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INNOVATIVE TEACHING AND TECHNOLOGY INTEGRATION: EFFECTS ON ACADEMIC PERFORMANCE IN MALAYSIAN HIGHER EDUCATION

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Abstract:

The rapid development of technological advances in communication and information (ICT) has profoundly altered teaching and learning methodologies in higher education, therefore requiring the implementation of innovative pedagogical approaches. This study seeks to investigate the impact of innovative pedagogical approaches and ICT integration on students' academic performance at Malaysian public universities. This study utilizes a quantitative research design to examine the correlations among major variables related to educational techniques, ICT utilization, and academic success. Data were gathered from 405 public university students through a structured questionnaire using a convenience sample method, with individual students as the unit of analysis. Primary data were examined by frequency analysis, descriptive analysis, reliability analysis, Pearson correlation analysis, and multiple regression analysis. The results indicate that both new pedagogical approach and ICT integration are significantly positively correlated with students' academic achievement. All provided hypotheses were validated, demonstrating the significant impact of pedagogical innovation and technology-enhanced learning on enhancing academic performance. The findings offer significant insights for educators, university administrators, and policymakers aiming to improve teaching efficacy and learning quality at Malaysian public universities.

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Keyword:

ICT Integration, Innovative Pedagogical Approaches, Students' Academic Performance, Teaching Innovation



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Introduction

The landscape of higher education has undergone significant transformation due to rapid technological advancement and the growing demand for 21st-century competencies. Universities are increasingly expected to adopt innovative pedagogical approaches that promote active learning, critical thinking, collaboration, and digital literacy. Public universities in Malaysia play a central role in developing competent and competitive graduates aligned with national development goals. National policy frameworks such as the Malaysian Education Blueprint for Higher Education emphasise student-centred learning and the integration of Information and Communications Technology (ICT) to enhance the quality and global competitiveness of higher education.

Innovative pedagogical approaches, including problem-based learning, project-based learning, flipped classrooms, and blended learning are designed to increase student engagement, encourage autonomy, and deepen conceptual understanding. The integration of ICT tools such as learning management systems, virtual classrooms, digital collaboration platforms, and online resources has made learning environments more flexible, interactive, and accessible. When effectively aligned with sound pedagogical principles, ICT integration can significantly enhance students' learning experiences and academic performance.

The COVID-19 pandemic further accelerated the adoption of technology-enhanced learning in Malaysian public universities, revealing both its transformative potential and its structural and pedagogical challenges. Although ICT and innovative teaching methods are widely implemented across institutions, empirical evidence examining their combined effect on measurable academic performance remains limited. Much of the existing literature focuses on student engagement, satisfaction, or perception rather than concrete academic outcomes.

Recent studies highlight the increasing importance of technological integration in strengthening pedagogical practices and addressing contemporary educational challenges. Technology-enhanced environments particularly in blended and hybrid modes have been shown to facilitate active learning and improve students' academic experiences. Research also underscores emerging trends in digital and blended learning strategies adopted by Malaysian institutions to enhance graduate competencies. However, the relationship between ICT implementation, pedagogical innovation, and quantifiable academic achievement remains complex and underexplored. Additionally, educators' competency in integrating ICT effectively continues to pose challenges that may influence instructional quality and student outcomes.

Despite ongoing advancements, a significant research gap persists regarding the direct and combined impact of innovative pedagogical approaches and ICT integration on students' academic performance in Malaysian public universities. While technology-supported learning environments are associated with increased participation and engagement, systematic empirical investigations linking these approaches to measurable academic success are still scarce. Addressing this gap is crucial to understanding how instructional innovation can translate into tangible educational outcomes.

This study contributes to the higher education literature by integrating previously fragmented strands of research on pedagogical innovation and ICT adoption into a unified conceptual framework. Unlike prior studies that treat pedagogy and technology as isolated instructional variables, this research conceptualises their interaction as complementary and mutually reinforcing within the institutional context of Malaysian public universities. By providing context-specific empirical evidence from a developing higher education system, the study addresses a geographical imbalance in the literature. Furthermore, it connects micro-level instructional practices with macro-level policy implications, offering a multi-level perspective that supports theoretical advancement and evidence-based decision-making in higher education.

Research Objective

RO1: To examine the influence of Innovative pedagogical approaches on students' academic performance in Malaysian public universities.

RO2: To examine the influence of ICT integration in teaching on students' academic performance in Malaysian public universities.

Literature Review

Students' Academic Performance in Malaysian Public Universities

Students' academic performance reflects the extent to which learners achieve the educational goals set by their educators, institutions, or educational systems, often measured through grades, test scores, examinations, assignments, and various assessment tools (Akinfolarin, 2023). This is a significant indicator of an individual's learning progress, cognitive development, and proficiency in applying their knowledge. Academic performance is complex, encompassing cognitive talents alongside affective, behavioural, and metacognitive components, such as motivation, engagement, study habits, self-regulation, and time management (Kpolovie, 2019). In contrast, research indicates that pupils' academic success is influenced by personal, instructional, and situational factors. Personal characteristics include intelligence, previous knowledge, learning preferences, motivation, and attitudes towards education (Alghamdi, 2020). Mazlan et al. (2025) assert that instructional elements encompass the educator's quality, curriculum design, feedback delivery by the lecturer, and the integration of new technology or pedagogical methods. Contextual influences include the educational setting, availability of learning materials, parental involvement, peer impact, and socio-economic position (Akinfolarin, 2023; Wulandari et al., 2025).

In recent decades, educational research has examined the impact of innovative teaching methods and technology integration on student academic performance. Flipped classrooms, active learning, project-based learning, and ICT integration have been shown to improve

students' understanding, retention, and application of knowledge, leading to increased academic achievement (Qi et al., 2024; Zuo et al., 2025). Students that engage in personalised, interactive, and collaborative environments typically achieve superior academic performance, since these approaches foster critical thinking, engagement, and motivation (Hashim et al., 2025; Laid & Adlaon, 2025). Furthermore, academic achievement is frequently utilised to assess the efficacy of educational initiatives. It demonstrates the extent of student learning and can also assess the quality of instruction, the efficacy of the curriculum, and policy decisions. Enhancing pupils' academic performance remains a primary objective of educational institutions globally. To achieve this objective, pedagogical approaches, educational technologies, and student assistance frameworks are more significant (Msafiri et al., 2023; Idowu, 2025).

Academic performance in Malaysian public institutions is regarded as a crucial metric of student success and the quality of higher education, typically assessed via cumulative grade point average (CGPA) and course achievement results. Research demonstrates that academic achievement is influenced by a multifaceted interaction of human, socio-economic, and institutional factors, rather than solely by cognitive capacity. Research on social media utilisation among Malaysian university students reveals ambiguous correlations between online engagement and academic results. Some findings indicate that increased social interaction and knowledge-sharing activities enhance perceived academic performance (Alias et al., 2023), while excessive usage and the stress linked to social media may detrimentally impact performance (Hasran & Ramlay, 2022). The impact of online and hybrid learning settings on academic performance has been a focal point in the Malaysian context, particularly in light of the swift shift during the COVID-19 epidemic. Research on online learning among public university students revealed that, when influenced by student commitment, online learning positively affected academic achievements, underscoring the significance of engagement and dedicated study behaviours in technology-enhanced educational environments (Taip et al., 2023).

Socio-economic status (SES) additionally influences academic motivation and performance. A cross-sectional study at Universiti Kebangsaan Malaysia (UKM) involving 401 undergraduates indicated that students from the B40 (lower income) demographic demonstrated elevated scores in specific dimensions of intrinsic motivation; however, no significant direct differences in academic performance were noted between the B40 and non-B40 groups. Within the B40 cohort, self-esteem exhibited a favourable correlation with academic achievement, indicating the significance of psychological support for students from underprivileged families (Mohd Shukri & Wan Sulaiman, 2025). Furthermore, demographic and background traits significantly influence university success. A study of accounting students at Universiti Utara Malaysia (UUM) revealed that family income, type of secondary school, and ethnicity significantly correlated with students' CGPA, while gender and sponsorship status did not serve as significant predictors. This suggests that socio-economic background and prior educational experiences may have a more substantial impact on performance outcomes than certain demographic variables (Hassan et al., 2020).

In conclusion, students' academic achievement is a complex construct influenced by cognitive, motivational, instructional, and environmental factors. A student's academic performance is profoundly affected by traditional teaching methods and novel initiatives, including technology integration, active learning, and personalised instruction. To devise effective teaching methods, improve learning outcomes, and foster comprehensive student development, it is crucial to

comprehend the factors affecting academic success. Evidence from Malaysian public institutions indicates that academic success is a multifaceted construct shaped by motivational variables, interaction with learning technology, socio-economic setting, and the quality of learning environments. The findings indicate that improving academic success in public higher education necessitates comprehensive strategies that extend beyond conventional teaching methods, including the development of student support systems, the promotion of effective digital learning practices, and the mitigation of socio-economic obstacles to equitable educational opportunities.

Innovative Pedagogical Approaches

Recent educational research highlights significant shifts from traditional lecture-based models to Innovative pedagogical approaches that emphasise student participation, customisation, and technology integration. The flipped classroom has gained popularity as it reverses conventional teaching by requiring students to study a topic prior to class and thereafter apply their knowledge through practical exercises during class time. Systematic reviews demonstrate that flipped classroom techniques enhance student engagement, involvement, and satisfaction across many educational contexts, with their efficacy dependent on deliberate instructional design and supportive frameworks (Mazlan et al., 2025). Furthermore, flipped learning has been associated with improved academic outcomes and engaging learning experiences when combined with active, student-centered approaches (Qi et al., 2024). Research finds barriers include technical readiness and assessment design, indicating that successful deployment requires careful planning and educator preparation (Baig & Yadegaridehkordi, 2023).

The integration of artificial intelligence (AI) into educational models represents a developing trend that alters the functional dynamics of flipped and mixed methodologies. Research indicates that AI-driven personalisation, when integrated with flipped instructional designs, can facilitate the creation of individualised learning pathways, provide real-time feedback, and enhance the flexibility of educational experiences, particularly in primary and language education (Hashim et al., 2025). Research on AI chatbots in flipped English classrooms reveals that educators deliberately utilise AI tools to improve vocabulary, grammar practice, and dialogic interaction; however, effective integration primarily depends on teacher facilitation and organised guidance (Ling & Jan, 2025). The amalgamation of generative AI with Bloom's taxonomy suggests that the use of AI in pre-class, in-class, and post-class activities can augment critical thinking, collaborative learning, and ongoing feedback mechanisms (Kwan et al., 2025). Nonetheless, these innovative connections provoke concerns regarding overreliance on technology and the imperative to align AI support with educational goals.

Alongside flipped classrooms and AI, student-centered and active learning methodologies remain crucial to contemporary pedagogical approaches. Systematic evaluations in science education highlight the importance of experiential learning, technology integration, and collaborative efforts that promote improved understanding and skill development (Laid & Adlaon, 2025). Case-based learning methodologies have demonstrated efficacy in enhancing critical thinking and active learning across students from diverse backgrounds when implemented alongside flipped models (Yang et al., 2024). Moreover, digital pedagogical developments in language teaching, such as mobile learning platforms and gamified tools, signify the broadening of educational horizons that employ interactive technologies to improve learning experiences (Khatimah, 2025). Studies on intelligent tutoring systems (ITS) and adaptive platforms demonstrate that these technologies can provide tailored guidance and

support, while their impacts vary among disciplines and deployment circumstances (Letourneau et al., 2025, as referenced in comprehensive systematic research).

This compilation of data indicates that novel pedagogical approaches, like flipped learning, AI-driven personalisation, active learning, and digital advancements, can enhance engagement, autonomy, and improved educational outcomes. Their efficacy relies on meticulous integration, lecturer preparedness, and continuous assessment to address equity and boundary concerns across many educational environments.

ICT Integration in Teaching

The integration of Information and Communication Technology (ICT) in education has emerged as a crucial strategy for transforming traditional teaching techniques, enhancing both instructional and learning experiences, and preparing students for participation in a globalised, digital society. Research consistently demonstrates that the incorporation of ICT in educational settings enhances student engagement, motivation, and academic success across all educational levels, from preschool through high school and beyond. A recent meta-analysis demonstrated that the use of ICT significantly enhances primary school pupils' language competence and topic knowledge acquisition, affirming its advantageous impact on learning when applied successfully (Zuo et al., 2025). Systematic reviews in secondary education demonstrate that appropriately aligned ICT tools promote curriculum coverage, interactive learning environments, and the development of digital competencies; however, successful integration depends on pedagogical alignment with learning objectives and effective assessment strategies (Msafiri et al., 2023).

A primary subject in the ICT literature is the importance of the roles, perceptions, and abilities of the teaching profession in successful integration. Many studies demonstrate that although numerous educators recognise the capacity of ICT to improve instruction and enhance pedagogical quality, challenges such as insufficient digital proficiency, technophobia, and inadequate professional development hinder effective technology utilisation (Akram et al., 2022; Joshi, 2022). Educators' favourable perceptions of ICT frequently stem from its potential to enhance student engagement and motivation, whereas unfavourable perceptions arise from concerns over increased preparation time, insufficient technical assistance, and difficulties in managing digital tools inside the classroom. This indicates that attitudes and preparedness significantly influence the utilisation of ICT (Akram et al., 2022; Abel, 2025). Professional development programs and continuous training are routinely highlighted as critical success elements for enhancing educators' ICT integration practices.

Besides educational variables, institutional and systemic conditions also influence the use of ICT. Research demonstrates that obstacles such as inadequate infrastructure, limited access to dependable technology, and the absence of strategic planning at academic and policy levels can impede the effective integration of ICT, leading to disparities, especially in under-resourced environments (Msafiri et al., 2023; Wulandari et al., 2025). Frameworks such as the Technological Pedagogical and Content Knowledge (TPACK) model emphasise that educators must integrate their understanding of technology with their pedagogical expertise and subject matter knowledge to optimise the use of ICT. This indicates that technology, in isolation, cannot transform learning without meticulous preparation and assistance (Mohd et al., 2024).

Furthermore, empirical research indicates that ICT integration is multi-faceted, involving not just access to hardware and software but also the learning culture, collaboration among instructors, and alignment of the curriculum. Research indicates that effective ICT practices require supporting university leadership, consistent infrastructure maintenance, and systems that engage both learners and instructors in innovative learning methods (Science Direct, 2024). Furthermore, research in language education and disciplines such as English literature demonstrates that ICT tools can improve innovative pedagogical approaches, digital content development, and learner-centred education, although contextual adjustments are essential for substantial outcomes (Ning & Ismail, 2024).

Despite evident advantages, there remains a lack of comprehensive understanding on the impact of various ICT tools on diverse learning outcomes across different courses and contexts, particularly in resource-constrained developing countries and universities. Researchers are advocating for longitudinal studies that examine the longevity of ICT advances, equity of access, and the impact of integration on educational quality over time (Idowu, 2025). Nonetheless, the literature clearly recognises ICT integration as a driver for pedagogical innovation, increased student engagement, and enhanced digital literacy, dependent on the resolution of systemic obstacles and adequate support for educators.

Relationship Between Innovative Pedagogical Approaches on Students' Academic Performance in Malaysian Public Universities

The adoption of Innovative pedagogical approaches, such as flipped classrooms, active learning, inquiry-based learning, gamification, and AI-driven personalised instruction, has consistently correlated with improvements in students' academic performance in Malaysian public universities. Research indicates that these approaches enhance engagement, motivation, and critical thinking, which are essential components of academic achievement (Abuhassna et al. 2024). Flipped classroom models enable students to engage with the subject prior to class, allowing in-class time to be utilised for collaborative problem-solving and application of acquired knowledge. This framework has been shown to enhance understanding, retention, and the ability to utilise knowledge in novel situations, all contributing to increased academic achievement (Yang et al., 2024).

Similarly, active learning and student-centered approaches, including project-based learning, case-based learning, and inquiry-based instruction, seek to improve cognitive engagement, metacognition, and self-regulated learning. Meta-analytic research demonstrates that students exposed to these pedagogical methods frequently outperform their peers in traditional lecture-based settings, particularly in evaluations of higher-order thinking (Laid & Adlaon, 2025; Yang et al., 2024). The integration of technology and AI tools enables personalised learning pathways, immediate feedback, and adaptable content, hence enhancing academic achievement by addressing individual learning needs and pacing (Hashim et al., 2025; Ling & Jan 2025).

Evidence suggests that motivation and engagement act as intermediates between creative pedagogy and academic results. Gamified learning environments have shown an increase in student engagement and intrinsic motivation, leading to enhanced performance on both formative and summative examinations (Khatimah, 2025). The effectiveness of these teaching methods relies on teacher readiness, instructional design, and contextual factors; without appropriate support and integration, technology-enhanced or active pedagogies may not produce improved academic results (Mazlan et al., 2025; Ling & Jan 2025). The literature

demonstrates a positive correlation between Innovative pedagogical approaches and students' academic performance in Malaysian public universities, resulting in benefits such as increased engagement, improved cognitive processing, personalised learning, and the development of higher-order skills. These tactics are most effective when accompanied by instructor preparation, systematic implementation, and continuous assessment to ensure alignment with the course objectives.

Relationship Between ICT Integration in Teaching on Students' Academic Performance in Malaysian Public Universities

The integration of Information and Communication Technology (ICT) in education has been acknowledged as a catalyst for enhancing students' academic performance at Malaysian public institutions by promoting active learning, engagement, and access to diverse learning resources. Studies demonstrate that the successful incorporation of ICT resources in classroom instruction fosters interactive and student-centered learning, hence improving comprehension, retention, and critical thinking abilities (Zuo et al., 2025). Research indicates that students perform better in subjects such as mathematics, science, and language acquisition when utilising multimedia resources, educational software, and online platforms to visualise complex concepts, engage in simulations, and practice problem-solving (Msafiri et al., 2023; Ning & Ismail, 2024).

The preparation of lecturers and their pedagogical skill in ICT utilisation are acknowledged as crucial mediators of its impact on academic performance. Studies demonstrate that educators possessing high digital literacy and pedagogical methods aligned with ICT can significantly enhance student learning results. Conversely, inadequate proficiency of educators or reluctance to employ technology may undermine the potential benefits of ICT (Joshi, 2022; Akram et al., 2022). Information and Communication Technology enable students to learn at their own pace and in a manner that suits them best. This has been associated with enhanced academic achievement and more autonomy in learning (ABEL,2025; Mohd et al., 2024). Institutional and infrastructural factors also influence the efficacy of ICT integration. To maximise the beneficial impacts of ICT on learning outcomes, access to dependable technology, enough technical assistance, and a user-friendly digital environment are essential (Msafiri et al., 2023; Wulandari et al., 2025).

Research demonstrates that the use of ICT promotes collaboration and communication, allowing students to interact with peers and educators via digital platforms, therefore improving understanding and knowledge acquisition (Msafiri, 2024). Despite evident advantages, issues such as inequitable access, insufficient training, and resistance to change continue to hinder the significant impact of ICT on academic performance (Idowu, 2025). Empirical research indicates that the use of ICT in teaching and learning within Malaysian public universities positively influences students' academic achievement, particularly when lecturers are adequately prepared and systemic support is established. Information and Communication Technology (ICT) serve not just as a medium for material delivery but also as a catalyst for fostering engagement, promoting higher-order thinking, and facilitating self-directed learning, all of which can enhance academic performance.

Research Framework

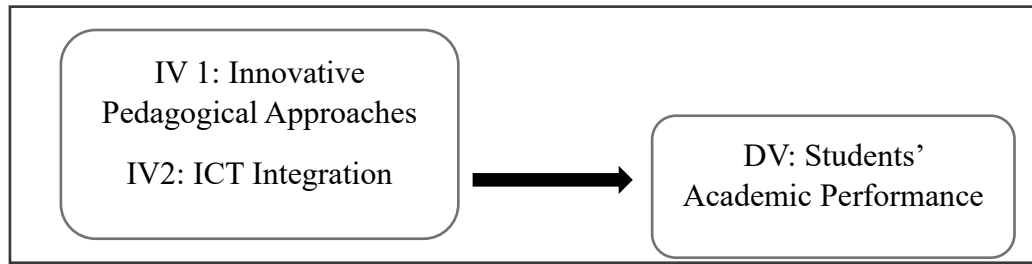


Figure 1: Conceptual Framework of Research

Research Methodology

Research Design

Akhtar (2020) defines research design as the systematic organisation of data collecting and analysis criteria aimed at aligning relevance with the study objective and methodology. Research design is a framework, structure, and strategy for acquiring answers to research enquiries and managing variability. Consequently, research design constitutes the overarching strategy by which researchers will address the study issues. Research design is categorised into two types: qualitative and quantitative. Quantitative research methods involve the collection of numerical data using questionnaires, which are subsequently utilised to create graphical representations and statistical analyses (Akhtar, 2020). This research will employ a quantitative analysis to ascertain the effects of educational innovations, including Innovative pedagogical approaches and ICT integration, on students' academic performance in Malaysian public universities.

Population and Sample size

This study focuses on students currently enrolled in public universities in Malaysia. According to Higher Education Statistics Malaysia, the total enrolment in Malaysian public universities is 611798 students. This Table 1 represents the target population of the study.

Table 1: Number of Students' Enrolment by Level of Studies in Public Universities for Year 2024

Level of Studies	Male	Female	Total
Doctor of Philosophy (PhD)	19852	25150	45002
Master	22173	33617	55790
Postgraduate Diploma	2691	9574	12265
Bachelor	147541	231712	379253
Diploma	38409	58228	96637
Pre-Universities/Foundation	7303	10234	17537

Certificate	2	13	15
Others	1993	3306	5299
Total	239964	371834	611798

(Source: Higher Education Statistics Malaysia, 2024)

To determine an appropriate sample size, the Determining Sample Size for Research Activities table developed by Krejcie and Morgan (1970) was utilised. Based on the recommended guidelines for large populations ($N > 100,000$), a minimum sample size of 384 respondents is considered sufficient to achieve a 95% confidence level with a 5% margin of error.

Accordingly, 384 students were selected using a random sampling technique to ensure representativeness and reduce sampling bias. To account for potential non-response or incomplete questionnaires, 400 questionnaires were distributed. This strategy was adopted to increase the likelihood of obtaining the required number of valid and usable responses for statistical analysis.

Sampling Techniques

This study employed a non-probability sampling technique to choose the participants. Convenience sampling was utilised, allowing researchers to select people who are easily accessible and willing to engage. This approach is considered efficient, economical, and effective for data collection, particularly under constraints of time and budget (Taherdoost, 2021). Convenience sampling involves selecting individuals who are readily available from the target group, making it suitable for meeting the purposive selection criteria aligned with the study objectives. This sampling method is frequently employed in pilot and exploratory research. Given the limitations of time and resources, convenience sampling was deemed appropriate for this exploratory research, which aims to obtain preliminary insights rather than to derive statistically generalisable findings. Consequently, data were collected from students enrolled at public universities in Malaysia who were accessible during the data collecting period.

Data Collection

Taherdoost (2021) asserts that the data collection process encompasses determining the method of distributing the questionnaire to respondents, the duration required for its dissemination, and the time needed for respondents to complete and return it. The data collection procedure entails the systematic gathering of replies from individuals. The data collection period for this study was projected to span four weeks to obtain responses from around 450 disseminated questionnaires. The questionnaire was distributed using a Google Form to students currently enrolled in public universities in Malaysia. The survey aimed to collect data on the impact of pedagogical innovation, including new teaching methods and the integration of information and communication technology (ICT), on the academic achievement of students at public institutions in Malaysia.

Instrument and Measurement

Katz (2020) asserts that questionnaires are a vital tool for data collecting in analytical contexts. This study employed a questionnaire to gather data from participants concerning their impressions and opinions on teaching innovation and its effect on students' academic achievement. Questionnaires are especially appropriate for research involving extensive populations because to their straightforward design, administration, and distribution. Furthermore, questionnaires are cost-effective and need less time to obtain responses compared to alternative data collection methods. The questionnaire was created in English to facilitate communication with responders. It was disseminated electronically via email and Google Forms. The survey comprised two components. The initial segment gathered demographic data from the participants. The latter portion concentrated on assessing the influence of teaching innovation, particularly Innovative pedagogical approaches and the ICT integration, on students' academic performance. A five-point Likert scale was employed to evaluate all items in the questionnaire. A score of 1 indicated "Strongly Disagree," a score of 2 indicated "Disagree," a score of 3 indicated "Neutral," a score of 4 indicated "Agree," and a score of 5 indicated "Strongly Agree".

Sample of Original Questionnaire

Table 2: Original Questionnaire Statement with Operational Definition and Sources.

Variables	Operational Definition	Statements	Sources
Students' Academic Performance (DV)	Students' Academic performance defines the quantifiable results of students' learning, encompassing knowledge acquisition, skill enhancement, and overall success in their courses. This study evaluates students' self-reported judgments regarding their grades, knowledge application, and satisfaction with academic results.	I consistently achieve in my academic evaluations. Innovative pedagogical approaches have enhanced my academic performance. The integration of ICT in learning has significantly influenced my academic performance. I am content with my overall academic accomplishment. I can successfully use knowledge acquired in class throughout evaluations.	Adopted from Taip et al. (2023)
Innovative Pedagogical Approaches (IV 1)	Innovative pedagogical approaches define instructional strategies that actively involve students in the learning process, promote critical thinking, and cultivate	Project-based learning enhances my comprehension of course material. Flipped classroom methodologies augment my readiness prior to class.	Adopted from Yang et al. (2024)

Variables	Operational Definition	Statements	Sources
	independent learning. This study encompasses methodologies including problem-based learning, project-based learning, flipped classrooms, blended learning, and collaborative activities.	Group conversations and collaborative learning are promoted in my seminars. The pedagogical approaches employed in my classes foster critical thinking. Innovative pedagogical methods enhance my engagement in the learning process.	
ICT Integration in Teaching (IV2)	ICT integration describes the methodical inclusion of digital technologies into pedagogy to improve instructional delivery, student engagement, and educational outcomes. It encompasses the utilization of learning management systems, virtual classrooms, online collaboration tools, digital materials, and multimedia in education.	Digital instruments (e.g., films, simulations, online assessments) augment my comprehension. Virtual lessons are executed proficiently. ICT tools facilitate engagement between educators and learners. The incorporation of technology enhances the flexibility and convenience of learning. I am proficient in utilizing digital tools for academic endeavours.	Adopted from Msafiri, (2024).

Pilot Test

This study involved a pilot test in which a questionnaire was administered to a group of responders. The pilot test is a crucial phase of the research process, as it aids in identifying potential flaws, ambiguities, or deficiencies in the questionnaire prior to the actual data collecting. A total of 35 responses were gathered and examined in this pilot test to evaluate the reliability of all questionnaire items. Karamurugan and Govindarajan (2022) assert that pilot test data can be examined with the Statistical Package for the Social Sciences (SPSS) to yield reliable outcomes. This study utilised Cronbach's alpha to assess internal consistency reliability. George and Mallery (2024) characterise reliability as the extent to which measurement tools are devoid of error and consistently yield steady outcomes. Moreover, Renuse (2024) recognises Cronbach's alpha as one of the most prevalent and important dependability metrics in research. The author classifies Cronbach's alpha values into distinct categories: excellent ($\alpha > 0.9$), good ($\alpha > 0.8$), acceptable ($\alpha > 0.7$), and questionable ($\alpha < 0.7$).

Table 1: The Reliability Statistics on Pilot Test

Variable	No. of Item	Cronbach's Alpha
Students' Academic Performance	5	0.875
Innovative pedagogical approaches	5	0.843
ICT Integration	5	0.852

The reliability analysis of the pilot test findings indicates that all variables exhibit strong internal consistency. Table 1 demonstrates that, the Cronbach's alpha value for Students' Academic Performance is 0.875, signifying strong dependability. Likewise, Innovative pedagogical approaches exhibited a Cronbach's alpha of 0.843, whilst ICT Integration attained a value of 0.852. Cronbach's alpha values exceeding 0.8 are deemed satisfactory, as per the reliability limits proposed by George and Mallery (2020) and Renuse (2024). Consequently, all constructs in this study satisfy the prescribed reliability standards, affirming that the questionnaire items are coherent and appropriate for implementation in the data collection phase.

Data Analysis Procedure

The data analysis procedure delineates the methodologies employed to interpret the data gathered from the questionnaires. Upon retrieval of the completed questionnaires, the data were coded and analysed utilising the Statistical Package for the Social Sciences (SPSS). This study utilised five types of statistical analyses: frequency analysis, descriptive analysis, reliability analysis, Pearson correlation analysis, and multiple regression analysis. Frequency analysis was employed to summarise respondents' demographic data, while descriptive analysis was performed to elucidate the central tendency and dispersion of the study variables. A reliability analysis was conducted to evaluate the internal consistency of the measuring devices. Pearson correlation analysis was utilised to investigate the associations among variables, while multiple regression analysis was employed to ascertain the predictive impact of the independent factors on the dependent variable.

Results and Discussion

To analysis results, this study uses the Statistic Package for Social Science (SPSS) student version. In addition, five studies such as frequency analysis, descriptive analysis, reliability analysis, Pearson correlation analysis, and multiple regression analysis, will address data analysis.

Frequency Analysis

The frequency analysis was conducted to examine the number and percentage of respondents according to demographic characteristics, including gender, age, highest academic attainment, field of study, current year of study, and current mode of study.

Reliability Analysis

Table 2: Reliability Analysis

Variable	Number of Item	Cronbach's Alpha
Students' Academic Performance	5	0.851
Innovative pedagogical approaches	5	0.873
ICT Integration	5	0.862

Table 2 shows the reliability analysis of the study variables utilising Cronbach's alpha coefficient. The findings reveal that all constructs exhibit strong internal consistency. The assessment of Students' Academic Performance, evaluated by five items, produced a Cronbach's alpha of 0.851, signifying strong reliability. Likewise, Innovative pedagogical approaches exhibited a Cronbach's alpha of 0.873, whilst ICT Integration attained an alpha value of 0.862, both indicating robust internal consistency. All alpha values exceed the required threshold of 0.70, indicating that the measurement tools employed in this study are reliable and appropriate for subsequent statistical analysis.

Descriptive Analysis

Table 3: Descriptive Statistics

Variable	N	Mean	Standard Deviation
Students' Academic Performance	405	4.3762	0.54846
Innovative Pedagogical Approaches	405	4.3585	0.53742
ICT Integration	405	4.4872	0.53492

Table 3 displays the descriptive statistics of the study variables, encompassing the mean and standard deviation for a sample of 405 students. The findings demonstrate consistently elevated levels across all constructs. The mean score for Students' Academic Performance was 4.3762, with a standard deviation of 0.54846, indicating that respondents generally regarded academic performance as strong, exhibiting minimal variety in their comments. Correspondingly, Innovative pedagogical approaches exhibited a mean value of 4.3585 and a standard deviation of 0.53742, signifying robust consensus among respondents concerning the implementation of innovative teaching methodologies. ICT Integration demonstrated the highest mean score (4.4872) and a standard deviation of 0.53492, indicating a significant amount of technology integration in the educational process and a uniformity in replies. The consistently low standard deviation values across all categories demonstrate consistency in respondents' judgements, whilst the elevated mean scores reflect favourable assessments of academic performance, educational methods, and ICT integration.

Pearson Correlation Analysis

Table 4: The Correlation Between Students’ Academic Approaches, Innovative Pedagogical Approaches and ICT Integration.

		SAP	NPA	ICT
SAP	Pearson correlation	1		
	Sig. (2-tailed)			
	N	405		
NPA	Pearson correlation	0.764**	1	
	Sig. (2-tailed)	0.000		0.000
	N	405	405	
ICT	Pearson correlation	0.725**	0.639	1
	Sig. (2-tailed)	0.000	0.000	
	N	405	405	405

**Correlation is significant at the 0.01 level (2-tailed)

The results from Table 4, demonstrate a significant positive association between Innovative pedagogical approaches and Students’ Academic Performance ($r = 0.764, p < 0.01$), suggesting that the enhanced implementation of new pedagogical methods is strongly linked to elevated academic performance among students. In addition, ICT Integration exhibits a significant positive correlation with Students' Academic Performance ($r = 0.725, p < 0.01$), indicating that enhanced incorporation of ICT in educational practices is associated with superior academic results. A moderate to high positive connection was identified between Innovative pedagogical approaches and ICT Integration ($r = 0.639, p < 0.01$). This suggests that the use of innovative pedagogical methods is generally associated with increased ICT integration in educational environments. All correlations were statistically significant at the 0.01 level (2-tailed), indicating substantial and robust links among the research variables and requiring further inferential analysis, including multiple regression analysis.

Multiple Regression Analysis

Table 5: Relationship between Innovative Pedagogical Approaches and ICT Integration With Students’ Academic Performance

Dependent Variable	Independent Variable	Std. Beta	Sig.
Students’ Academic Performance	Innovative Pedagogical Approaches	0.348	0.000**
	ICT Integration	0.425	0.000**
R ²		0.560	
Adjusted R ²		0.557	
F Change		91.444	

P < 0.01**, P < 0.05*

Table 5 displays, the outcomes of a multiple regression analysis investigating the correlation between Innovative pedagogical approaches, ICT integration, and students' academic performance. The results demonstrate that both independent variables significantly forecast students' academic achievement. Innovative pedagogical approaches provide a beneficial and statistically significant impact on students' academic performance ($\beta = 0.348$, $p < 0.01$). This indicates that the implementation of new teaching strategies significantly enhances academic performance among students in public universities at Malaysia. Likewise, ICT integration exhibits a more pronounced positive and statistically significant effect on students' academic performance ($\beta = 0.425$, $p < 0.01$). This indicates that the successful incorporation of information and communication technology in educational processes is vital for improving students' academic performance among public universities students at Malaysia.

The model accounts for a significant amount of the variance in students' academic performance, with a R^2 value of 0.560, signifying that 56.0% of the variation in academic performance is collectively investigated by Innovative pedagogical approaches and ICT integration. The corrected R^2 value of 0.557 further substantiates the model's robustness following the adjustment for the number of predictors. The model is statistically significant, demonstrated by an F-change value of 91.444 ($p < 0.01$), indicating that the variables collectively offer a robust explanation of students' academic achievement. The results indicate that both Innovative pedagogical approaches and ICT integration are substantial and favourable predictors of students' academic performance among public universities students in Malaysia, with ICT integration exerting a somewhat greater impact. These findings underscore the significance of Innovative pedagogical approaches and the incorporation of technology in enhancing educational results.

Results of Hypotheses Testing Summary

Table 5: Hypothesis Result

Hypothesis	Statement	Remarks
H1	There is relationship between Innovative pedagogical approaches and students' academic performance in Malaysian public university.	Accepted
H2	There is relationship between ICT integration and students' academic performance in Malaysian public university.	Accepted

Analysis of Results

This study's findings indicate that both innovative pedagogical approaches and ICT integration significantly affect students' academic performance in Malaysian public universities. These findings align with previous empirical studies and recognized educational theories.

The current research identified a robust positive correlation between innovative pedagogical approaches and students' academic performance ($r = 0.764$, $p < 0.01$; $\beta = 0.348$, $p < 0.01$). This discovery corresponds with the constructivist learning theory articulated by Jean Piaget, which underscores active learning, student involvement, and the building of knowledge through interaction and experience. Innovative pedagogies, like collaborative learning, problem-based

learning, and student-centered instruction, facilitate deeper cognitive processing, hence improving academic performance.

Likewise, the results corroborate the research of John Hattie (2021), whose meta-analytical studies demonstrate that effective pedagogical tactics and visible learning methodologies substantially enhance student performance. Hattie underscored that instructional quality significantly influences academic success, aligning with the notable beta value identified in this study. This result aligns with other empirical studies demonstrating that creative instructional strategies enhance students' motivation, engagement, and academic achievement. Studies indicate that student-centered methodologies improve critical thinking abilities and promote higher academic success relative to conventional lecture-based techniques. Consequently, the present findings substantiate the assertion that reforming instructional techniques is vital for enhancing educational outcomes in higher education institutions.

The research indicated that ICT integration exerts a substantial and marginally greater influence on students' academic performance ($r = 0.725$, $p < 0.01$; $\beta = 0.425$, $p < 0.01$). This discovery aligns with the Technology Acceptance Model (TAM) formulated by Fred Davis, which asserts that perceived utility and user-friendliness of technology facilitate user adoption and performance results. When students regard ICT tools as advantageous and readily available, their learning efficacy and academic performance enhance. This outcome further corroborates the framework established by Punya Mishra and Matthew J. Koehler (2020) in the Technological Pedagogical Content Knowledge (TPACK) paradigm. The TPACK framework underscores the amalgamation of technology, pedagogy, and topic understanding to augment educational efficacy. This study indicates that the effective incorporation of ICT into teaching techniques markedly improves student learning results.

Furthermore, prior empirical research has demonstrated that digital learning platforms, multimedia resources, and online collaborative tools enhance information accessibility, foster interactive learning, and advance academic achievement. The elevated beta value for ICT integration in this study suggests that technology-enhanced learning environments may be especially vital in contemporary higher education settings.

The moderate to strong link between innovative pedagogical approaches and ICT integration ($r = 0.639$, $p < 0.01$) corroborates prior studies indicating that effective technology utilization is frequently integrated within innovative teaching tactics. Technology alone does not ensure enhanced academic success; its efficacy is contingent upon the instructional methods employed. This discovery corresponds with current educational research, which contends that the integration of pedagogy and technology fosters more engaging and significant learning experiences. Institutions that concurrently invest in pedagogical innovation and technology infrastructure are more likely to attain enhanced student outcomes.

The regression model accounted for 56% of the variance in students' academic achievement ($R^2 = 0.560$), demonstrating significant explanatory capacity. This aligns with previous research in higher education that identifies teaching quality and technology integration as significant factors influencing academic success. The current findings corroborate the existing literature by affirming that innovative instructional methods substantially improve pupils' academic achievement, the inclusion of ICT significantly enhances academic outcomes, and the amalgamation of instructional innovation and technological integration establishes a robust platform for academic achievement in Malaysian public universities. These findings augment

the expanding corpus of research advocating for educational reform via contemporary pedagogical methodologies and judicious ICT deployment.

Conclusion

This study examined the effects of innovative pedagogical approaches and the integration of Information and Communication Technologies (ICT) on the academic performance of students in Malaysian public universities. The findings reveal that the implementation of student-centered pedagogical strategies, together with the effective utilization of ICT, significantly enhances student engagement, improves access to educational resources, and strengthens instructional effectiveness. These results underscore the critical importance of aligning pedagogical innovation with technological integration to advance educational quality and to inform evidence-based decision-making in higher education policy and institutional practice. This research makes several significant contributions to the existing body of knowledge on Malaysian higher education. First, although prior studies have examined ICT integration and innovative pedagogical approaches independently, limited empirical research has explored their combined and comparative effects on students' academic performance within Malaysian public universities. By integrating these two dimensions into a unified conceptual framework, this study provides a more comprehensive understanding of how instructional innovation and technological integration interact to influence academic achievement. Second, the study offers robust quantitative evidence linking ICT integration and innovative pedagogical approaches to measurable academic performance outcomes. Through regression analysis, the findings demonstrate the predictive power of these variables in the Malaysian higher education context an area that has received relatively limited empirical attention. Notably, the finding that ICT integration exerts a marginally stronger influence than pedagogical strategies provide new insight into the increasing importance of technological readiness and digital infrastructure in contemporary universities.

Third, the study contributes context-specific empirical evidence that supports national higher education transformation initiatives, particularly those outlined in the Malaysian Education Blueprint for Higher Education (2015–2025). By focusing on students in Malaysian public universities, the research provides timely insights that inform policy evaluation, institutional planning, and strategic decision-making related to digital transformation and student-centered learning reforms. Fourth, the explanatory model developed in this study accounts for a substantial proportion of variance (56%) in students' academic performance. This finding reinforces the argument that ICT integration and structured pedagogical reform are fundamental determinants of academic success in twenty-first-century higher education, rather than merely complementary enhancements.

Finally, the study makes a methodological contribution by developing and validating reliable measurement instruments for assessing ICT integration, innovative pedagogical practices, and academic performance within the Malaysian university system. The integrated analytical framework established in this research offers a foundation that can be replicated, refined, or extended by future scholars.

Despite these contributions, several limitations should be acknowledged. The study was confined to Malaysian public universities, which may limit the generalizability of the findings to private institutions or higher education systems in other national contexts. Differences in institutional structures, technological resources, and pedagogical cultures may produce varying

outcomes. Additionally, the reliance on self-reported data introduces the possibility of response bias and may not fully capture actual teaching practices or objective measures of academic performance. Furthermore, the cross-sectional research design restricts the ability to establish causal relationships or to examine the long-term effects of pedagogical and technological interventions over time.

Future research should address these limitations by employing longitudinal designs to investigate the sustained impact of innovative pedagogies and ICT integration on student learning outcomes. Expanding the scope of inquiry to include private universities and cross-national comparative studies would enhance the external validity and generalizability of the findings. Moreover, adopting mixed-methods approaches—integrating quantitative analysis with qualitative techniques such as interviews, focus groups, and classroom observations—would provide deeper insights into how specific pedagogical strategies and ICT tools influence student engagement and academic performance. Further exploration of discipline-specific ICT applications, as well as the role of institutional support, faculty professional development, and digital readiness, would offer valuable guidance for strengthening teaching effectiveness and fostering sustainable innovation in higher education.

In sum, this study advances scholarly understanding by empirically validating the integrated effects of ICT integration and pedagogical innovation, offering contextually grounded insights for Malaysian public universities, and providing meaningful implications for higher education policy, practice, and future research.

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