathematics. However, limited studies have been conducted on designing mathematics modules as text-based learning materials for Vocational High School (VHS) students. Hence, developing an integrated Realistic Mathematics Education (RME) and Project-based Inquiry (PIL) module could be an innovative solution. This study analyzes the validity assessment as a part of the developmental stage of developing the module. The validation process was conducted by a team of five experts in mathematics education, who used a questionnaire to assess both the face and content validity. The questionnaire was designed to evaluate four key aspects of face validity: language, text, graphics, and presentation. In terms of content validity, it considered five crucial aspects: suitability to the target population, implementation of each module activity which based on the principles of RME and the phases of PIL, compatibility with the allocated time, ability to enhance student performance in terms of creativity and achievement, and potential to influence attitudes towards excellence, particularly in terms of student motivation. The data analysis was conducted using descriptive statistics and percentages. Based on the data analysis, the score percentage for all face and content validity aspects is good, ranging from 84% to 98%. Therefore, all module aspects have high content validity and exceed 70%.

Keywords: face validity, content validity, realistic mathematics education, project-based inquiry learning, linear programming



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Need Analysis for Development of Circle Kit for Form 2 Circle Topic

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Abstract. A needs analysis was conducted to ascertain the present requirements and desires of students in order to develop a Circle Kit for Form 2 Mathematics topics. To conduct the research, a random selection of secondary schools at Perak, Selangor, and Putrajaya, was made. Through purposive sampling, a total of 90 Mathematics teachers were chosen as the study's sample. This study employed a quantitative approach for data collection utilising the Need Analysis Questionnaire (NAQ) as the survey instrument. The gathered data was analysed using descriptive statistics. The results revealed that 95.5% of the respondents believed the necessity for developing a Circle Kit specifically designed for Form 2 Mathematics. Furthermore, a significant majority of teachers, specifically 75.4%, have selected Circle as the primary topic that requires attention in the development of the Circle Kit. Ultimately, it is important to develop this Circle Kit specifically designed for Circle. Based on the study, the analysis suggests that the Circle Kit should be designed to incorporate specific characteristics related to content, activities, materials, and assessment.

Keywords: Circle, Form 2 Mathematics, Descriptive Statistics, Circle Kit





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Analisis Keperluan: Pembangunan Aplikasi Mudah Alih Berbantuan Kecerdasan Buatan Bagi Menyelesaikan Masalah Fizik Dalam Topik Daya dan Gerakan

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Abstrak. Perkembangan teknologi seperti peranti pintar dan pelbagai bentuk aplikasi pesat dibangunkan dari semasa ke semasa. Turut tidak ketinggalan teknologi Kecerdasan Buatan (KB) merupakan perkembangan inovasi teknologi dalam era Revolusi Industri (IR 4.0) yang dapat membantu, memudahkan, dan mempercepatkan proses tugasan berbanding dengan kebolehan secara semulajadi manusia seperti mencipta gambar rajah dan mencari jawapan dengan cepat dan tepat. Pemahaman sesuatu konsep sangat penting bagi pelajar menjana pemikiran secara kreatif dan kritis. Kemahiran pelajar dalam menyelesaikan masalah dengan menggunakan pemahaman dan pengetahuan sedia ada terhasil apabila pelajar dapat memahami kehendak soalan yang dibantu oleh gambar rajah yang lengkap. Sehubungan itu, kajian lepas telah membuktikan bahawa penggunaan gambar rajah dalam sesi Pengajaran dan Pembelajaran (PdP) dapat membantu pelajar dalam memahami konsep Fizik dan seterusnya membantu dalam menyelesaikan masalah bagi tajuk Gerakan Linear. Lantaran itu, aplikasi yang berintegrasikan KB dilihat sesuai diimplementasikan bagi menyelesaikan isu tersebut. Justeru itu, kajian ini dijalankan bagi mengenal pasti keperluan pembangunan sebuah aplikasi pendidikan berdasarkan KB, bagi menyelesaikan masalah dalam mata pelajaran Fizik khususnya topik Daya dan Gerakan. Instrumen menggunakan borang soal selidik analisis keperluan telah diedarkan terhadap 107 orang pelajar tingkatan empat yang mengambil mata pelajaran Fizik di bawah pentadbiran Pejabat Pendidikan Daerah (PPD) Tanjung Malim. Keputusan data yang terkumpul dianalisis menggunakan perisian SPSS





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(Statistical Package for The Social Sciences) versi 20. Hasil analisis menunjukkan bahawa keperluan pelajar terhadap penggunaan aplikasi pendidikan berasaskan KB berada pada tahap yang baik. Dapatan seterusnya juga menunjukkan peratusan yang tinggi terhadap keperluan aplikasi pendidikan berasaskan KB bagi topik Daya dan Gerakan, Fizik tingkatan empat, iaitu 91.8% responden bersetuju untuk sebuah aplikasi pendidikan perlu dibangunkan manakala hanya 8.2% yang tidak bersetuju. Dapatan kajian menunjukkan bahawa perlunya ada sebuah aplikasi pendidikan berintegrasi KB bagi topik Daya dan Gerakan yang dapat membantu meningkatkan minat dan motivasi pelajar dalam menyelesaikan masalah terhadap topik tersebut. Kesimpulannya, kebanyakkan responden memberikan maklum balas yang baik terhadap keperluan untuk membangunkan aplikasi pendidikan berasaskan KB ini bagi membantu PdP khususnya dalam menyelesaikan masalah Daya dan Gerakan.

Kata Kunci: teknologi kecerdasan buatan, aplikasi pendidikan, pdp, daya dan gerakan, fizik





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Kajian Literatur Secara Komprehensif: Penggunaan E-Modul Berasaskan Kecerdasan Buatan dalam Subjek Sains dan Implikasinya Terhadap Pengajaran dan Pembelajaran

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Abstrak. Berdasarkan Kementerian Sains, Teknologi dan Inovasi (MOSTI), trend pelajar yang mengambil subjek Matematik Tambahan dan Sains Tulen iaitu Fizik, Kimia dan Biologi adalah menurun di mana calon yang mengambil Sijil Pelajaran Malaysia (SPM) 2023 telah merekodkan penurunan sebanyak 3.33% bagi subjek Matematik Tambahan, Fizik (1.42%), Kimia (1.42%) dan Biologi (2.2%). Namun, keputusan SPM 2023 bagi kesemua subjek ini menunjukkan peningkatan berbanding tahun sebelumnya. Kajian lepas mendapati penggunaan teknologi digital seperti e-modul dilihat sangat membantu dalam meningkatkan prestasi murid semasa sesi Pengajaran dan Pembelajaran (PdP). Tambahan pula, penggunaan pelbagai teknologi semasa sesi PdP telah berkembang sejak penularan COVID-19 kepada PdP yang lebih fleksibel, mudah diakses, serta menarik minat pelajar terhadap Sains apabila pelajar dapat berinteraksi secara langsung dengan bahan PdP daripada sumber global. Perkembangan ini telah mewujudkan pelbagai medium dan aplikasi pengajaran digital seperti penggunaan Kecerdasan Buatan (KB) yang mampu melakukan tugas dan fungsi mirip pemikiran manusia untuk mewujudkan PdP yang sistematis. Misalnya, penggunaan ChatGPT membantu guru menyediakan Rancangan Pengajaran Harian (RPH) dengan efisien. Peningkatan penggunaan KB juga telah menarik minat syarikat besar seperti Google untuk melabur sebanyak RM9.4 bilion di Malaysia sebagai usaha meningkatkan program literasi KB untuk manfaat guru dan pelajar. Jadi, kajian ini dijalankan untuk mengenal pasti penggunaan





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dan impak e-modul berdasarkan KB bagi mata pelajaran Sains. Seterusnya, dengan menjalankan analisis tinjauan sistematik terhadap 30 artikel jurnal dan buku berkaitan penggunaan KB dalam PdP yang diterbitkan antara tahun 2017 hingga 2024, gambaran keseluruhan tentang perkembangan pendidikan digital berdasarkan KB semasa PdP dapat dilihat. Hasil daripada kajian lepas mendapat peningkatan yang positif terhadap penggunaan KB dalam PdP mampu meningkatkan kefahaman, motivasi, penglibatan dan merangsang pemikiran kritis pelajar. Kesimpulannya, dapatan daripada tinjauan literatur menunjukkan bahawa pengaplikasian KB dalam PdP membantu pelajar meningkatkan pencapaian mereka dalam Sains. Ini kerana penggunaan KB dapat memperbaikkan pembelajaran, menyediakan bimbingan automatik dan mencipta kandungan pendidikan interaktif, yang secara langsung meningkatkan minat dan pemahaman pelajar. Bertepatan dengan hala tuju negara untuk memperkasakan pendidikan STEM yang dinamik akan merealisasikan impian untuk melahirkan generasi berpengetahuan tinggi dan berfikiran kritikal bagi mendepani era ekonomi digital.

Kata Kunci: e-modul, pembelajaran berdasarkan digital, kecerdasan buatan, mata pelajaran Sains, PdP





IPCSM: 029 – 024

Komik Pembelajaran Berasaskan Kecerdasan Buatan Bagi Topik Haba dalam Kalangan Murid Tingkatan Empat: Analisis Keperluan

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Abstrak. Pada zaman yang dipenuhi dengan kemajuan teknologi yang pesat dan transformasi dalam teknik pembelajaran, terdapat keperluan yang mendesak untuk memperkenalkan pendekatan inovatif dalam sistem pendidikan. Dalam pembelajaran topik haba, murid-murid sering menghadapi beberapa masalah utama. Salah satu masalah utama ialah konsep-konsep dalam topik haba yang kompleks dan abstrak yang menyebabkan murid-murid menghadapi cabaran semasa Pengajaran dan Pembelajaran (PdP). Data menunjukkan bahawa murid-murid sering mengalami kesukaran dalam memahami konsep-konsep abstrak seperti termodinamik, teori kinetik gas, dan hukum termodinamik. Kajian ini bertujuan untuk menganalisis keperluan komik pembelajaran berdasarkan Kecerdasan Buatan (AI) bagi topik haba dalam kalangan murid-murid tingkatan empat di daerah Kota Setar. Penelitian ini dijalankan sebagai respon terhadap cabaran pengajaran dan pembelajaran sains yang memerlukan pendekatan baru untuk meningkatkan minat dan pemahaman murid-murid. Kajian ini menggunakan reka bentuk kajian kuantitatif secara tinjauan yang menggunakan borang soal selidik sebagai instrumen kajian. Borang tersebut diedarkan kepada 30 guru Fizik sekolah menengah di daerah Kota Setar yang dipilih menggunakan teknik pensampelan rawak mudah. Hasil kajian menunjukkan bahawa majoriti guru (83.33%) menganggap topik haba sebagai topik yang mencabar bagi murid-murid. Selain itu, majoriti guru (96.66%) bersetuju tentang keperluan untuk mengembangkan bahan pembelajaran kendiri berasaskan AI untuk subjek Fizik, dengan fokus pada topik haba (83.33%). Sebagian besar guru (93.33%) memilih komik sebagai jenis bahan pembelajaran kendiri berasaskan AI yang paling sesuai. Teknik pembelajaran yang paling disukai adalah pembelajaran berasaskan permainan dan inkuiri (93.33%). Dalam aspek pelaksanaan aktiviti, 90% guru memilih eksperimen, simulasi, dan permainan sebagai aktiviti yang sesuai untuk bahan pembelajaran kendiri berasaskan AI. Untuk pentaksiran, lembaran kerja dan aktiviti latihan interaktif dipilih oleh majoriti guru



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(93.33%). Berdasarkan hasil kajian ini, disyorkan untuk membangunkan komik berdasarkan AI yang mana ianya akan dapat memenuhi keperluan pembelajaran murid-murid dan memudahkan guru dalam menyampaikan konsep-konsep sains yang kompleks. Komik ini diharapkan dapat menjadi Bahan Bantu Mengajar (BBM) yang efektif untuk menyampaikan topik haba dengan cara yang lebih mudah difahami dan menarik minat murid-murid.

Kata Kunci: kecerdasan buatan, komik, pengajaran dan pembelajaran, pendidikan sains dan konsep haba





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Pembelajaran dan Kecerdasan Buatan Dalam Pendidikan Fizik: Sebuah Tinjauan Literatur

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Abstrak. Penggunaan gamifikasi dan Kecerdasan Buatan (KB) dalam pendidikan Fizik semakin meningkat, namun kesan jangka panjang dan keberkesanannya masih belum jelas. Masalah utama adalah bagaimana cara mengintegrasikan kedua-dua teknologi ini dengan berkesan untuk meningkatkan pengalaman pembelajaran para pelajar dalam subjek Fizik. Sehubungan dengan itu, dapatan dari pelbagai sumber menunjukkan bahawa minat dan motivasi pelajar dalam subjek Fizik kian berkurang. Dengan itu, tinjauan ini bertujuan untuk menilai bagaimana gamifikasi dan KB memberi kesan terhadap pendidikan Fizik. Dalam tinjauan ini, sumber literasi dianalisis daripada 30 sumber dengan akses terbuka di laman sesawang yang telah ditapis daripada kajian lepas yang menggunakan kedua-dua kaedah teknologi ini dalam bidang pendidikan. Metodologi tinjauan melibatkan empat langkah utama: perancangan, pencarian, penilaian, dan pelaporan. Dengan itu, dapat disimpulkan bahawa melalui penerapan sistem ganjaran seperti mata, lencana atau papan kedudukan dalam platform permainan, pelajar akan lebih berkemungkinan untuk terlibat secara aktif dalam proses pembelajaran. Motivasi mereka juga meningkat dengan ketara dari masa ke masa. Selain itu, maklum balas diperibadikan berkenaan konsep Fizik kompleks oleh sistem pembelajaran berdasarkan KB seperti Sistem Bimbingan Pintar (SBP) dan Platform Pembelajaran Adaptif dapat membantu pelajar memahami konsep tersebut dengan lebih mendalam. Melalui gabungan teknologi berdasarkan KB dan permainan ini, pelajar bukan sahaja dapat meningkatkan tahap akademik mereka tetapi juga menjadi peserta aktif dalam pembelajaran di bilik darjah. Namun, masalah masih wujud seperti keperluan pelaburan awal yang besar, potensi kebergantungan berlebihan kepada teknologi, latihan komprehensif guru, kekurangan kesedaran umum dalam kalangan pihak berwajib mengenai cara permainan pendidikan berfungsi dalam amalan, isu berkaitan piawaiyan infrastruktur sekolah atau jalur lebar, kesediaan guru serta kebolehan profesionalnya yang diperlukan semasa menangani pendekatan baru termasuk yang berdasarkan permainan perlu diambil kira.

Kata Kunci: Gamifikasi, Kecerdasan Buatan, Pendidikan Fizik, Penglibatan Pelajar, Teknologi Pendidikan



IPCSM: 032 – 028

Kajian Literatur secara Komprehensif: Integrasi Teknologi Digital berdasarkan Kecerdasan Buatan bagi Memperkasakan Kaedah Pengajaran dan Pembelajaran Fizik Kuantum

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Abstrak. Penggunaan teknologi Kecerdasan Buatan (KB) telah menjadi trend pendidikan secara global selepas pandemik COVID-19 melanda di mana pembelajaran dilakukan secara maya dengan menggunakan bantuan teknologi digital. Meskipun pelbagai penggunaan teknologi digital telah diterapkan dalam kaedah pengajaran dan pembelajaran (PdP), masih terdapat kekurangan dari segi pemahaman terhadap keberkesanan dan trend penggunaan teknologi digital seperti KB dalam meningkatkan pencapaian murid. Kaedah PdP berintegrasi teknologi KB dapat digunakan dalam konsep abstrak seperti Fizik Kuantum, untuk mengatasi miskonsepsi dan menangani kesukaran penguasaan topik dengan menggunakan simulasi interaktif. Oleh itu, kajian ini dilakukan bagi mengenal pasti trend penggunaan dan keberkesanan teknologi KB dalam persekitaran pembelajaran digital bagi memperkasakan kaedah PdP Fizik Kuantum. Kajian ini telah merujuk sumber terbitan dari tahun 2018 hingga 2024 dengan menggunakan kaedah analisis tinjauan sistematik yang terdiri daripada 30 bilangan artikel jurnal dan buku untuk mendapatkan maklumat berkaitan penggunaan dan keberkesanan teknologi KB dalam PdP Fizik Kuantum. Hasil daripada carian mendapati bahawa penggunaan teknologi KB dapat memperkasakan kaedah PdP melalui peningkatan terhadap minat dan penglibatan murid dalam pembelajaran Fizik Kuantum yang abstrak ini serta dapat meningkatkan variasi teknik pengajaran bagi yang abstrak ini. Penggunaan teknologi KB seperti platform *PopAi* dapat meningkatkan minat dan penglibatan murid melalui interaksi dengan kandungan pembelajaran secara lebih dinamik serta dapat menawarkan penghasilan slaid pembentangan dan peta minda menggunakan generatif KB bagi menjimatkan masa penghasilan bahan pembentangan. Demikian itu, kesediaan dalam pembelajaran digital juga perlu dipertingkatkan seperti infrastruktur digital dan kemahiran pengendaliannya supaya potensi teknologi KB ini dapat dimanfaatkan sepenuhnya sesuai seiring dengan keberhasilan revolusi pendidikan 4.0. Disamping ia dapat mempersiapkan generasi masa hadapan yang mahir dari segi teknologi digital untuk menghadapi cabaran dan peluang dalam era kemajuan teknologi. Kesimpulannya,



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penggunaan teknologi KB dalam kaedah PdP Fizik Kuantum masa kini semakin meningkat seiring dengan bukti keberkesanannya terhadap peningkatan pencapaian dan minat murid dalam PdP Fizik Kuantum.

Kata Kunci: Fizik Kuantum, Kecerdasan Buatan, Pembelajaran Digital, Teknologi Digital, Pendidikan 4.0





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IPCSM: 033 – 029

Pembelajaran Menggunakan Komik dan Kecerdasan Buatan Dalam Subjek Fizik serta Implikasinya dalam Pengajaran dan Pembelajaran : Tinjauan Literatur

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Abstrak. Laporan dari Kementerian Sains, Teknologi dan Inovasi (MOSTI) mendapati bahawa pelajar yang mengambil mata pelajaran bagi subjek Fizik merekodkan penurunan sebanyak 1.42 % bagi calon yang menduduki Sijil Pelajaran Malaysia (SPM) tahun 2023 berbanding tahun 2022. Bahkan, perdana menteri juga mengakui bahawa minat golongan pelajar dalam menceburi bidang Sains, Teknologi dan Matematik (STEM) semakin merosot serta latihan dalam pendidikan bidang STEM, Kecerdasan Buatan (KB) serta Pendidikan Teknikal dan Latihan Vokasional (TVET) adalah sangat lemah. Rentetan daripada itu, sistem pendidikan bertanggungjawab dalam meningkatkan minat pelajar dalam mempelbagaikan kaedah Pengajaran dan Pembelajaran (PdP) termasuk Bahan Bantu Mengajar (BBM) yang menarik dan berkesan. Salah satu BBM yang dikenalpasti ialah penerapan teknologi KB di dalam komik. Tidak dapat dinafikan bahawa negara Malaysia sememangnya kekurangan komik yang berunsurkan pendidikan khususnya dalam subjek Fizik itu sendiri. Malahan, kajian tentang pembelajaran menggunakan komik dan penerapan KB dalam subjek Fizik masih kurang dijalankan. Oleh itu, kajian literatur ini dijalankan untuk mengenal pasti kegunaan serta implikasi pembelajaran menggunakan komik dan KB bagi subjek Fizik dalam sesi PdP. Di dalam kajian ini, kaedah analisis tinjauan sistematik digunakan di mana terdapat empat langkah iaitu analisis, merangka soalan kajian, membuat pecarian artikel mahupun jurnal berkaitan tajuk kajian serta membaca, menganalisis dan mengeluarkan maklumat daripada artikel mahupun jurnal yang diperolehi. Hasil kajian lepas mendapati bahawa bukan sahaja ia mampu berkesan untuk menarik minat pelajar, malah dapat mengajar subjek yang kompleks dengan cara yang mudah diakses serta menyeronokkan. Justeru itu, kajian ini merumuskan bahawa pembelajaran menggunakan komik dan KB berpotensi dapat meningkatkan minat pelajar dalam bidang STEM khususnya subjek Fizik. Malahan, ia juga menjadi sebagai satu titik permulaan untuk industri komik tempatan berkembang dengan lebih meluas serta dapat meningkatkan kualiti sistem pendidikan di Malaysia.

Kata Kunci: Komik, kecerdasan buatan, Fizik, bahan bantu mengajar, pengajaran dan pembelajaran





IPCSM: 035 – 032

Development of the Physicist-Muslim Comic for Newton's Law of Motion concept: A Need Analysis from Teachers' and Students' Perspectives

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Abstract. Newton's Law of Motion is one of the abstract concepts that require the use of various types of resources as teaching and learning aids to improve students' understanding towards the concept. Hence, this research was carried out to analyze the need of developing an al-Quran integrated learning aid in the form of comic for Newton's Law of Motion concept from the perspectives of teachers and students. The research design was the survey study which employed teacher and student questionnaires as the research instruments. A total of 20 physics teachers and 384 senior high school students in West Sumatra were selected using simple random sampling technique as the sample of this research. The data were analyzed using descriptive statistics analysis. The findings indicated that 65 % teachers and 72.9 % students agreed that Newton's Law of Motion is the difficult concept to teach and learn. The findings also showed that only 55 % teachers employed the al-Quran verses to teach Physics concept but no teachers employed the educational comic in their teaching and learning session. However, 79.4 % students assumed that the educational comic can help them to enhance their understanding towards the Physics concept. In conclusion, there is a need of developing an al-Quran integrated learning aid in the form of comic for Newton's Law of Motion concept. The learning aid is expected to improve students' understanding towards the concept.

Keywords: Learning aid, Al-Quran, comic, Newton's Law of Motion, teachers' and students' perspective



IPCSM: 001 – 013

The Impact of STEM Teaching Model on Physics Student Teachers' Awareness and Readiness

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Abstract: STEM education is the focal point and important direction of education reform around the world. China's STEM education started late, and its current development is relatively backward in certain provinces. Besides, the shortage of STEM teachers is another big reason. Student teachers are the successors of future teachers, and the teachers' level of STEM awareness and readiness plays a critical role in STEM education. This study used a survey research design to examine the impacts of STEM teaching mode on student teachers' awareness and readiness for STEM subjects. First, 53 student teachers were chosen using the cluster sampling method as a research sample, and then five STEM teaching activities for student teachers were implemented throughout two months using the STEM teaching model, pre-survey and post-survey were conducted using questionnaires, and the survey data were analysed using the mean, standard deviation, and paired t-test. The results of the study found that the level of STEM awareness and readiness of student teachers was low before the activities, and significantly improved after the activities. In conclusion, we can apply the STEM teaching model to improve student teachers' STEM awareness and readiness, cultivate their STEM literacy, and provide more qualified STEM teachers for STEM education in China.

Keywords: STEM Education, Student Teacher, STEM Teaching Model, STEM Awareness, STEM Readiness



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IPCSM: 003 – 002

Kajian Literatur Secara Komprehensif Pembelajaran Berasaskan Teknologi Menggunakan Kecerdasan Buatan Bagi Mata Pelajaran Sains dan Implikasinya dalam Pengajaran dan Pembelajaran

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Abstrak. Pencapaian pelajar Malaysia dalam subjek sains jauh ketinggalan apabila dibandingkan dengan negara-negara maju yang lain. Hal ini dibuktikan dengan kedudukan Malaysia yang tidak memberangsangkan dalam penilaian antarabangsa iaitu di tangga ke-47 dalam Program Penilaian Pelajar Antarabangsa (PISA) 2022. Antara faktor utama kepada permasalahan ini adalah sekolah rata-rata masih terikat kepada kaedah tradisional seperti '*chalk and talk*' dan tidak memanfaatkan penggunaan teknologi untuk menarik minat pelajar terhadap mata pelajaran sains. Kepekaan terhadap perkembangan teknologi dalam pendidikan adalah sangat penting untuk memastikan kaedah pengajaran dan pembelajaran lebih relevan dan efektif. Teknologi kecerdasan buatan (KB) merupakan teknologi yang baru mula diperkenalkan dalam dunia pendidikan di mana komputer berupaya untuk mempunyai kognitif seperti manusia. Namun begitu, kajian keberkesanan teknologi KB di dalam sesi Pengajaran dan Pembelajaran (PdP) bagi mata pelajaran sains masih kurang dijalankan. Oleh itu, kajian literatur ini dijalankan adalah untuk mengenalpasti kegunaan dan impak penggunaan teknologi KB di dalam PdP sains. Kajian literatur ini dijalankan menggunakan keadah analisis tinjauan sistematik yang terdiri daripada empat langkah iaitu merangka soalan kajian, membuat carian artikel atau jurnal berkaitan tajuk kajian, membaca dan menganalisis abstrak, dan mengeluarkan maklumat daripada artikel ataupun jurnal. Hasil kajian lepas



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menunjukkan kesan positif terhadap penggunaan teknologi KB di dalam dunia pendidikan sains kursusnya dalam meningkatkan kefahaman pelajar, penglibatan pelajar di dalam proses PdP dan secara tidak langsung mengurangkan beban guru oleh kerana teknologi KB mampu untuk melaksanakan tugas guru seperti menjana kuiz, lab maya dan memberikan maklum balas prihal pelajar. Justeru, kajian merumuskan bahawa penggunaan teknologi KB berpotensi untuk meningkatkan pencapaian pelajar di dalam mata pelajaran sains dan juga mahir dalam bidang teknologi maklumat. Ini juga selari dengan hala tuju negara dalam melaksanakan pendigitalan dalam pendidikan iaitu ingin melahirkan pelajar yang hebat dari segi akademik dan mahir digital.

Kata Kunci: pembelajaran berdasarkan teknologi, kecerdasan buatan, mata pelajaran Sains, bahan bantu mengajar, PdP





IPCSM: 027 – 031

Development of the Fuzzy Delphi Instrument for Identifying Elements of the PhyARECi-STEM Learning Module

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Abstract. This research aims to describe the process of developing the Fuzzy Delphi instrument used to identify the PhyARECi-STEM learning module. This questionnaire was developed based on the national higher education standards analysis in Indonesia, Hilda Taba's curriculum model, module elements found in literature, interviews, and focus groups with experts. This study is descriptive in nature. The 50-item questionnaire relates to learning outcomes, learning content, learning process, and learning assessment. The validity evidence of the Fuzzy Delphi questionnaire was conducted by 9 experts to ensure content validity. Subsequently, the questionnaire was distributed to 30 respondents to obtain reliability of the questionnaire. The data analysis techniques used for validity and reliability were Content Validity Index (CVI) and Cronbach's alpha, respectively. The research findings indicate that the Fuzzy Delphi questionnaire has been proven valid and reliable. The Fuzzy Delphi questionnaire presented in this study will be used as a basis for determining the elements to be included in the PhyARECi-STEM learning module for the Applied Physics course, based on expert opinions.

Keywords: Augmented Reality, Applied Physics, Fuzzy Delphi Instruments, Learning Module, STEM Approach





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Achievement Level of Form Two Students in the Introduction to Mechanical Topic in the Design and Technology (RBT) Subject

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Abstract. This study aims to examine the achievement level of form two students in the Introduction to Mechanical topic in the Design and Technology (RBT) subject through mid-year examinations. The study involved 130 form two students in the Seremban district who are studying the RBT subject. The exam questions were developed based on the Table of Test Specifications (JSU) according to the chapters that have been learned. The findings show that the mastery level for the 130 students on the Introduction to Mechanical topic is low. A total of 63% and above of the students gave wrong answers to questions in Section A. In Section B, the findings show that the highest percentage of students scored only one mark for questions 13 to 17 except for question 18, which is more than 38%. Meanwhile, in Section C, students only obtained the highest score of five out of 10 marks, which is 11.5% of the total students. To ensure students can master this topic, it is recommended to diversify the use of Teaching Aids (ABBMM) in the teaching and learning process for this topic. The Introduction to Mechanical topic is an important topic for students to master because at the end of the learning on this topic, students need to build a functioning mechanical gadget.

Keywords: Achievement level, Form two students, Mechanical topic, RBT, Teaching Aids





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The BS_tID Mathematical Model for Prevalence of Stunting

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Abstract. This research aims to propose a new mathematical model for the transmission of stunting prevalence in children. This research develops an initial model of stunting prevalence, namely the BS_tID compartmental model which considers the basic characteristics of stunting transmission. This mathematical model will include the development of difference and differential equations to represent the transmission of stunting prevalence in real life. This new initial mathematical model can be used by the authorities as a prevention strategy to reduce the prevalence of stunting. The extension of this research will include the application of the proposed BS_tID mathematical model to the stunting data in Indonesia.

Keywords: compartmental model, difference equation, differential equations, stunting, children





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The Connectivity and the Structure of the Power Graph of Symmetric Group

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Abstract. This study investigates the power graph of symmetric group S_n for $3 \leq n \leq 6$. In power graph, vertices represent group elements, and edges connect vertices if one element is a power of another. We focus on detailed power relations and the systematic constructions on the power graph for each S_n . The analysis includes the identification of complete subgraphs K_n that correspond to cycles within the groups. Additionally, the study demonstrates the presence of non-complete subgraphs in the power graphs of symmetric groups for $n > 4$. This finding underscores the non-cyclic nature of symmetric groups, as they cannot be generated by a single element. The study provides a thorough understanding of the structure and properties of power graphs in symmetric groups, emphasizing their arrangement and algebraic characteristics.

Keywords: Power graph of group, symmetric group, connectivity, non-cyclic



IPCSM: 049 – 047

Mengesan Kehadiran Dinamik Kalut Ke Atas Siri Masa Suhu Di Kawasan Populasi Penduduk Tinggi Di Petaling, Selangor

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Abstrak. Populasi penduduk yang tinggi boleh memberikan kesan terhadap peningkatan suhu di kawasan bandar selain daripada kekurangan tumbuh-tumbuhan berikut penggantian hutan dengan bangunan yang giat dibangunkan dari semasa ke semasa. Kajian ini dijalankan bagi mengesan kehadiran dinamik kalut terhadap siri masa suhu di kawasan populasi tinggi di Petaling, Selangor sebelum peramalan dapat dilaksanakan dengan menggunakan pendekatan kalut. Kehadiran dinamik kalut dapat dikenal pasti dengan menggunakan plot ruang fasa dan kaedah Cao. Kedua-dua kaedah ini memerlukan pembinaan ruang fasa. Terdapat dua parameter yang diperlukan dalam pembinaan ruang fasa iaitu masa tunda, τ dan matra pemberanan, m . Di dalam kajian ini, nilai $\tau = 1$ adalah ditetapkan dan hasil nilai $E1(m)$ adalah 3. Keputusan menunjukkan dinamik kalut dapat dikenal pasti terhadap siri masa suhu di Petaling dengan wujud rantau penarik dan berkumpul di tengah-tengah plot ruang fasa. Tambahan lagi, nilai $E2(m) \neq 1$ dan ini mengukuhkan lagi kehadiran kalut hadir. Oleh hal demikian, data siri masa suhu di Petaling, Selangor boleh digunakan untuk dibina model peramalan menggunakan pendekatan kalut.

Kata Kunci: analisis; pendekatan kalut; siri masa; suhu populasi penduduk tinggi



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Analisis Kewujudan Dinamik Kalut Terhadap Siri Masa Kelajuan Angin Di Pelabuhan Klang, Malaysia

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Abstrak. Pengetahuan tentang sifat angin amatlah penting bagi sektor ekonomi seperti di kawasan pelabuhan dan peramalan kewujudan dinamik kalut di kawasan berkepentingan seperti Pelabuhan Klang dapat mengurangkan risiko kerugian dan pihak berwajib dapat melakukan persediaan lebih awal. Kajian ini dijalankan bagi menganalisis kewujudan dinamik kalut terhadap kelajuan angin di Pelabuhan Klang, Selangor dengan menggunakan plot ruang fasa dan kaedah Cao. Langkah ini penting sebelum peramalan menggunakan pendekatan kalut dilaksanakan. Asas bagi plot ruang fasa dan kaedah Cao adalah melibatkan pembinaaan semula ruang fasa dan kedua-dua kaedah ini memerlukan dua parameter iaitu (i) masa tunda, τ dan (ii) fasa dimensi pemberanan, d adalah diperlukan untuk plot ruang fasa dan kaedah Cao. Parameter τ diperoleh dengan penetapan $\tau = 1$ dan pengiraan nilai purata maklumat bersama (PMB). Manakala, d diperoleh daripada kaedah Cao dan hasilnya, terdapat dua gabungan parameter diperoleh iaitu ($\tau = 1, 4$) dan ($\tau_{pmb} = 1, 5$). Gabungan parameter tersebut adalah (1, 4) dan (1, 5). Keputusan menunjukkan dinamik kalut wujud dalam siri masa kelajuan angin apabila analisis plot ruang fasa menunjukkan wujud rantau penarik dan berkumpul di tengah-tengah plot ruang fasa bagi kedua-dua gabungan parameter. Manakala nilai $E1(d)$ menunjukkan nilai tepu dan terdapat nilai $E2(d) \neq 1$. Jadi, hasil dapatkan daripada kaedah Cao ini mengukuhkan lagi kewujudan dinamik kalut hadir pada data siri masa yang dikaji. Oleh hal demikian, data siri masa kelajuan angin di Pelabuhan Klang, Selangor boleh digunakan untuk dibina model peramalan menggunakan pendekatan kalut.

Kata Kunci: Dinamik kalut, siri masa kelajuan angin, pelabuhan



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Vibration Analysis of the Distributed Optical Vibration Sensor (DOVS) On Various Surrounding Material and Water Content

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Abstract. Distributed optical vibration sensing (DOVS) is an optical sensing method that monitors acoustic turbulence in optical fibres, and then demodulating and processing the optical signal to correlate it to an external parameter. Optical based DOVS sensors have a number of key advantages, including large-scale monitoring, good concealment, good flexibility and anti-electromagnetic interference which makes them useful for a wide range of applications. In this work, a distributed vibration sensing (DVS) is demonstrated using a 1550 nm erbium-doped fiber amplifier (EDFA) as a broadband emission source and a single-mode fiber (SMF) as the sensing mechanism. An Arduino piezoelectric transducer (PZT) vibrator is used as the vibration source in the experiments, while sand, soil, and cement with different water compositions are used as the test media. The different water content has varying refractive indices and elasticities. The vibration analysis is measured through the Fast Fourier Transform (FFT) where the frequency drift, intensity, and signal-to-noise ratio (SNR) is observed. Results of the testing show a similar sensitivity of intensity for different materials and water content which is 0.016dB/mL. Meanwhile, the highest frequency drift is observed for sand with varied water content which is 0.617Hz/mL. Similarly, the highest SNR of 23.5dB was also obtained for soil with a water content of 250 mL, while the lowest SNR was that of cement with the same water content at 15.1dB. This indicates that the DOVS system is capable of picking up even minor vibrations in cement, soil and sand, and would thus have significant applications in structural monitoring.

Keywords: Distributed vibration sensing, Optical fiber, Single Mode Fiber (SMF), vibration analysis





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Review on graphene/silver nanoparticles hybrid as supercapacitor

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Abstract. The demand for energy storage has rapidly increased in line with the increase in smart wearables and other electronic devices. Therefore, many studies have begun to focus on the development of supercapacitors as an alternative form of energy storage that is more powerful than batteries or capacitors. Graphene is one of the alternative electrode materials because of its excellent electrical properties and large surface area. However, pristine graphene tends to have a low conductivity, and the restacking also reduces the surface area, thus decreasing its performance as a supercapacitor electrode. The addition of silver nanoparticles (AgNPs) presents an alternative solution to overcome this problem. Recent progress on graphene/AgNPs hybrid supercapacitors will be summarized in this review article. The properties of graphene, AgNPs, and graphene/AgNPs will be briefly discussed followed by their synthesis methods. Furthermore, the performance of graphene/AgNPs as supercapacitor electrodes will be studied in detail. Finally, the challenges and future research directions in this field are highlighted. For instance, there is a need to improve the scalability and long-term stability of these hybrids while maintaining their exceptional electrochemical performance. Overall, the article provides a comprehensive overview of the current state-of-the-art in graphene/AgNPs hybrids for supercapacitor applications and identifies potential areas for further investigation.

Keywords: graphene, silver nanoparticles, supercapacitor





IPCSM: 022 – 026

A Comprehensive Study of 4-Sulfocalix[4]arene Thin Films with Atomic Force Microscopy: Thickness and Topographical Analysis

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Abstract. This study aims to characterise 4-Sulfocalix[4]arene (SC[4]) thin films using Atomic Force Microscopy (AFM) in analysing its thickness and surface morphology. Quartz substrates were cleaned using ultrasonic cleaning with an Elmasonic P70H. SC[4] thin films were then fabricated on a quartz surface using WS-400BZ-6NPP/A1/AR1 model spin coater from Laurel Technologies, producing thin films with 5, 10, 15, and 20 layers. Each thin film was characterised in the tapping mode of the AFM Park System NX-10. Scans were conducted on different film areas of different scales, and the data were analysed usingXEI Data Processing and Analysis Software. Height measurements obtained via Line Profile analysis revealed a progressive increase in film thickness with the additional layers, demonstrating a significant linear relationship. AFM images showed precise 2D and 3D surface topography, indicating that the thin films became uneven and non-uniform with the addition of more layers. The findings demonstrated a linear relationship between film thickness and the number of layers, measuring 58.175 nm for 5 layers, 77.626 nm for 10 layers, 84.608 nm for 15 layers, and 94.806 nm for 20 layers. The surface roughness of thin films was also determined, and it is significantly influenced by the number of layers, as illustrated by the root mean square roughness (R_q). This irregular deposition process leads to an increase in surface irregularity, as proven by equivalent studies on thin films. This study emphasised the effectiveness of AFM in thin film research by demonstrating its precision in measuring thickness and analysing surface topography.

Keywords: 4-Sulfocalix[4]arene, Spin-Coating Method, Atomic Force Microscope, Thickness Measurement, Topographical Analysis



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Comprehensive Review of Superhydrophobic/Superoleophilic vs. Superhydrophilic/Superoleophobic Membranes for Treating Oilfield-Produced Water

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Abstract. The effective and sustainable treatment of oilfield-produced water (OPW) remains a critical environmental and operational challenge within the oil and gas industry. Nowadays, advancements in membrane technology promise solutions for treating OPW in separation oil and water. This comprehensive review examines the performance, benefits, and limitations of two opposing membrane types: superhydrophobic/superoleophilic and superhydrophilic/superoleophobic. This review synthesizes recent advancements in material design, including the incorporation of nanomaterials, surface modifications, and composite structures, to enhance the functional properties of these membranes. Based on the material design, critical evaluations are conducted on essential performance criteria, such as mechanical stability, permeability, fouling resistance, separation efficiency, and reusability. Additionally, the review addresses the environmental and economic implications of deploying these membrane technologies in OPW treatment, considering scalability, sustainability, and cost-effectiveness. Superhydrophobic/superoleophilic membranes have excellent oil capture efficiency due to their strong oil affinity and water repellency. Nonetheless, they are susceptible to fouling and durability issues. In contrast, superhydrophilic/superoleophobic membranes, known for their water permeability and oil repellency, offer enhanced fouling resistance and long-term stability but may face challenges in achieving high separation efficiency. Moreover, the findings highlight the potential of integrating the strengths of both membrane types to develop hybrid solutions that address the diverse challenges in OPW treatment. Future research directions are suggested, focusing on innovative fabrication techniques not just in the fabrication of membranes but also in membrane production materials





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that provide sustainability, develop novel materials such as from graphene oxide and graphene to optimize membrane performance, and expand practical applicability. This comprehensive review can be a reference for choosing and developing membrane materials designed to treat OPW effectively and sustainably.

Keywords: Superhydrophilic/superoleophobic, superhydrophobic/superoleophilic, membrane, oilfield-produce water





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Kaedah PLS-SEM Atau CB-SEM Bagi Data Kesetiaan Pelanggan Terhadap Pembekal Perkhidmatan Mudah Alih

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Abstrak. Kajian ini bertujuan mengkaji dengan lebih jelas dua kaedah *Structural Equation Modelling (SEM)* yang sering digunakan iaitu *Partial Least Square (PLS-SEM)*, kaedah berdasarkan varians dan *Covariance Based (CB-SEM)*, kaedah berdasarkan varians. *SEM* biasanya digunakan untuk menerangkan pelbagai hubungan statistik secara serentak melalui visualisasi dan pengesahan model. Sesetengah penyelidik mengklasifikasikan *SEM* sebagai *CB-SEM*. Bagi membuat penilaian terhadap kaedah yang mempunyai pendekatan yang lebih baik, data yang sama digunakan bagi kedua-dua kaedah. Tinjauan telah dijalankan ke atas pengguna perkhidmatan mudah alih di Negeri Melaka, iaitu salah satu negeri yang terlibat dengan pembekal perkhidmatan yang tidak mencapai piawaian ditetapkan. Dalam kajian ini, seramai 448 responden telah mengambil bahagian. Dapatan kajian menunjukkan bahawa *loadings* item dalam PLS-SEM adalah lebih tinggi berbanding dengan CB-SEM. Dapatan juga memperlihatkan nilai *average variance extracted (AVE)* dan *composite reliability (CR)* adalah lebih tinggi dengan kaedah PLS-SEM berbanding CB-SEM, yang menunjukkan kebolehpercayaan dan kesahan konstruk yang lebih baik.

Kata Kunci: kaedah PLS-SEM, kaedah CB-SEM, AMOS, SmartPLS, data kesetiaan pelanggan





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K-nearest Neighbor Regression for Estimating Song Popularity Using Gower Distance

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Abstract. In the music industry, the popularity of a song is important to predict before it is released. The machine learning approach is also widely used to investigate human activities, such as in the art field. In this paper, we were interested in predicting the popularity of songs using the K-nearest neighbors regression. The Spotify app was used to gather some information related to the audio features of a song, i.e., song duration, acousticness, danceability, energy, instrumentalness, key, liveness, loudness, mode, speechiness, tempo, time signature, and valence. Since mixed-type variables were used, the Gower distance was considered for the dissimilarity measure. In addition, two weighting approaches were also compared for predicting song popularity. By using 10-fold cross-validation, we obtained the best performance in predicting the song popularity when $k = 5$ nearest neighbors were used. Moreover, it was also found that the proportional weights showed better prediction performance when compared with equal weights.

Keywords: song popularity, K-Nearest neighbor regression, audio feature, gower distance, weighting method



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Geographic Weighted Panel Regression Models For Contraceptive Use in West Sumatera

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Abstract. Geographically Weighted Panel Regression (GWPR) model applies panel regression to spatial data, geographic weight is used at each observation site to estimate parameters. This study aims to ascertain the GWPR model and the factors that impact the number of active family planning participants in each district/city in West Sumatera Province between 2020 and 2023. To achieve this, spatial weighting was provided by the fixed Kernel Gaussian Function, and the optimal bandwidth was determined by applying Cross-Validation (CV) criteria. The research data is secondary data obtained from the official website of the West Sumatra Central Bureau of Statistics. The findings of this study are the different in models and factors that influence the number of family planning participants in 19 districts / cities in West Sumatra.

Keywords: Geographic Weighted Panel Regression, Contraceptive Use, Spatial



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Translation, Validation, and Reliability of The Smartphone Addiction Instrument in The Indonesian Version for Early Childhood

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Abstract. The use of smartphones among young children is increasing rapidly with the advancement of technology. However, excessive use can lead to addiction and have negative impacts on children. This study aims to translate the Smartphone Addiction Instrument for early childhood into Indonesian and subsequently verify the validity and reliability of the instrument. This study is a cross-sectional observational survey involving the participation of 50 parents of children aged 4-5 years in data collection. There are three stages in this study: the translation process was developed through translation and back-translation; the validity involves three types of testing: content validity by consulting three experts: a psychologist, a psychiatrist, and an early childhood education lecturer; structural validity conducted through exploratory factor analysis and confirmatory factor analysis; and construct validity conducted using the Pearson test; and the reliability test was assessed using Cronbach's Alpha. The study results showed that the Content Validity Index (I-CVI) and the Scale Content Validity Index (S-CVI) of the instrument were both 1, indicating excellent content validity. The exploratory factor analysis revealed a three-factor structure, supported by eigenvalues, total explained variance, and the scree plot. Additionally, all recommended fit indices fell within acceptable ranges as determined by confirmatory factor analysis. The Cronbach's α value of the Smartphone Addiction Instrument in the Indonesian version was 0.796, indicating good overall reliability. Therefore, this Smartphone Addiction Instrument is valid and reliable among early childhood. The developed three-factor structure, comprising self-control failure, salience, and serious consequences, will help identify smartphone addiction in early childhood and can be used to plan educational interventions for parents, educators, and researchers in addressing smartphone addiction issues in early childhood.

Keywords: Smartphone Addiction Instrument, Translation, Validation, Reliability





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An Analysis of Primary School Teachers' Perceptions, Readiness and Willingness towards Development of Comprehensive Sexuality Education in Malaysia

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Abstract. Sex education in Malaysia is not fully implemented as it is still in debate whether it is compulsory to teach the young generation about sexuality. The concept of sexuality education is still considered taboo in our society and therefore the importance of SE rarely gets to be introduced at both home and school. Past studies emphasized that the implementation of CSE program in Malaysia seems ineffective in resolving the sexual related problems among children in this context. This study was aimed to analyse primary school teachers' perceptions, readiness and willingness towards development of Comprehensive Sexuality Education (CSE) in Malaysia. Quantitative research design with multistage cluster sampling was used to recruit 380 primary school teachers as the respondents for this study with a higher proportion of respondents taught in urban school areas (67.6%) compared to rural school areas (32.4%). The study revealed significant positive correlations between perceptions, readiness, and willingness towards CSE, emphasizing the interrelated nature of these elements. Improved perceptions of CSE were significantly associated with higher levels of readiness ($r = 0.793, p < 0.001$) and willingness ($r = 0.698, p < 0.001$). Moreover, MANOVA analysis reveals that there are significant differences in perceptions ($df = 1, p < 0.001$) and readiness ($df = 1, p = 0.001$), but not in willingness ($df = 1, p = 0.128$), towards the development of CSE between rural and urban primary school in Malaysia. This indicates that the willingness to engage in CSE development is uniformly high across both rural and urban teachers. In conclusion, this study underscores the necessity for enhanced support and resources to ensure educators are adequately prepared to effectively facilitate discussions on sex education. This can be achieved through comprehensive teachers' training programs aimed at advancing professional development in teaching sex education lessons.

Keywords: Comprehensive sexuality education, teachers, perceptions, readiness, willingness





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Forecasting Land Use Trends using Long Short-Term Memory Networks for Rubber Plantations in Johor

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Abstract. This work focuses on rubber plantations in Johor, Malaysia, to demonstrate how Long Short-Term Memory (LSTM) networks can be used to anticipate future land use trends. In addition to explaining the training method and describing the model architecture, the paper also covers several data pre-processing strategies and uses performance measures to assess the model's accuracy. To find patterns and trends in the historical data, the article also employs time series analysis. The results highlight how LSTM networks can be used to predict land usage accurately and consistently, providing valuable information for Johor's agricultural planning and policy-making.

Keywords: Long Short-Term Memory (LSTM), Land Use Forecasting, Rubber Plantations, Johor, Time Series Analysis





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Development of Chemistry Domain Assessment Instrument to Test Higher Level Thinking Skills Form 2 Students

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Abstract. This study aims to develop and validate the Chemistry Domain Item Assessment Test (IPDK) while assessing the reliability, validity, and level of students' higher-order thinking skills (HOTS) based on gender and location (urban and rural). Using a quantitative approach, a stratified random sampling method was employed to select 514 respondents from Form 2 students in national secondary schools in Selangor, comprising 252 rural and 262 urban students, with a gender distribution of 226 males and 288 females from a total population of 70,921 students in Selangor. The IPDK instrument exhibited high face and content validity ($CVI = 1$) as well as high internal consistency (Cronbach Alpha = 0.82). The main study results indicate that the mean score attained by sampled students in Selangor was 607.68 (High Level), reflecting a high level of mastery of Higher Order Thinking Skills (HOTS). Rasch Measurement Model analysis revealed that male students achieved a mean score of 647.34 (High Level), while female students scored 639.74 (High Level). Urban students achieved a mean score of 629.23 (High Level), compared to 573.92 (High Level) for rural students. Detailed statistical examination of the 50 items measured through high standard deviation, wide range of difficulty levels, high separation index, and low Mean Item Standard Error confirmed the reliability, validity, and effectiveness of the Rasch Measurement Model in testing a broad spectrum of item difficulty and consistent measurement of latent instrument properties. In conclusion, the study findings indicate that the IPDK instrument effectively aids educators in assessing the proficiency of Form 2 students in Chemistry, aligning with educational goals and serving as a suitable tool for measuring students' HOTS.

Keywords: chemistry, assessment, HOTS, Rasch



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Analisis Keperluan Untuk Pembangunan Aplikasi Pembelajaran Berasaskan Permainan Matematik Tambahan Tingkatan 4

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Abstrak. Matematik Tambahan merupakan satu cabang mata pelajaran matematik yang dijadikan sebagai mata pelajaran elektif di peringkat menengah atas di sekolah-sekolah di Malaysia. Mata pelajaran ini diperkenalkan bagi menyediakan pelajar ke arah bidang Sains, Teknologi, Kejuruteraan dan Matematik (STEM). Gaya pengajaran guru perlu berbeza-beza mengikut peredaran semasa dan generasi yang diajar untuk menarik minat mereka mengikut perubahan zaman yang mereka alami. Dengan kemajuan teknologi pendidikan, guru perlu melengkapkan diri dengan pengetahuan teknikal, pedagogi dan kemahiran untuk menghasilkan proses pengajaran dan pembelajaran (PDP) agar lebih berkesan dan berkualiti tinggi. Analisis keperluan ini bertujuan untuk mengenalpasti topik yang sukar dalam matematik tambahan tingkatan empat serta keperluan untuk membangunkan satu aplikasi pembelajaran berdasarkan permainan. Soal selidik dalam talian telah digunakan dalam kajian ini yang melibatkan 30 orang responden yang terdiri daripada murid tingkatan empat di Daerah Seberang Perai Tengah, Pulau Pinang. Dapatkan kajian menunjukkan bahawa sebanyak 60% menyatakan topik Indeks, Surd dan Logaritma merupakan topik yang paling sukar untuk dipelajari. 70% daripada responden telah mencadangkan untuk membangunkan satu aplikasi pembelajaran yang berdasarkan permainan bagi menarik perhatian murid semasa sesi pengajaran dan pembelajaran matematik tambahan tingkatan empat.

Kata Kunci: Aplikasi pembelajaran berdasarkan permainan





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Analisis Keperluan Pembangunan Dan Keberkesanan Modul Pembelajaran Heutagogi Terhadap Pencapaian Dan Motivasi Murid Pintar Cerdas Dalam Pembelajaran Subjek Fizik

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Abstrak. Kajian analisis keperluan ini dijalankan bagi memberi fokus kepada kepentingan membangunkan Modul Pembelajaran Heutagogi dalam kalangan Murid Pintar Cerdas di Akademi Sains Pendang, Kedah. Penggunaan Modul Pembelajaran Heutagogi ini memberi fokus kepada kaedah pembelajaran yang boleh diaplikasikan dalam pembelajaran Murid Pintar Cerdas. Modul Pembelajaran Heutagogi ini sesuai digunakan dalam pengajaran dan pembelajaran Murid Pintar Cerdas. Analisis keperluan ini telah dijalankan bagi mendapat maklumat daripada 37 orang guru yang mengajar subjek Sains dan Fizik di daerah Pendang dan daerah Padang Terap yang terletak di negeri Kedah. Soal selidik ini terdiri daripada 3 konstruk iaitu demografi yang mengandungi 4 item (jantina,tahap pengajian, mata pelajaran yang diajar dan pengalaman mengajar), kemudian diikuti dengan konstruk kedua iaitu keperluan untuk membangunkan Modul Pembelajaran Heutagogi dan akhir sekali adalah persoalan berkaitan topik fizik yang sesuai dipilih menggunakan menggunakan kaedah pembelajaran Heutagogi. Data dianalisis secara deskriptif untuk mendapatkan peratus dan nilai min bagi semua konstruk. Hasil kajian menunjukkan bahawa terdapat keperluan untuk membangunkan Modul Pembelajaran Heutagogi dalam kalangan Murid Pintar Cerdas terutamanya bagi topik Daya dan Gerakan. Hasil daripada kajian analisis ini memberi gambaran awal bahawa Modul Pembelajaran Heutagogi ini dapat membantu guru mengurangkan kawalan semasa proses PdP di samping meningkatkan pemikiran kritis dan kreatif dalam kalangan murid pintar cerdas. Selaian itu, hasil kajian analisis keperluan ini juga menunjukkan Modul Pembelajaran Heutagogi dapat menjadipakan proses PdP itu lebih berkesan dan menarik.

Kata kunci: Analisi Keperluan, Modul Pembelajaran Heutagogi, Murid Pintar Cerdas, Fizik



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Topology in Motion: Advancements in Pure Mathematical Theory and Applications

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Abstract. This article comprehensively explores topology, focusing on recent advancements, applications, and its integration with various disciplines. Topology, a branch of mathematics dealing with space's properties preserved under continuous transformations, has witnessed significant progress and interdisciplinary collaboration. Recent theoretical developments highlight advancements in algebraic topology, differential topology, and the interplay between topology and geometry. Integration with other fields, including number theory, theoretical physics, and biology, demonstrates topology's wide-ranging impact. Applications in scientific disciplines such as biology, chemistry, and materials science showcase how topological methods elucidate complex phenomena. Moreover, integrating topology with machine learning and artificial intelligence has led to innovative data analysis and pattern recognition approaches. Topological neural networks, for instance, leverage spatial and structural information for enhanced performance. This article underscores topology's profound implications for understanding fundamental structures and addressing real-world challenges by delving into recent developments and interdisciplinary connections.

Keywords: Topology, Recent Developments, Applications, Interdisciplinary Integration, Algebraic Topology, Differential Topology, Theoretical Physics, Biology, Chemistry, Machine Learning, Artificial Intelligence





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Pemodelan Dinamik Penyebaran dan Strategik Kawalan Penyakit Rabies di Asia Tenggara: Kajian Literatur Bersistematik (2019-2023)

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Abstrak. Rabies merupakan salah satu penyakit berjangkit (zoonosis) yang boleh menjelaskan sistem saraf manusia dan kesihatan awam di kebanyakan kawasan di Asia Tenggara serta menimbulkan ancaman kepada populasi manusia dan juga haiwan. Penyakit ini boleh menjangkiti manusia melalui air liur haiwan yang terinfeksi *Lyssavirus* dan kebanyakannya adalah melalui gigitan anjing. Dalam dunia yang ideal, strategik pencegahan dan kawalan Rabies perlu dibangunkan dengan pemahaman menyeluruh tentang dinamik penyakit ini. Dinamik penyebaran Rabies di Asia Tenggara dipengaruhi oleh beberapa faktor, termasuk kepadatan populasi anjing, liputan vaksinasi, tingkah laku manusia, dan faktor persekitaran. Pemodelan dinamik penyebaran dan strategik kawalan Rabies adalah penting bagi memahami faktor-faktor yang mempengaruhi penyebarannya dan membangunkan strategik kawalan yang lebih efektif. Beberapa pendekatan pemodelan matematik dan komputasi telah digunakan untuk memahami corak dinamik penyebaran Rabies di Asia Tenggara. Teknik-teknik pemodelan ini berupaya membantu dalam mensimulasikan penyebaran Rabies, menilai keberkesanan langkah-langkah kawalan, dan mengenal pasti strategik intervensi yang optimum. Justeru itu, satu kajian literatur bersistematik telah dijalankan dengan berpandukan kriteria PRISMA bagi menganalisis maklumat yang berkaitan dengan pemodelan dinamik penyebaran dan strategik kawalan Rabies di Asia Tenggara. Secara umumnya, ulasan kajian ini melibatkan beberapa prosedur seperti membandingkan pelbagai kaedah pemodelan, menyemak dan menilai keberkesanan langkah-langkah kawalan, serta mengenal pasti jurang yang boleh dikaji atau diteroka oleh penyelidik dalam usaha membantu mengurangkan kadar kes Rabies di Asia Tenggara. Melalui kajian literatur bersistematik, dan aplikasi pendekatan pemodelan matematik dan komputasi, taburan geografi, epidemiologi penyakit dan kesan penyakit Rabies ke atas populasi manusia dan haiwan dapat dijelaskan secara terperinci. Penemuan ini menekankan keperluan mendesak





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untuk intervensi pelbagai aspek yang bertujuan untuk mengurangkan kadar kes Rabies di rantau ini. Walaupun kemajuan telah dicapai dalam beberapa bidang, terdapat cabaran yang dihadapi termasuklah sistem pengawalan yang tidak mencukupi, akses terhad kepada vaksin, dan halangan sosio-budaya terhadap vaksinasi dan pengurusan populasi anjing yang kurang baik.

Kata kunci: Rabies, Zoonosis, Strategik kawalan, Pemodelan matematik, Pemodelan komputasi





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Enhanced *E. coli* expression of membrane protein FLL1 originated from oil palm

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Abstract. The oil palm, *Elaeis guineensis* is blessed with a diverse family of endogenous lipase known to influence the innate oil quality while catalyzing many other biochemical reactions in the fruit. To accurately assess the capacity of the enzymes as a catalyst, single protein isolation is necessary. FLL1; a previously discovered oil palm lipase was chosen as the gene of interest due to its possible effect on the oil quality. The previous studies conducted provided a well-constructed documentation on FLL1 at the gene level leaving its information as protein, a literary gap. It was deduced that recombinant protein strategy was the best option to reach the aligned goal. Therefore, FLL1 was subjected to gene cloning and protein expression to prompt the whole study. Firstly, FLL1 was synthesized into pGEX6P-2 to produce GST fusion protein. Then, the vector was transformed and cloned in Rosetta™(DE3) pLysS Competent Cells. The culture was subjected to an optimized protocol ascertained via manipulation of parameters (induction temperature and IPTG concentration). The result revealed that FLL1 was best expressed at 37 °C with 0.4 mM IPTG to produce crude with desirable lipase activity. As planned, this study managed to provide the groundwork for FLL1 purification as a functional protein, later. To uncover the true potential of FLL1, the enzyme should be profiled to examine its property and possibly initiate its future commercialization.

Keywords: FLL1, oil palm lipase, recombinant protein, cloning, protein expression





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Development and Usability of the Geometry Kit Integrating Inquiry Learning Based Project in the Topic of Space Year Four

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Abstract. This study aims to develop and test the usability of the Geometry Kit (GeoKit) integrating project-based inquiry learning in the topic of Space for Year 4 Mathematics. This study uses a development study design by applying the ADDIE model which consists of five phases namely analysis (A), design (D), development (D), implementation (I) and evaluation (E). The sample selection was carried out by simple random sampling of 124 samples consisting of fourth year students in two schools in Batang Padang, Perak. Data was collected through three research instruments, namely a needs analysis questionnaire, content and face validity of GeoKit questionnaire and usability of GeoKit questionnaire. Validation of GeoKit was performed by four experts. The findings of the expert evaluation were analyzed using the Content Validity Index (CVI) while the data of GeoKit needs analysis and usability were analyzed descriptively through frequency, percentage, mean and standard deviation. The findings of the study show that the developed GeoKit has satisfactory validity with I-CVI and S-CVI/Ave values of 1.00. The findings of the study also show the mean score and standard deviation of GeoKit's usability for the construct of usefulness ($M=3.43$, $SP=0.37$), easy to learn ($M=3.46$, $SP=0.39$), easy to use ($M=3.49$, $SP=0.50$) and satisfaction ($M=3.60$, $SP=0.38$) are high. In conclusion, the developed GeoKit has satisfactory validity and high usability. Hence, it implicates that GeoKit that integrates project-based inquiry learning becomes one of the alternative kits that supports active student learning and provides a meaningful learning experience for students in mastering the topic of Space.

Keywords: geometry kit, project-based inquiry learning, ADDIE model, usability, mathematics



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