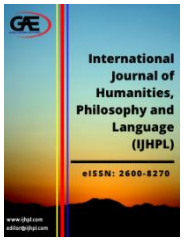
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OVERCOMING IMPLEMENTATION HURDLES IN MALAY LANGUAGE CLASSROOM-BASED ASSESSMENT WITH GENERATIVE ARTIFICIAL INTELLIGENCE (GEN-AI)

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Abstract:

Designed to meet the ministry's core vision, the Malaysian Ministry of Education's Strategic Plan 2024–2030 outlines key institutional goals. However, recent assessments of Classroom-Based Assessment (PBD) reveal a distinct gap in integrating Generative AI (Gen-AI) into Malay language testing. This missing link creates barriers that directly hinder effective teaching and learning. Consequently, the objective of this paper is to propose the strategy on the barriers of implementing PBD in the Malay language assessment subject using GenAI. The implications of the study are discussed with a focus on policy, training, and PBD practices. Furthermore, the outlined strategies include enhancing teacher training through professional development programs, empowering the use of technology in assessment to increase efficiency, and continuously collecting and analyzing data to identify strengths and weaknesses in teaching and learning. The limitations of this discussion are confined to the scope of GenAI in the Malay language, as well as general validity and reliability. Therefore, it is recommended that further research be conducted, specifically focusing on improving the validity and reliability of GenAI instruments for the Malay language from diverse perspectives. To conclude, adopting GenAI for Malay language assessment requires a stakeholder-centric approach. Success hinges on two critical factors: the practical design of the evaluation tools and the readiness of school personnel to implement them.

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Keyword:
Artificial Intelligence, Classroom-Based Assessment, Digital Education, Gen-AI, Strategy

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Introduction

Digital education is a learning process that utilizes digital technology as the primary tool to acquire, organize, and display information within a lesson. It refers to the application of digital technology in the teaching and learning process. This includes the use of digital tools such as computers, tablets, the internet, and educational software to enhance the quality of learning. Furthermore, it involves the utilization of digital platforms, virtual reality technology, and the digital organization of the educational process (Munauwarah & Achadi, 2023). Digital education employs various types of digital tools, such as computers, tablets, and smartphones. There are also applications and platforms, including e-learning, webinars, and online courses, which are also known as online training.

The use of technology in digital education can be applied through several teaching and learning methods, namely interactive learning and content, digital evolution, and collaborative learning. Besides making learning more flexible and accessible, digital education also allows learning sessions to be tailored to the specific needs of both students and teachers. Education in the digital era must be capable of integrating Information and Communication Technology across all academic subjects (Lelu Ngongo et al. 2019). The digitalization of education involves integrating digital technology and utilizing new pedagogical approaches to improve the learning process (Shahril 2024).

Digital learning within the transformation of the nation's education system is a process of adapting digital technology into education, enabling educators to achieve objectives during the teaching, learning, and facilitation process (PdPc) (Hasin et al. 2022). Digital education has become an increasingly relevant topic in this modern technological era. While it offers a multitude of benefits, there are also several issues and barriers that must be addressed. One of the main benefits of digital education is access to vast and diverse learning resources. Students can access learning materials from anywhere and at any time, which facilitates the learning process. Additionally, digital technology enables more interactive and engaging learning experiences through the use of videos, animations, and simulations. The potential of AI and its utilization in language learning existed, particularly in the aspect of constructing written sentence patterns (Yaacob et al., 2026).

Nevertheless, there are several issues that require careful attention. Findings from previous studies indicate that one of the primary issues is the digital divide, as not all students have access to digital devices and stable internet connectivity. This can lead to inequality in learning

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opportunities. Furthermore, ensuring cybersecurity and protecting students' data privacy pose significant barriers. Additionally, the incorporation of technology in education demands high digital literacy from both teachers and students, requiring continuous training and support to ensure they can utilize technology effectively. There are also concerns regarding the effects of excessive digital device usage on students' physical and mental health. Concurrently, the level of readiness and skills among teachers must also be prioritized, as it directly impacts the students.

Overall, digital education involves integrating digital technology and employing new pedagogical approaches to enhance the learning process (Shahril 2024). Correspondingly, while digital education offers immense opportunities to elevate the quality of learning, it also demands a careful and strategic approach to overcome the emerging issues and barriers. Through the cooperation of all parties involved, we can ensure that digital education delivers maximum benefits to all students. AI has the potential to enrich language learning experiences and empower Malaysian students in facing global challenges (Awang & Wahab, 2026). Henceforward, this research paper is to propose the strategy on the barriers of implementing PBD in the Malay language assessment subject using Gen-AI.

Therefore, this paper does not attempt to evaluate the effectiveness of Gen-AI through empirical investigation. Instead, it presents a conceptual and policy-oriented framework that synthesizes current educational policies and recent literature to propose practical strategies for overcoming implementation barriers in Malay language Classroom-Based Assessment.

Literature Review

There are policies, barriers and strategies that will be discussed in literature.

Policy Related to Digital Education

The Digital Education Policy (DPD) was launched by the Minister of Education, YB Fadhlina Sidek, on November 28, 2023, with the vision of producing digitally fluent and competitive students through the enhancement of knowledge, skills, and values. This policy serves as the official statement from the Ministry of Education Malaysia (MOE) regarding the government's continuous and high commitment to leading the transformation of the digital education revolution landscape. This high aspiration can be achieved through multi-faceted approaches focusing on uplifting the knowledge, skills, and values of students, educators, and educational leaders. This mission requires the provision of high-quality infrastructure, a more informative and effective info structure, as well as relevant material content for the successful implementation of digital education initiatives.

The active involvement of strategic partners is also strategically integrated to ensure their valuable contributions are seamlessly incorporated across all levels of education, from preschool to post-secondary. The DPD also represents the government's commitment to sustainable educational development by promoting the effective use of digital technology in an integrated, creative, innovative, responsible, and ethical manner. The policy outlines four main objectives supported by various identified strategies and initiatives, namely: (a) developing digitally fluent students to meet the demands of the digital era; (b) empowering educators and educational leaders to integrate digital technology within the educational ecosystem; (c)

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strengthening digital education infrastructure, info structure, and content; (d) optimizing the active involvement of strategic partners as catalysts for digital education.

Overall, the MOE has presented 4 objectives, 6 pillars, 18 strategies, and 41 initiatives to successfully achieve the goals of this DPD. The ultimate goal is to develop digitally literate students who possess the capability to utilize digital technology effectively in an integrated, creative, innovative, responsible, and ethical manner. These students must be able to use digital tools to generate new ideas, analyze data scientifically, solve problems, and communicate as well as collaborate efficiently.

Secondly, the MOE Strategic Plan 2024-2030 was interesting to be reported. The Ministry of Education Malaysia Strategic Plan (PSKPM) 2024-2030 was developed as an operational document to achieve the strategic direction of the Ministry of Education Malaysia (MOE) by the year 2030. It serves as a continuation of the Malaysia Education Blueprint 2013-2025. The national education system continues to evolve alongside current developments. The education system in Malaysia is continuously improved by taking economic, technological, and social changes into account to ensure a quality and relevant education system.

Overall, this MOE Strategic Plan is anchored on 5 strategic pillars, 17 strategies, 66 programs, and 82 Key Performance Indicators (KPIs). The 2nd strategic pillar emphasizes strengthening digital education, under which 3 strategies, 8 programs, and 11 KPIs have been mapped out in an effort to produce a digitally literate generation capable of meeting current and future needs. This Strategic Pillar 2 focuses on empowering quality digital education and integrating technology into teaching and learning. This focus aligns with the MOE's vision to provide quality education to achieve a prosperous nation. The three strategies developed toward strengthening digital education are: (a) strengthening Information and Communication Technology (ICT) infrastructure and info structure; (b) empowering students, teachers, and educational leaders; and (c) optimizing the active involvement of strategic partners.

In addition, MOE Education Service Officers (PPP) Digital Education Empowerment Program 2022-2025 was one of the MOE's effort to prepare an education workforce that is digitally competent and constantly in step with fast-paced digital technology developments. The government has approved an allocation of RM47 million under the 12th Malaysia Plan for the implementation of the MOE Education Service Officers (PPP) Digital Education Empowerment Program 2022-2025. This program is not restricted solely to schoolteachers but also covers all teachers and educational leaders across all agencies under the purview of the MOE. The Education Service Officers (PPP) Digital Education Empowerment Program is an initiative implemented by the MOE to support digital education strategies, equipping educators with digital knowledge, meeting the government's aspirations, and supporting initiatives under Pillar 4 of MyDIGITAL, which is to develop agile and competent digital talent. This program is spearheaded by the Teacher Professionalism Division (BPG) alongside the Aminuddin Baki Institute (IAB) and the Institute of Teacher Education Malaysia (IPGM).

The primary objective of this program is to empower educators and educational leaders to integrate digital technology into the educational ecosystem. A total of 9 main scopes of work have been outlined in this program, namely: (a) screening to detect the digital mastery cohorts of PPPs (basic, intermediate, and advanced levels); (b) development of the Digital Training Learning and Content Management System (SiPP); (c) development of PPP digital competency modules; (d) implementation of digital training according to the proficiency levels of PPPs and

educational leaders; (e) development of the PPP Digital Expert Team (Pasukan Pakar Jauhari Digital); (f) Smart Digital Hybrid Classrooms; (g) impact studies on PPP digital training; (h) fostering a culture of digital creativity and innovation; and (i) a digital communication plan.

The Ministry of Education Malaysia's (MOE) digital policies directly transform the framework of Malay language Assessment by shifting traditional evaluation methods into the digital era. Under the Digital Education Policy (DPD) and the MOE Strategic Plan (PSKPM) 2024–2030, the assessment of the four core language skills listening, speaking, reading, and writing is modernized through technology integrated into teaching and learning (PdP). For instance, oral proficiency (Mendengar dan Bertutur) can now be assessed via digital audio-video recordings on the DELIMa platform, while writing components evaluate a student's ability to communicate in grammatically correct, high-quality Malay language within modern digital mediums. For instance, as teachers can be implementing essay writing assessments guided by budget simulations through AI prompts as well (Osaman & Mohd Matore, 2026). Furthermore, the assessment rubrics are expanded to measure not just linguistic accuracy, but also the digital fluency of students, testing their ability to use the national language ethically, creatively, and responsibly to generate ideas and analyze data online.

Simultaneously, the RM47 million allocated for the Education Service Officers (PPP) Digital Education Empowerment Program 2022–2025 directly elevates the data-driven quality of these language assessments. By screening and training Malay language teachers (Guru Mata Pelajaran BM) into advanced digital competency cohorts, educators are equipped to design sophisticated online formative assessments and utilize Smart Digital Hybrid Classrooms for real-time tracking of student progress. This systematic upskilling allows teachers to move away from rigid, paper-based testing and adopt dynamic, continuous evaluation models. Ultimately, these digital policies provide the infrastructure, analytical tools, and teacher capabilities necessary to run standardized, data-driven Malay language Assessments that meet the evolving demands of the digital era.

Malaysia now is heading to the digital world via learning. Digital learning in the national education transformation process presents various issues and barriers for teachers and students during the implementation of digital technology in the teaching and learning process. A lack of internet access and technological skills poses significant barriers in the efforts to execute digital learning. A small segment of society exhibits a negative perception toward this form of education and hinders the use of digital learning materials in the classroom (Hasin et al. 2022).

The application of digital technology in the teaching and learning process is essential for producing highly motivated students. Workshops and training sessions that ought to be provided by administrators can overcome teachers' shortcomings in handling technology. Consequently, teachers who possess high self-efficacy and proficiency in utilizing technology can play a more effective role in the teaching, learning, and facilitation process (PdPc). It is well known that Information and Communication Technology (ICT) learning was introduced by the Ministry of Education Malaysia long ago, specifically in 2014. Teachers were provided with adequate training and courses to operate computer hardware as well as its built-in applications. Even so, when the nation was tested by the COVID-19 pandemic, it clearly highlighted the issues and barriers that teachers needed to address (Nik Abdullah et al. 2021). Figure 1 simplify the issues and strategies on digital learning for national education transformation. This helps to understand the bigger picture of those issues.

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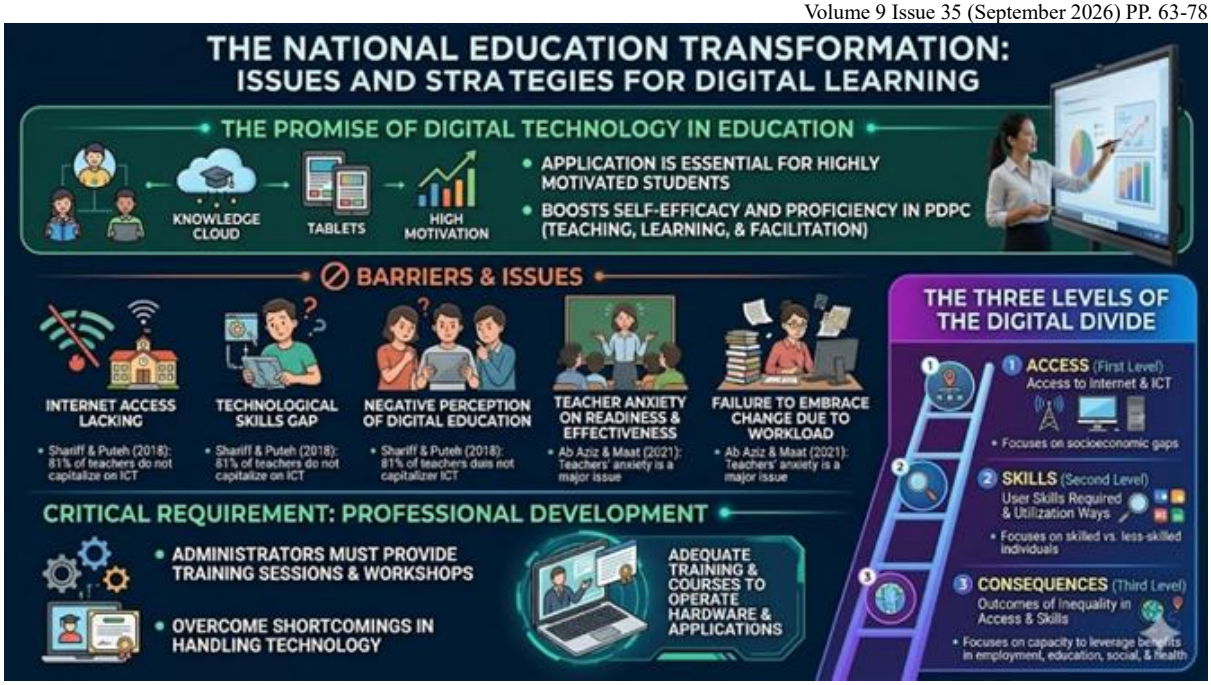


Figure 1: Issues and Strategies on Digital Learning for National Education

Shariff and Puteh (2018) reported that 81% of teachers admitted to not capitalising on the advantages of ICT in teaching and learning (PdP) activities; furthermore, even among teachers who had attended the Smart School Course, less than 51% implemented computer-assisted PdP. Nevertheless, during the COVID-19 pandemic, schools applied online learning methods, and teachers relied fully on ICT to deliver instructional input. In addition, Ab Aziz and Maat (2021) discovered in their study that teachers' anxiety regarding technology integration in terms of readiness and implementation effectiveness constituted one of the issues in using technology. Teachers' deficiencies in knowledge mastery, PdP methodology, usage and reliability, alongside their attitudes toward ICT, have resulted in teachers rarely utilizing ICT.

A lack of teacher readiness in implementing ICT in teaching and technological pedagogical content knowledge (TPACK) is also among the issues faced. Teachers' failure to embrace change through instructional technology is caused by workload factors and a low utilization of multimedia software-based Teaching Aids (BBM). The level of multimedia technology software usage for PdP among Islamic Education Teachers (GPI) remains at a moderate level (Nawi et al. 2020). Hashim (2024) argues that the digital divide issue remains relevant and continues to attract researchers' attention in line with rapidly evolving technological changes.

Prior literature has suggested three levels of the digital divide. The first level relates to the issue of access to the internet and various forms of ICT. Studies at this level focus heavily on a limited and narrow definition, namely regarding access or the first-level digital divide (Van Dijk, 2017). It was initially associated with the socioeconomic gap between those who had access to computers and the internet and those who lacked access to such facilities (Ferreira et al., 2021). Meanwhile, the second-level digital divide focuses on issues beyond access, namely the skills required by users and the varying ways the internet is utilized. Skills and proficiencies at this level have formed a digital divide between individuals who are skilled and those who are less skilled in digital technology. The third level of the digital divide relates to the consequences of inequalities in technological access and skills, as well as technology usage

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across various aspects such as employment, education, social life, politics, and health (Van De Werfhorst et al., 2022). It refers to the capacity of individuals and society to leverage the benefits and advantages of ICT access and usage. Disparities can still exist in terms of the rewards and benefits they derive from these resources (Van De Werfhorst et al., 2022). Even past research also stated issues such as unequal access, limited critical application, and over-reliance on AI underscore the need for structured guidance and institutional support (Ni, 2026).

Conceptual Research Method

The study used a conceptual research design to investigate the implementation barriers of Generative Artificial Intelligence (Gen-AI) in Malay language Classroom-Based Assessment (PBD). Conceptual research, unlike empirical studies that use primary data collection, develops knowledge through the synthesis of existing theories, educational policies, and scholarly literature to produce new perspectives and practical recommendations (Gilson & Goldberg, 2015; Jaakkola, 2020). The conceptual approach was chosen because this paper aimed at suggesting strategic solutions rather than testing hypotheses or measuring causal relationships. The development of the concepts in this paper was guided by an integrative literature review which systematically searched relevant literature to identify common barriers to implementation and potential intervention strategies. The sources were Malaysian education policy documents such as the Digital Education Policy (2023), the Ministry of Education Strategic Plan 2024–2030, the Education Service Officers Digital Education Empowerment Programme 2022–2025, and recent empirical studies on digital education, teacher readiness, classroom-based assessment, and Generative Artificial Intelligence. Integrative reviews provide researchers with the means to synthesise findings from a range of sources and build a comprehensive conceptual understanding of emerging educational issues (Snyder, 2019; Torraco, 2005).

From the synthesis, five main implementation barriers were consistently identified, including teacher readiness, student readiness, infrastructure readiness, parent and community support, and digital competency of educational leaders and teachers. These recurring themes subsequently shaped the development of five strategic recommendations presented in this paper. Hence, the proposed framework should be considered as a conceptual and policy-oriented model intended to guide future empirical studies and educational practices in the integration of Gen-AI into Malay language classroom-based assessment. Accordingly, the following section presents five strategic recommendations developed from the conceptual synthesis of the reviewed literature and policy documents. Each strategy addresses one of the major implementation barriers identified and offers practical guidance for strengthening the integration of Gen-AI in Malay language Classroom-Based Assessment.

To provide a clearer overview of the conceptual development process, Figure 1 illustrates the research framework adopted in this study. The framework demonstrates how national education policies and previous literature were synthesised through an integrative literature review approach to identify the major implementation barriers and subsequently develop strategic recommendations for the implementation of Generative Artificial Intelligence (Gen-AI) in Malay language Classroom-Based Assessment (PBD).

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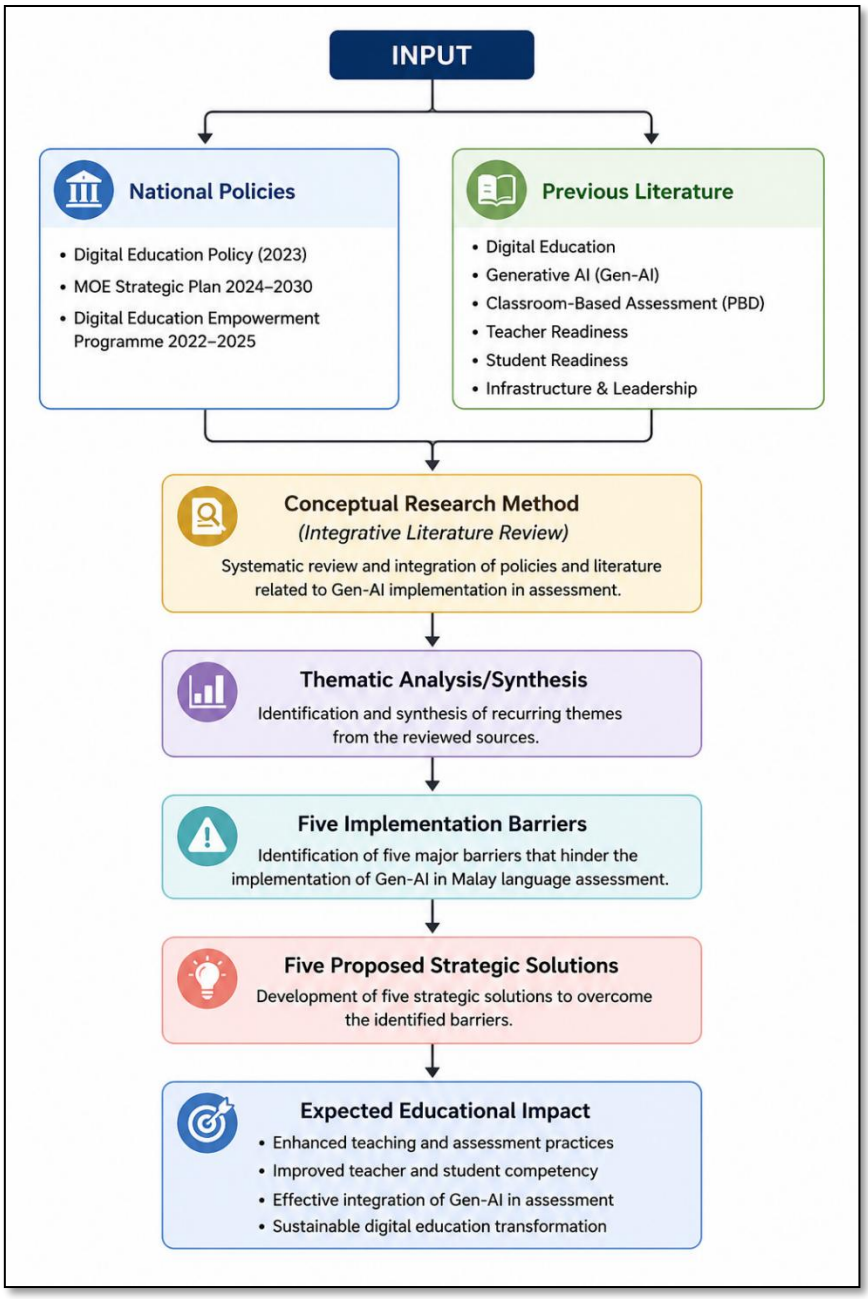


Figure 2. Conceptual Research Framework

As illustrated in Figure 2, the conceptual research framework begins with two primary sources of evidence, namely national education policies and previous literature. These sources were synthesised through an integrative literature review to identify recurring implementation barriers. The thematic synthesis subsequently informed the development of five strategic recommendations that serve as a conceptual and policy-oriented framework for strengthening the implementation of Gen-AI in Malay language Classroom-Based Assessment.

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Proposed Strategies for Overcoming Barriers in Implementing Gen-AI in Malay Language Classroom-Based Assessment

Based on the conceptual synthesis of the reviewed literature, five interrelated implementation barriers were consistently identified. Accordingly, five corresponding strategies are proposed to strengthen the integration of Gen-AI in Malay language classroom-based assessment.

First Barrier Strategy: Teacher Readiness in Information and Communication Technology

Teachers face several barriers. Deploying digital applications in the learning process delivered through various formats such as video, audio, or PowerPoint demands a significant amount of time and patience from educators. Within this strategy, school administrators play a pivotal role in ensuring that teachers are exposed to technology integration management, enabling them to apply it across all classroom teaching and learning processes. As educators, it must be kept in mind that contemporary students are more engaged and focused when presented with visually compelling digital applications that capture their attention. Teachers must continually be prepared to self-improve and transform their instructional methods in tandem with technological advancements (Ab Hakim & Iksan 2018). Educators need to remain highly motivated to adapt the learning process to align with modern technological developments.

To overcome the primary barrier of teacher readiness in utilizing Generative AI (Gen-AI) for Malay language assessment, the core strategy must focus on structured, localized professional development that bridges technical AI literacy with subject-specific pedagogy. Rather than providing generic IT training, educational institutions and platforms (such as Malaysia's DELIMa) must deploy targeted workshops that upskill educators in using Malay-specific Natural Language Processing (NLP) tools. This strategy involves training teachers to effectively prompt GenAI to automate formative assessments, design localized rubrics and generate diverse comprehension or essay stimuli that respect the complex morphology and cultural nuances of the Malay language. By embedding ethical safeguards and balancing technology with human-centered instruction, this strategy systematically transforms teacher apprehension into digital efficacy, ensuring they can confidently leverage AI to evaluate student literacy without compromising pedagogical integrity.

Second Barrier Strategy: Student Readiness in Alignment with Digital Evolution

A study by Che Muhammad Nor and Mohd Matore (2023) discusses how the implementation of online learning through Google Classroom in secondary schools has not yet been fully explored. This issue involves student readiness; specifically, students are unaccustomed to integrating digital applications into online learning processes. Various efforts have been undertaken by schools and industries to encourage students to adopt technology-based learning during educational sessions. This collective drive simultaneously alleviates the academic stress resulting from a lack of computer skills.

To address the second barrier which is student readiness in alignment with digital evolution, the strategy must focus on cultivating critical AI literacy, ethical consumption, and structural digital equity tailored to the linguistic demands of Malay language assessment. As GenAI tools rapidly evolve, students frequently struggle to differentiate between standard AI outputs and the nuanced grammatical, morphological, and contextual precision required in Malay language. The strategy, therefore, involves integrating basic AI prompt engineering and digital ethics

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directly into the Malay language curriculum, moving students from passive users who copy-paste responses to active, critical evaluators who can use AI for guided brainstorming, vocabulary expansion, and essay structuring. Concurrently, to bridge the digital divide that stems from socioeconomic and regional disparities, educational stakeholders must ensure that access to these localized, AI-driven learning tools is democratized and utilizing offline-compatible AI applications or zero-rated data access via regional learning hubs. This comprehensive approach ensures that all students, regardless of their background, develop the foundational digital maturity and linguistic skepticism necessary to use GenAI safely and effectively as a personalized learning companion.

Third Barrier Strategy: Infrastructure Readiness for Technology-Based Learning

The issue of weak and deficient digital infrastructure in schools, particularly in rural areas, must be resolved to achieve more effective and successful utilization of digital learning in education. Most developing nations have attempted to transition the learning process from physical classrooms to virtual learning. Parents have voiced frustrations regarding the difficulties of home-based learning due to various issues, such as incompatible systems and technologies, poor broadband connectivity, and the amount of time consumed managing home-based lessons. Technological digitalization requires robust internet bandwidth. School administrators must upgrade internet facilities on school grounds so that teachers and students can access connectivity anywhere within the school compound.

To fulfill the requirements of an appropriate infrastructure, functional computers, fast and stable internet access, and high-quality devices are required. Equipped with these elements, teachers and students can utilize digital resources seamlessly without any disruptions. Adequate school infrastructure also yields long-term benefits that positively impact society as a whole. With sound infrastructure in place, we can produce a generation of students who are skilled and competent in navigating rapid digital technological developments. Strategic investments by the government and schools must be carefully managed to improve this infrastructure for the benefit of future generations.

To overcome the third barrier which is infrastructure readiness for technology-based learning, the strategy must focus on architecting a high-performance, locally optimized digital ecosystem that minimizes bandwidth constraints while ensuring seamless access to Generative AI (Gen-AI) tools for Malay language assessment. Given the disparities in internet connectivity across urban and rural schools, the core infrastructure strategy relies on deploying lightweight, open-source Large Language Models (LLMs) that are fine-tuned for Malay language and hosted on localized edge servers or school intranets. This reduces heavy dependence on high-speed, continuous cloud connectivity and eliminates high data latency during real-time formative assessment (Yoon & Abdul Karim, 2026). It suggests that the integration of AI technology through visual animation and audio narration can support learning that is more engaging, interactive, and meaningful. Furthermore, this approach requires standardizing device compatibility across legacy hardware by building low-bandwidth web interfaces and mobile-friendly assessment apps that integrate with existing national platforms like DELIMa. By combining distributed localized computing with data-optimization protocols, the infrastructure becomes resilient enough to democratize AI-driven Malay language tools such as automated essay grading and personalized feedback systems for every student, regardless of regional connectivity constraints.

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Fourth Barrier Strategy: Parent and Community Support

In utilizing these digital applications, cooperation from parents is critical and necessary to ensure that all plans and efforts initiated by teachers can proceed smoothly. Nevertheless, Hasin (2022) found that schools still face barriers regarding parental cooperation when implementing digital learning online.

Engagement sessions and awareness campaigns must be intensified. Parents need to understand and be prepared to provide digital learning equipment in addition to supporting their children's studies. Parents must be educated on how technology is integrated into education. They need to comprehend the importance of technology in their children's academic development and be informed about the risks and preventive measures associated with technology usage. This will empower them to make informed decisions to ensure their children's safety when interacting with technology during learning.

To mitigate the fourth barrier which is parent and community support, the strategy must focus on building transparent, community-driven advocacy and digital literacy campaigns that reframe GenAI from an instrument of academic dishonesty into a structured tool for cultural and linguistic preservation. Because parents often fear that AI reliance will erode authentic writing skills or lead to plagiarism in Malay language assessments, schools must leverage Parent-Teacher Associations (PIBG) to host collaborative AI in Literacy workshops. These sessions should demystify how GenAI functions as a collaborative home-learning assistant demonstrating, for example, how parents can co-use AI to generate personalized vocabulary flashcards, simulate bilingual translation drills, or provide immediate, formative feedback on grammar (tatabahasa) and sentence structure (binaan ayat). Concurrently, community integration can be achieved by partnering with local cultural institutions, such as Dewan Bahasa dan Pustaka (DBP), to champion public awareness campaigns that highlight the ethical, human-in-the-loop use of technology to safeguard Malay heritage. By establishing clear school-home boundaries on acceptable AI assistance and celebrating students' AI-augmented creative works, this strategy transforms parental skepticism into an active partnership, creating a unified ecosystem that reinforces language proficiency both inside and outside the classroom.

Fifth Barrier Strategy: Digital Competency of Leaders and Teachers

In this progressively advanced era of digital education, teachers must actively develop themselves professionally to keep pace with rapidly evolving digital technology. They must thoroughly master digital technology and seamlessly integrate it into the learning curriculum. To achieve this, teachers require comprehensive support in terms of training, instructional resources, complete school infrastructure, and mastery of the latest technological skills.

Mad Nordin et al. (2023), in their study, state that teachers must upscale their skills and enhance training related to digitalization, which subsequently assists them in mastering applications and devices related to digital technology. Consequently, teachers must participate in professional courses and training that emphasize technology utilization in education. This developmental training is the cornerstone of the digital education transformation. Teachers must actively engage in training courses and development programs that emphasize digital literacy and technology integration in the instructional process.

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Although efforts are underway to provide online training such as the SiPP platform, numerous constraints exist, such as complimentary licenses being restricted to one year only, alongside claims that the platform lacks user-friendliness. Therefore, educational leadership at the MOE level must take a more proactive approach in designing appropriate training programs or methods that align with current demands.

To address the fifth barrier which is the digital competency of school leaders and teachers, the strategy must focus on establishing a dual-track visionary leadership and pedagogical framework that institutionalizes GenAI literacy across all levels of the educational hierarchy. For school leaders (such as principals and Guru Kanan Mata Pelajaran), the focus is on data-driven strategic management: training them to interpret macro-level AI assessment metrics to optimize school-wide Malay language literacy strategies, allocate technological resources effectively, and navigate the ethical and privacy policy frameworks of AI integration. Simultaneously, for Malay language teachers, the competency strategy shifts from basic ICT use to applied AI-pedagogy integration. This involves fostering professional learning communities (PLCs) where educators collaboratively design AI-driven rubric matrices, master the art of prompt engineering specifically for Malay morphology, and share best practices for detecting AI-generated plagiarism. By transforming school leaders into digital champions who foster an ecosystem of innovation, and equipping teachers with advanced AI-diagnostic capabilities, this strategy ensures that technology-based assessment is driven by robust, unified professional expertise rather than ad-hoc, isolated efforts. Further experimental studies are recommended to evaluate the effectiveness of GenAI in Malay language assessment in terms of student achievement, feedback quality, and content comprehension (Osaman & Mohd Matore, 2025). Figure 3 visually emphasized on the strategies to overcome barriers on implementing PBD in Malay language assessment using GenAI.

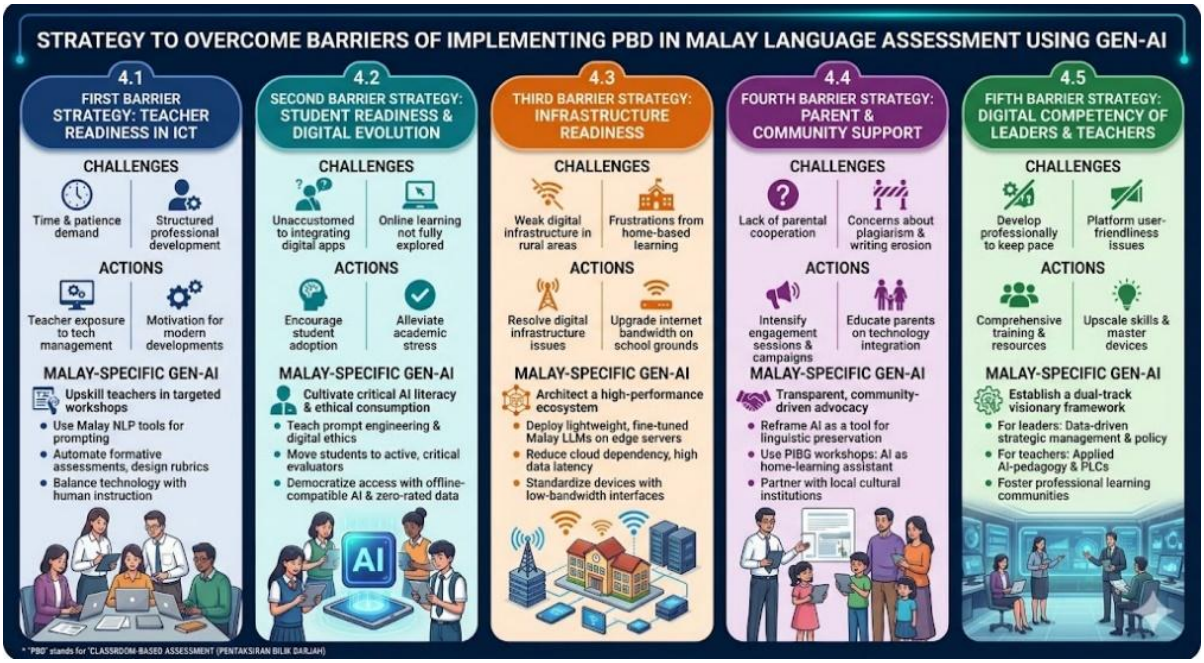


Figure 3: Strategies to Overcome Barriers on Implementing PBD in Malay language Assessment using GenAI.

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Implications and Future Research

The proposed framework should be interpreted as a conceptual model rather than an empirically validated intervention. Its purpose is to provide educational stakeholders with evidence-informed guidance derived from existing literature and national policy documents. Future empirical studies are required to evaluate the feasibility and effectiveness of each proposed strategy across different educational settings**.**

If Malaysia's Digital Education Policy is going to work for Malay language classes, GenAI has to be part of the conversation. But honestly, it is not going to be an easy shift. First off, teachers need to be ready, and that means everyone from the veterans to the brand-new rookies. Without proper, hands-on training to grade tough things like Malay grammar and sentence structure using AI, the whole system faces a real risk of falling apart. And what about the students? Sure, they have the world at their fingertips with AI, but they cannot just copy and paste their way through an essay. Students must learn how to question what the AI gives them, expand their vocabulary, and use it strictly as a tool to map out their writing. Otherwise, they will just fall behind. But here is the real issue: none of these matters if the tech does not work. The priority must be building low-bandwidth, localized AI tools that function even with a terrible internet connection, ensuring rural and underprivileged students are not left in the dark. It is really taking a village. Parents, neighbours, and local groups need to step up, help fund devices, and change the mindset at home. AI should not be seen as a cheating tool, but as a digital study buddy that keeps the language alive. Principals and school leaders have a massive role to play here too. They cannot just sit back; they have to lead the charge and build these digital classrooms. Meanwhile, teachers need to learn how to write great prompts so they can move past old-school textbooks and embrace interactive learning. Looking ahead, real, long-term research is necessary to see if any of this is actually working. Studies should track how teacher training holds up, figure out how to fit global tech models into local school culture, and close the gap between rich and poor students. Most importantly, keeping an eye on how all this screen time affects students' mental health is vital, ensuring a high-tech future that still puts human well-being first.

Conclusion

This study set out to propose the strategy on the barriers of implementing PBD in the Malay language assessment subject using Gen-AI. Digital education has become an increasingly relevant topic in this modern technological era. While it offers a multitude of benefits, there are also several issues and barriers that must be addressed. The findings reveal that the strategies significantly enhance the quality of Malay language assessment. Importantly, the results highlight that the teachers can improve their assessment method and the students can adapt it well. The implications of this study are twofold. From a theoretical perspective, it contributes to the growing body of literature on the digitalization by demonstrating GenAI especially when implementing PBD in the Malay language assessment subject. From a practical standpoint, students can access learning materials from anywhere and at any time, which facilitates the learning process. Additionally, digital technology enables more interactive and engaging learning experiences, such as through the use of videos, animations, and simulations. Nevertheless, there are several issues that require careful attention. One of the main concerns is the digital divide, where not all students have access to digital devices and stable internet connectivity. This can lead to inequality in learning opportunities. Furthermore, ensuring cybersecurity and protecting students' data privacy pose significant barriers.

Additionally, the incorporation of technology in education demands high digital literacy from both teachers and students. This requires continuous training and support to ensure they can utilize technology effectively. There are also growing concerns regarding the effects of excessive digital device usage on students' physical and mental health. Overall, while digital education offers immense opportunities to elevate the quality of learning, it also demands a careful and strategic approach to overcome the emerging issues and barriers. Through the cooperation of all parties involved, we can ensure that digital education delivers maximum benefits to all students. Although the present study is conceptual in nature, it provides a structured policy-oriented framework that may guide future empirical investigations. Subsequent studies should validate the proposed framework through surveys, interviews, Delphi techniques, or intervention studies involving Malay language teachers across different educational contexts.

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