UNIVERSITI TEKNOLOGI MARA

PIONEERING EDUCATIONAL PERSPECTIVES

Series 2025

THE World University Rankings 2023 TOP 1501+
TOP 128 UI GreenMetric
MDEC Premier Digital Tech Institution
THE IMPACT RANKINGS 2022 TOP 101-200
MyRA

PIONEERING EDUCATIONAL PERSPECTIVES

Series 2025

Chief Editors:
Nur Alyani binti Khairol Anuar
Muhammad Irfan bin Mokhtar

Editors:
Aqeela binti Ahmad Kamiri
Hawa Syamsina binti Md Supie
Nurul Nadiah binti Rasdi
Qistina Azra binti Mohani
Siti Aishah binti Taib
Nurul Hijah binti Jasman
Siti Mariam binti Mohammad Iliyas

Published by:
Academy of Language Studies, Universiti Teknologi MARA
Cawangan Johor, Kampus Pasir Gudang, Jalan Purnama,
Bandar Seri Alam, 81750 Masai, Johor Darul Ta'zim.
07-3818455
edgii.apbpg@gmail.com

Copyright © Pioneering Educational Perspectives: Series 2025

All rights reserved. No part of this publication may be reproduced in any form or by electronic or mechanical means, including information storage and retrieval systems, or transmitted in any form or by any means, without the prior permission in writing from the publisher.

e-ISBN : 978-967-0033-31-0

Published date: 2025

Chief Editors:
Nur Alyani binti Khairol Anuar
Muhammad Irfan bin Mokhtar

Editors:
Aqeela binti Ahmad Kamiri
Hawa Syamsina binti Md Supie
Nurul Nadiah binti Rasdi
Qistina Azra binti Mohani
Siti Aishah binti Taib
Nurul Hijah binti Jasman
Siti Mariam binti Mohammad Iliyas

Published by:
Academy of Language Studies, Universiti Teknologi MARA Cawangan Johor, Kampus Pasir Gudang, Jalan Purnama, Bandar Seri Alam, 81750 Masai, Johor Darul Ta'zim.
07-3818455
edgii.apbpg@gmail.com

Preface

Pioneering Educational Perspectives: Series 2025 is a collection of thought-provoking insights and research contributions exploring contemporary educational trends and practices. This eBook presents a diverse range of perspectives on innovative teaching methodologies, digital learning strategies, and transformative approaches in education. Designed to serve as a resource for educators, researchers, and practitioners, it aims to inspire meaningful discussions and advancements in the field. Through carefully curated chapters, this publication offers fresh ideas and practical solutions to enhance learning experiences in an ever-evolving educational landscape.

e-ISBN: 978-967-0033-31-0

OPTIMIZING CONTENT DELIVERY FOR TEACHING AND LEARNING IN SCIENCE YEAR 5 USING A VIRTUAL REALITY ENVIRONMENT WITH COSPACES EDU 108

Muhammad Asyraf Abdullah Zawawi 108

ENHANCING PHARMACEUTIC EDUCATION WITH DIGITAL TOOLS: LEARNING ABOUT EXCIPIENTS IN MARKETED PRODUCTS THROUGH INFOGRAPHICS 112

Nurul Alyaa binti Ibrahim[1,*], Mohd Nadzri Mohd Najib[2] & Wong Yuet Yen[3] 112

IDENTIFYING STUDENT AT-RISK VIA BEHAVIORAL RECOGNITION AND LEARNING ANALYTICS DASHBOARD 116

Chai Waii Yuan[1], Chong Mien May[2] & Hairul Aysa binti Abdul Halim Sithiq[3] 116

Lenz DiSCo 120

Noreha Binti Midin[1]*, Norfazlina Binti Mohd Rahim[2], Rizaudin Bin Abd Rashid[3] & Najihah Binti Bakri[4] 120

TIKTOKONOMICS – HARNESSING THE POWER OF SOCIAL MEDIA TO TEACH ECONOMICS ECONOMICS FOR BUSINESS DECISION (ECO745) 123

Azlina Hanif[1,*]& Arlinah Abd Rashid[2] 123

ENGAGING LEARNING: AN INTERACTIVE GUIDE FOR CROP SCIENCE 127

Siti Nurul Atikah Abu Samah[1], Wan Natasya Wan Ahmed[2,*], Hamizah Othman[3] & Muhammad Afiq Haikal Yusoff Raimi[4] 127

KIT PEMBELAJARAN INTERAKTIF MBPK KSSM T1 SUBJEK PENGURUSAN DIRI: YOUR COLOURS YOUR LIMIT 130

Sandi Anak Danel[1]*, Pang Lee Ying[2], Shirley Anyie[3], Geraldine Lasak Ding[4], & Vestly Kong Liang Soon[5] 130

IMMERSIVE IOT LEARNING WITH AR-MICROC: A NEW EDUCATIONAL PARADIGM 134

Farah Waheda Othman[1]*, Irdayanti Mat Nashir [2], Mohamad Syahril Mat Saad[3], Ramlee Mustapha[4] & Mohamed Nor Azhari Azman[5] 134

3M-VM: REVOLUTIONIZING ESL SKILLS THROUGH AI IN PROJECT- BASED LEARNING 138

Nurul Ajleaa binti Abdul Rahman[1]* & Nur Ain Nasuha binti Nasran[2] 138

THEORY-BASED LEARNING DALAM PENDIDIKAN ERA 4.0: PENGHASILAN PRODUK INOVASI MELALUI KURSUS TEORI SENI DENGAN BANTUAN PLATFOM KREATIF AI SEBAGAI KAEDAH PEMBELAJARAN MASAKINI 142

Dr. Mohd Iqbal Badaruddin[1,*], Muhammad Luqman Ibnul Hakim Mohd Saad[2], Dr. Farid Abdullah[3], Hartini Mohd Razali[4] & Mazni Omar[5] 142

AI2P: ARTIFICIAL INTELLIGENCE TOOLS AND PAIR PROGRAMMING TO ENHANCE STUDENTS SELF-EFFICACY AND CONFIDENCE TO LEARN PYTHON PROGRAMMING 148

Ts. Syahrul Affendi Bin Abdul Rahman[1,*] 148

ASSESSMENT MARKS MADE EASY: THE EXCEL VBA SOLUTION 152

Mohamad Irwan P. Harahap[1,*] & Rohimah Khoiriyah Harahap[2] 152

DIGITAL TRANSFORMATION OF MALAYSIAN SIGN LANGUAGE EDUCATION 156

Mat Redhuan Samsudin[1,*], Noorlida Daud[2] & Rushana Sulaiman @ Abd Rahim[3] 156

e-ISBN: 978-967-0033-31-0

AI2P: ARTIFICIAL INTELLIGENCE TOOLS AND PAIR PROGRAMMING TO ENHANCE STUDENTS SELF-EFFICACY AND CONFIDENCE TO LEARN PYTHON PROGRAMMING

Ts. Syahrul Affendi Bin Abdul Rahman[1*]

[1]*MRSM Kuala Klawang*

**Corresponding author: syahrul.affendi@mara.gov.my*

ABSTRACT

This study explores the impact of integrating artificial intelligence (AI) tools and pair programming on the self-efficacy and confidence of secondary school students in learning Python programming. The study was conducted with 74 secondary school students with no experience in programming. The research is based on Quasi-Experimental (Pretest-Posttest Design). Over an 8-week period, students engaged in a structured Python programming class that combined the use of AI tools for coding aid and pair programming techniques. Self-efficacy and confidence levels were measured through pre- and post-intervention surveys. A t-test was used to analyze the differences in the pre- and post-intervention scores. The t-test analysis revealed a statistically significant improvement in students' self-efficacy and confidence levels in learning Python programming after the intervention. The mean self-efficacy score increased from 5.24 (SD = 0.8) to 6.31 (SD = 0.4), and the mean confidence score increased from 4.27 (SD = 0.7) to 6.3 (SD = 0.4), both at a significance level of $p < 0.01$. The integration of AI tools and pair programming significantly enhances the self-efficacy and confidence of secondary school students in learning Python programming. These findings suggest that educational strategies incorporating AI and collaborative learning can be effective in promoting positive learning outcomes in computer science education.

KEYWORDS: Artificial Intelligence, Pair Programming, Computer Science Education, ChatGPT, Google Gemini, Copilot.

PROBLEM AND OBJECTIVE

Programming skills continue to be one of the most in-demand skills by companies today in the digital era. The pandemic that has swept across the globe over the past two years has accelerated the digital transformation in every side of life (Hursen, 2023). Hence, programming skills are one of the necessary abilities needed to aid this change. To support this, the education sector also plays a role in exposing programming skills to the younger generation, even as they enter higher education (Alam, 2023). An individual does not necessarily need to become a professional programmer to get programming skills. However, being exposed to programming can enhance one's computational abilities, which are essential for solving everyday problems.

A variety of teaching and learning approaches are used in programming classes to help students master the subject. The trending approaches include pair programming, program visualization, and gamification (Wei et al., 2021; Malik et al., 2020; Basigie, 2022). The mentioned approaches have specific goals in mind: to share the thinking process with others to enhance productivity, visually display the code for easier absorption of information, or incorporate game elements to enhance engagement in learning.

e-ISBN: 978-967-0033-31-0

Teachers who employ pair programming in their classes can emphasize more student-centered learning. In addition, the technique is also able to reduce teacher workload by allowing students to learn collaboratively with their peers without requiring constant guidance from the teacher (Williams et al., 2002). These active learning techniques also help promote attributes of 21st-century students, such as the ability to collaborate and communicate with their peers (Hsu et al., 2022).

In instances where limited teacher guidance is used, students may face challenges assessing their own learning. However, the integration of innovative technologies, such as generative artificial intelligence, can prove beneficial in this regard. It is important to note that the purpose of employing AI tools is not to replace teachers but rather to serve as a valuable resource in facilitating and augmenting students' self-directed learning (Meyer et al., 2023).

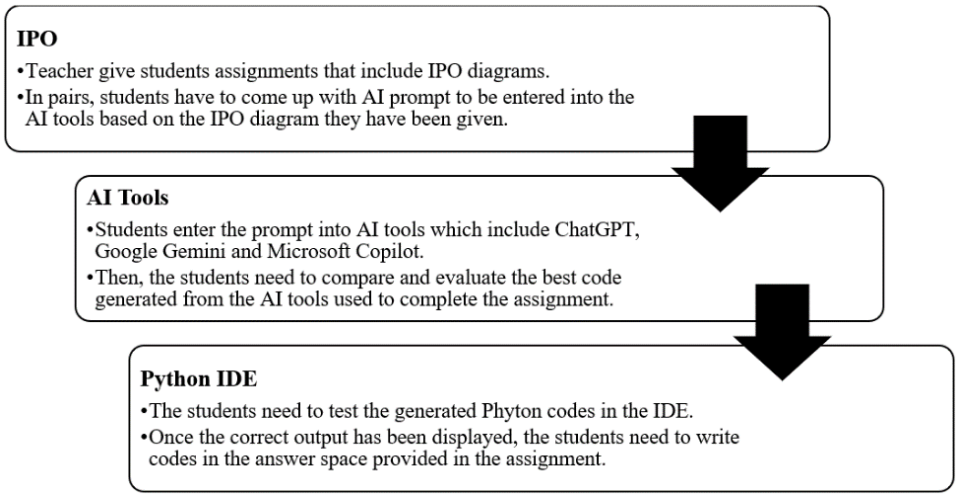
Hence, learning not only happens between human-human collaboration through pair programming but also between computer-human collaboration using AI tools (Wu et al., 2023; Santos, 2023). However, there are limited efforts to incorporate both AI tools and pair programming into the teaching and learning of programming subjects, particularly in secondary education. Therefore, this research looks to address this gap by examining the impact of AI tools and pair programming on students' programming skills and outcomes.

DESIGN DESCRIPTION

The research employed a quasi-experimental (pretest-posttest) design. Over eight weeks, students participated in structured Python programming classes that combined AI tools and pair programming techniques. The intervention involved practical assignments where students used AI tools to generate code and collaborated with peers to complete tasks. The study measured self-efficacy and confidence levels through pre- and post-intervention surveys, analyzed using t-tests to determine the significance of the results. efly explain your design, covering its purpose, features, functionality, and target audience. Highlight any unique selling points.

VISUALS

The study includes a flow diagram illustrating the practical assignment completion process during the intervention. This diagram outlines the steps from receiving assignments with IPO (Input-Process-Output) charts to using AI tools for code generation and testing the final code in an IDE.



NOVELTY AND UNIQUENESS

The novelty of this study lies in its dual approach of integrating AI tools and pair programming in secondary education. While AI tools like ChatGPT, Google Gemini, and Copilot have been

e-ISBN: 978-967-0033-31-0

used individually in educational settings, their combined use with pair programming is relatively unexplored. This innovative approach not only aids in coding tasks but also fosters collaborative learning, enhancing both human-human and human-computer interactions.

BENEFITS TO MANKIND

The integration of AI tools and pair programming in education can significantly enhance students' learning experiences and outcomes. By improving self-efficacy and confidence in programming, students are better prepared for the demands of the digital era. This approach promotes essential 21st-century skills such as collaboration, communication, and self-directed learning, contributing to the development of a more competent and confident future workforce.

COMMERCIAL POTENTIAL

Educational institutions, from high schools to universities, can integrate AI2P modules into their curricula. These modules can be used in computer science subject to help students learn programming more effectively. By providing an interactive and supportive learning environment, institutions can boost student outcomes and satisfaction, potentially attracting more enrolments.

Developing a mobile app that incorporates AI2P can make learning Python programming accessible to a wider audience. The convenience of a mobile app allows students to practice coding anytime and anywhere. AI tools within the app can offer on-the-go assistance, making it easier for students to learn and troubleshoot problems independently.

CONCLUSION

The study demonstrates that the integration of AI tools and pair programming, termed AI2P, effectively enhances students' self-efficacy and confidence in learning Python programming. The results indicate that AI2P promotes higher self-regulation and collaborative learning, preparing students for the challenges of the digital age. The success of AI2P suggests that educational strategies incorporating AI and collaborative learning can transform programming education, leading to improved student skills, knowledge, and confidence.

REFERENCES

Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. Contemporary Educational Technology, 15(3), ep429.

Andersen, R., Mørch, A. I., & Litherland, K. T. (2022). Collaborative learning with block-based programming: investigating human-centered artificial intelligence in education. Behaviour & Information Technology, 41(9), 1830-1847.

Basigie, M. A. (2022). The Impact of Combining Follow-Up Questions and Worked Examples in Program Visualization Tool on Improving Students 'held Mental Models of Pointers 'value And Address Assignment. Education & Pedagogy Journal, (2 (4)), 53-64.

Biswas, S. (2023). Role of ChatGPT in Computer Programming.: ChatGPT in Computer Programming. Mesopotamian Journal of Computer Science, 2023, 8–16.

Bowman, N. A., Jarratt, L., Culver, K. C., & Segre, A. M. (2020). Pair programming in perspective: Effects on persistence, achievement, and equity in computer science. Journal of Research on Educational Effectiveness, 13(4), 731-758.

e-ISBN: 978-967-0033-31-0

Bailey, P. (2023). Code and Debug with Bard. Google. https://blog.google/technology/ai/code-with-bard

Chaudhary, T. (2023). Google Bard for Developers. Edureka. https://www.edureka.co/blog/google-bard-for-developers

Cockburn, A., & Williams, L. (2000). The costs and benefits of pair programming. Extreme programming examined, 8, 223-247.

Faja, S. (2011). Pair Programming as a Team-based Learning Activity: A review of Research. Issues in Information Systems, 12(2), 207-216.

Golgiyaz, Sedat. (2023). ChatGPT in Computer Software Education.

Hsu, Ting & Chang, Ching & Wu, Long-Kai & Looi, Chee-Kit. (2022). Effects of a Pair Programming Educational Robot-Based Approach on Students' Interdisciplinary Learning of Computational Thinking and Language Learning. Frontiers in Psychology.

Hursen, C., Paşa, D., & Keser, H. (2023). High School Students' Use of Information, Media, and Technology Skills and Multidimensional 21st-Century Skills: An Investigation within the Context of Students, Teachers, and Curricula. Sustainability, 15(16), 12214. MDPI AG.

Jonsson, M., & Tholander, J. (2022, June). Cracking the code: Co-coding with AI in Creative Programming Education. In Proceedings of the 14th Conference on Creativity and Cognition (pp. 5-14).

Kazanidis, I., & Moussiades, L. (2017). The Use of Pair Programming in The Object-Oriented Programming Instruction. MIBES transactions, 11(1), 40-47.

Korkmaz, Ö., & Altun, H. (2014). Adapting Computer Programming Self-Efficacy Scale and Engineering Students' Self-Efficacy Perceptions. Participatory Educational Research, 1(1), 20-31.

Lo, Chung Kwan. (2023). What Is the Impact of ChatGPT on Education? A Rapid Review of Literature. Education Sciences. 13. 410.

Malik, S., Al-Emran, M., Mathew, R., Tawafak, R., & AlFarsi, G. (2020). Comparison Of E-Learning, M-Learning and Game-Based Learning in Programming Education–A Gendered Analysis. International Journal of Emerging Technologies in Learning (iJET), 15(15), 133-146.