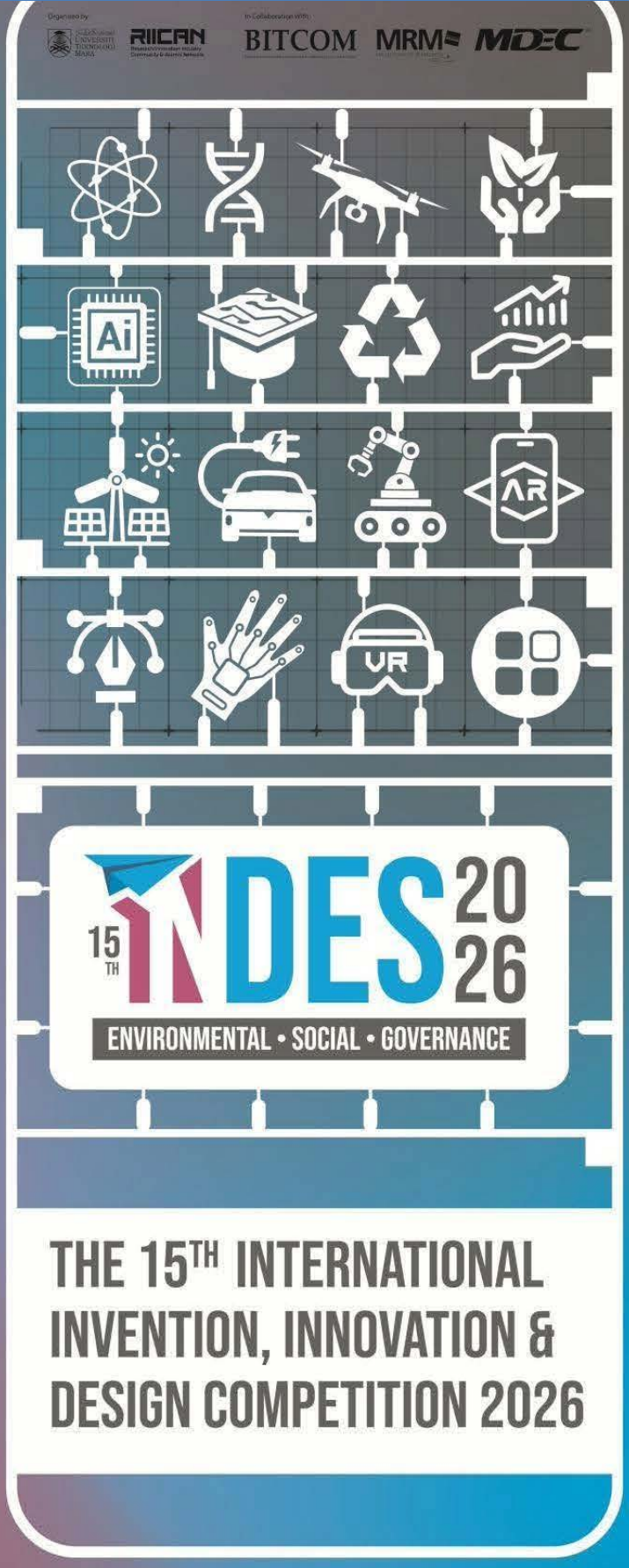


E-BOOK OF

EXTENDED ABSTRACT

E-BOOK OF EXTENDED ABSTRACT

THE 15th INTERNATIONAL
INVENTION, INNOVATION &
DESIGN COMPETITION 2026

Organized by:
Office of Research, Industry,
Community & Alumni Network
UiTM Perak Branch

© Unit Penerbitan UiTM Perak, 2026

All rights reserved. No part of this publication may be reproduced, copied, stored in any retrieval system or transmitted in any form or by any means; electronic, mechanical, photocopying, recording or otherwise; without permission on writing from the director of Unit Penerbitan UiTM Perak, Universiti Teknologi MARA Perak Branch.

Unit Penerbitan UiTM Perak,
Universiti Teknologi MARA,
Perak Branch, 32610
Seri Iskandar Perak, Malaysia.

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e- ISBN 978-967-2776-67-3

Cover Design: Asrul Nizuan Ariffin

Typesetting : Georgia

EDITORIAL BOARD

Editor-in-Chief

Muhd Syahir Abdul Rani

Managing Editors

Muhammad Wajihuddin Johari
Paul GnanaSelvam A/L Pakirnathan
Nazirul Mubin Mohd Noor
Nurdiyana Mohamad Yusof
Halimatussadiah Iksan

Copy Editors

Sheema Liza Idris
Nurul Munirah Azamri
Zarlina Mohd Zamari
NoorAileen Ibrahim
Farahidatul Akmar Awaludin
Siti Syairah binti Fakhruddin
Noor Fazzrienee JZ Nun Ramlan
Madaha binti Hanafi @ Mohd Ghani
Halimatun Saadiah Abd Mutalib
Hanitha A/P Satthiananthan
Syaza Kamarudin
Iza Faradiba Mohammad Patel
Nuramira Anuar
Noorlinda Alang
Noraziah Azizan
Faridatul Akma Wan Mohd Rashdi
Azurawati Zaidi
Ong Elly
Noran Nur Munira Khalili
Amirah Athirah Amir Yazid
Nurshahirah Azman
Daljeet Singh Sedhu A/L Janah Singh
Budiman Sabri Ahmad
Amirul Farhan Ahmad Tarmizi
Sarah Sakinah Assa'adah Johari

PPC EDGE: SMART LEARNING TOOL

Azilah Anis[1], Azimah Daud[1], Siti Norida Wahab[1*], Shariff Harun[1]

[1]Faculty of Business and Management, Universiti Teknologi MARA Cawangan Selangor, 42300 Puncak Alam, Selangor, Malaysia

**Corresponding author: sitinorida23@uitm.edu.my*

ABSTRACT

PPC Edge: Smart Learning Tool is a course-aligned, ChatGPT-powered assistant developed to support independent and self-directed learning in Production Planning and Control (OPM545). It addresses student challenges in understanding technical PPC concepts, solving calculations, and applying knowledge to real business scenarios gaps which often linked to limited contact hours and underprepared institutional AI support in Malaysian higher education. The tool combines AI guidance with structured prompts, critical review, and reflective learning, facilitating concept explanation, calculation solving with managerial interpretation, business application, exam revision, and answer checking. Developed through a six-stage process which is problem identification, instructional design, chatbot configuration with iterative YAML refinement, pilot testing, classroom implementation, and evaluation, PPC Edge was used by 67 Part 4 undergraduate students during Semester 1, 2025/2026. Pre-post surveys showed improvement across six learning areas, with the strongest gains in independent learning, business application, conceptual understanding, and calculation solving. PPC Edge demonstrates that faculty-curated, course-specific AI can enhance learning autonomy, promote AI literacy, and extend support beyond classroom hours when implemented responsibly.

Keywords: Artificial Intelligence, Production Planning and Control, Self-Directed Learning, AI Literacy, Higher Education

1. INTRODUCTION

Production Planning and Control (OPM545) is a core area in operations management because it supports resource planning, production control, demand management, work scheduling, and operational efficiency. In OPM545, students are expected to understand topics such as forecasting, aggregate planning, Material Requirements Planning, scheduling, Just-in-Time, and other PPC-related concepts. These topics require students to combine conceptual understanding, calculation accuracy, and managerial interpretation. However, many students struggle to move confidently from theory to quantitative procedures and then to business application. This reflects a wider challenge in higher education, where students need learning support that is flexible, personalised, and responsive to different levels of understanding (Badger et al., 2026).

The rapid adoption of generative AI in higher education has created both opportunities and risks. ChatGPT and similar tools are increasingly used for explanation, tutoring, feedback, clarification, and academic support. However, research shows that these tools require careful integration because unguided use may encourage over-dependence, weak critical evaluation, or academic misconduct (Baig & Yadegaridehkordi, 2024; McGrath et al., 2025). UNESCO (2023) also argues that generative AI should be introduced through human-centred, ethical, and pedagogically sound approaches rather than

treated as a replacement for teaching and learning. Therefore, the main issue is not whether students use AI, but whether they use it critically, responsibly, and in ways that strengthen learning.

Hence, PPC Edge was developed to address this need in OPM545. It is a course-aligned AI chatbot designed to support independent and self-directed learning by helping students understand PPC concepts, solve calculations, apply knowledge to business situations, revise for assessments, and check their own answers. This approach is consistent with recent findings that GenAI chatbots can support student learning when they provide personalised assistance, immediate feedback, and opportunities for self-regulation, while still requiring students to evaluate outputs critically (Badger et al., 2026).

The development of PPC Edge also aligns with Malaysia's responsible AI agenda. The National Guidelines on Artificial Intelligence Governance and Ethics emphasise fairness, reliability, privacy, inclusivity, transparency, accountability, and human benefit as key principles for responsible AI use (Ministry of Science, Technology and Innovation Malaysia [MOSTI], 2024). In this context, PPC Edge supports AI-literate learning by teaching students not only PPC content, but also how to prompt effectively, review AI-generated responses critically, cross-check answers, and avoid passive copying

2. METHODOLOGY

PPC Edge was developed through a six-stage process: (1) problem identification, (2) instructional design, (3) chatbot configuration with iterative YAML refinement, (4) pilot testing and refinement, (5) classroom implementation, and (6) evaluation. Problem identification focused on diagnosing student learning difficulties and defining the innovation's objectives. Instructional design aligned the tool with course outcomes and created the chatbot blueprint. During configuration, the knowledge base and YAML instruction architecture were developed and refined iteratively until internal testing standards were met. Pilot testing with former students provided feedback for further YAML refinement. In classroom implementation, 67 Part 4 OPM545 students used PPC Edge before and after classes, during tutorials, assignments, case preparation, and revision week. A structured guidance package instructed students on accessing the tool, writing effective prompts, refining weak responses, reviewing AI-generated answers critically, and recording learning points. Students were also reminded to verify calculations against lecture notes or textbooks (UNESCO, 2023). Effectiveness was evaluated using pre-post surveys measuring improvement in independent learning, PPC concept application, conceptual understanding, calculation solving, exam revision, and answer checking. Changes in scores indicated the impact of PPC Edge on student learning outcomes.

3. FINDINGS

The findings show positive improvement across the four learning areas with available pre-use and post-use data. Table 1 presents the mean scores before and after students used PPC Edge, together with the mean gain and percentage improvement. Overall, the results indicate that PPC Edge had the strongest impact on independent learning and application of PPC concepts to real business situations, followed by conceptual understanding and calculation solving. This pattern suggests that the tool was especially useful in helping students learn beyond classroom hours and connect PPC knowledge with practical operational issues.

Table 1 Improvement in Student Learning After Using PPC Edge

Learning Area	Before	After	Mean Gain	Improvement (%)
Independent learning	2.89	4.60	1.71	59.2
Application of PPC concepts	2.94	4.46	1.52	57.0
Understanding PPC concepts	3.25	4.60	1.35	41.5
Solving calculations	2.95	4.01	1.06	29.9

The strongest improvement was recorded in independent learning, where the mean score increased from 2.89 before using PPC Edge to 4.60 after using the tool, representing a gain of 1.71 points or 59.2%. This suggests that PPC Edge helped students become more confident in learning independently outside formal classroom hours. The result is consistent with recent literature suggesting that generative AI chatbots can support self-directed learning when students use them for immediate explanation, feedback, and guided academic support rather than passive answer copying (Badger et al., 2026).

The second highest improvement was recorded in the application of PPC concepts to real business situations, where the mean score increased from 2.94 to 4.46, showing a gain of 1.52 points or 57.0%. This finding is significant because application is often more complex than memorisation. In OPM545, students must interpret operational problems such as demand uncertainty, inventory shortage, production delay, capacity constraint, or scheduling conflict, then connect these problems with relevant PPC concepts. PPC Edge supported this process by helping students identify the main issue, select the appropriate concept, explain its operational implication, and consider suitable managerial action. This supports the view that AI-supported learning should function as a reasoning aid that helps students interpret and apply knowledge, not merely retrieve information (McGrath et al., 2025)

Students' understanding of PPC concepts also improved from 3.25 to 4.60, representing a gain of 1.35 points or 41.5%. This indicates that students benefited from immediate explanations, simpler examples, and follow-up questioning when they did not fully understand a topic. This finding aligns with studies showing that ChatGPT and similar AI tools can support higher education through explanation, clarification, and personalised academic assistance when used with clear pedagogical guidance (Baig & Yadegaridehkordi, 2024).

Calculation solving improved from 2.95 to 4.01, with a mean gain of 1.06 points or 29.9%. Although this was the lowest percentage improvement, the gain remains meaningful because calculation-based topics require procedural accuracy, correct formula selection, data organisation, and repeated practice. PPC Edge helped students follow a structured calculation process that included formula, given data, working steps, final answer, and managerial interpretation. However, the smaller gain also suggests that calculation learning still requires lecturer guidance, worked examples, and verification against lecture notes because generative AI tools may occasionally produce inaccurate numerical steps or misleading outputs (UNESCO, 2023)

Overall, the findings demonstrate that PPC Edge is most effective when used as a guided learning assistant rather than a replacement for lecturers, textbooks, or student effort. Its value lies in course alignment, structured student guidance, effective prompting, and critical review of AI-generated responses. The results suggest that a course-specific AI chatbot can improve student autonomy, conceptual understanding, calculation confidence, and business application when embedded within responsible pedagogical design (Badger et al., 2026; UNESCO, 2023).

4. CONCLUSION

PPC Edge effectively addresses challenges in understanding technical PPC concepts, performing calculations, applying theory to business scenarios, revising for assessments, and checking answers. Its strength lies in combining AI assistance with structured guidance, effective prompting, critical review, and reflective learning. Generative AI chatbots can enhance learning through personalised support, but unguided use risks over-reliance and weak critical evaluation (Badger et al., 2026; McGrath et al., 2025). Survey results showed improvement across all learning areas, with the largest gains in independent learning, business application, conceptual understanding, and calculation solving. The tool supports student confidence, fosters self-directed learning beyond classroom hours, and helps connect PPC knowledge to operational decision-making. At the institutional level, PPC Edge provides a model for responsible AI integration, and at the national level, it aligns with Malaysia's AI governance principles promoting ethical, transparent, and human-centred AI use (MOSTI, 2024). PPC Edge has potential for scalability and adaptation to other technical or problem-solving subjects. Future work may include broader implementation across UiTM campuses, course adaptation, publication of findings, and comparative studies. The tool demonstrates that AI can strengthen higher education outcomes when aligned with course objectives and used to support, rather than replace, student thinking (UNESCO, 2023).

REFERENCES

Badger, M., López, N., & Nissen, C. F. R. (2026). The impact of GenAI chatbots on student learning in higher education: A literature review. International Journal of Technology in Education, 9(1), 43–69. https://doi.org/10.46328/ijte.5111

Baig, M. I., & Yadegaridehkordi, E. (2024). ChatGPT in the higher education: A systematic literature review and research challenges. International Journal of Educational Research, 127, 102411. https://doi.org/10.1016/j.ijer.2024.102411

McGrath, C., Farazouli, A., & Cerratto-Pargman, T. (2025). Generative AI chatbots in higher education: A review of an emerging research area. Higher Education, 89, 1533–1549. https://doi.org/10.1007/s10734-024-01288-w

Ministry of Science, Technology and Innovation Malaysia [MOSTI]. (2024). National Guidelines on Artificial Intelligence Governance and Ethics (AIGE). Government of Malaysia.

UNESCO. (2023). Guidance for generative AI in education and research. United Nations Educational, Scientific and Cultural Organization.

E-BOOK OF EXTENDED ABSTRACT THE 15th INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2026

eISBN 978-967-2776-67-3

9 789672 776673

Date of Publication: 13 July 2026

UNIT PENERBITAN UITM PERAK

(online)