Exploring English Language Teachers' Perceptions and Practices of Digital Lesson Planning Using Planboard: A Qualitative Study in a Private School in Seremban

Nur Nadiah Basher*., Melor Md Yunus., Hanita Hanim Ismail

Universiti Kebangsaan Malaysia, Bangi, Malaysia

DOI: https://dx.doi.org/10.47772/IJRISS.2025.91100186

Received: 18 November 2025; Accepted: 27 November 2025; Published: 04 December 2025

ABSTRACT

The digitalization of educational practices has intensified the need for effective Digital Lesson Planning Platforms (DLPPs), yet empirical evidence regarding their implementation in Malaysian private schools remains limited. This study investigates the effectiveness of Planboard, a DLPP, in enhancing instructional planning among English language teachers at a newly established private school in Seremban, Malaysia. Although digital tools are increasingly integrated into education, the use of DLPPs in Malaysian private schools, particularly in ELT, remains underexplored. Addressing this gap, the study aims to evaluate Planboard's usability, usefulness, and influence on lesson quality, structure, and efficiency, while identifying challenges encountered during its integration. Guided by the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT) and Technological Pedagogical Content Knowledge (TPACK) framework, a qualitative methodology was employed through five months of classroom observations and semi-structured interviews with two English teachers. Findings indicate that Planboard improved lesson organization, time management and curriculum alignment, particularly when used by digital literate teachers. However, technical challenges such as internet reliability, data retention and limited digital fluency were significant barriers. The study contributed to the understanding of DLPP adoption in underrepresented educational contexts and underscores the importance of infrastructure, training and instructional support for effective implementation. These insights highlight the potential of digital platforms to enhance lesson planning when integrated thoughtfully into pedagogical routines.

Keywords: Digital Lesson Planning Platforms, English Language Teaching, Lesson Planning, Planboard Integration, Education

INTRODUCTION

Research Background

The importance of lesson planning has never been a topic of discussion within any educational institute as they are the backbone of teachers' effectiveness within any type of syllabus. Lesson planning has traditionally been regarded as a cornerstone of effective teaching, ensuring that classroom instruction is well-structured, goal-oriented, and aligned with curriculum standards [27], [16]. However, even with the knowledge of its importance, teachers in many educational settings continue to experience challenges such as time constraints, administrative workload, and pressures from rigid curricular structures, which affect instructional coherence [50], [33]. These challenges are compounded by the intensification of teaching tasks and the complexity of classroom time management [50], [33]. In response, Digital Lesson Planning Platforms (DLPPs) have emerged as tools to streamline planning, encourage collaboration, and integrate digital resources efficiently [19], [52]. These platforms not only enhance instructional design but also support teachers in aligning lesson plans with learning outcomes, particularly in outcome-based education systems [52], while promoting collaborative and reflective teaching practices [19].

One such platform, Planboard, offers customizable lesson templates, drag-and-drop scheduling, curriculum alignment, and digital resource integration, facilitating structured and efficient planning [39]. In English Language Teaching (ELT), DLPPs have shown promise in supporting language teachers through structured

templates, integrating multimedia resources, and curriculum-linked planning tools. These platforms help language educators design activities that promote communicative competence, incorporate differentiated institutions, and align with language acquisition frameworks. As English teachers often navigate a variety of student proficiency levels and skill-focused objectives, such as reading, writing, listening and speaking, the ability to organize lessons digitally and adapt them flexibility is particularly valuable [55], [36]. In practice, DLPPs have been associated with enhanced teacher efficiency, better lesson organization, and support for differentiated instruction practices [11], [2]. However, despite their growing adoption, empirical evaluations of their effectiveness in newly established or private school contexts within Malaysia, especially outside urban centers, remain limited [32].

This exploration is timely given the rapid push towards digitalization in Malaysian education, where private schools often act as early adopters of educational technology.

Problem Statement

Although digital tools such as Planboard promise to reduce teachers' workload and enhance instructional quality, their adoption is not without barriers. Existing studies highlight issues such as the steep learning curve for teachers unfamiliar with digital platforms, resistance due to established planning routines, and contextual misalignments with national or school-based curricula [56], [45], [37].

In Malaysia, empirical research on DLPPs remains limited, especially in the context of private schools where technology adoption can vary widely. Existing studies are often small-scale, focusing on pilot implementations or prototype systems within single institutions [47]. This reflects a broader trend where local evidence on the pedagogical and organizational integration of such platforms is scarce, particularly outside urban or well-resourced public schools [54]. While international studies highlight the potential of digital lesson planning tools to enhance teaching efficiency and student engagement, the applicability of these benefits to diverse Malaysian school contexts remains uncertain.

Thus, the problem this study addresses is the uncertain effectiveness of Planboard in improving lesson quality, efficiency, and structure, as well as the potential usability and integration challenges faced by teachers in a new private school setting. Furthermore, the integration of DLPPs into ELT presents unique pedagogical opportunities and challenges. Given the need for language teachers to design lessons that address diverse learner proficiencies and communicative skill areas, digital planning platforms offer structures, adaptable tools that can support differentiated instruction, multimedia integration and alignment with language learning outcomes. Studies have shown that such platforms can improve lesson coherence and instructional alignment in ELT contexts [40], [31], [18]. However, the extent to which these benefits translate to English language classrooms in Malaysia, particularly in private schools with varied technological capacities, remains unexplored. As such, this study not only evaluates Planboard's overall effectiveness but also examines its specific impact within English language lesson planning.

Research Objective

This study outlines the following specific objectives:

1. To explore English language teachers' perceptions of usability and usefulness of Planboard in their day-to-day lesson planning.

2. To examine how the use of Planboard influences the quality, efficiency, and structure of English language lesson planning practices.

3. To identify the challenges faced by English language teachers when integrating Planboard into their instructional planning.

LITERATURE REVIEW

Digitalization of Lesson Planning

Lesson planning has long been considered an essential practice for ensuring effective teaching and learning. Traditionally, teachers prepared lesson plans in written or printed formats, which served as blueprints for instructional delivery, classroom management, and assessment alignment. With the rapid digitalization of education, however, lesson planning has undergone a significant transformation. The emergence of digital tools has enabled teachers to move beyond static documents and embrace dynamic, interactive, and shareable planning platforms [19], [30], [13]. Digitalization in education provides several key benefits. It enhances accessibility to resources and learning opportunities [21], [53], enables easier storage and retrieval of lesson materials through digital platforms [48], and allows for the integration of multimedia resources that enrich teaching and learning experiences [48]. Furthermore, digital technologies foster collaboration among teachers by promoting inclusive and innovative practices [6], [21]. Globally, education systems have increasingly promoted the use of digital lesson planning tools as part of wider efforts to modernize pedagogy and respond to 21st-century learning demands [4], [42], [13]. In countries such as the United States and the United Kingdom, digital lesson planning platforms have been integrated into teacher training and professional development programs, reflecting their growing importance in everyday educational practice [20], [34], [19], [30].

This body of research lays a comprehensive foundation for examining how a specific digital lesson planning platform, such as Planboard, fits within the wider educational shift toward digitalization. It offers valuable context for understanding the platform's potential to support enhanced instructional planning through increased efficiency, accessibility, and multimedia integration. At the same time, the literature reveals important areas of tension and complexity that warrant closer investigation, particularly the practical and contextual challenges teachers may face when incorporating such tools into their everyday planning routines. These may include issues related to digital literacy, platform navigation, time constraints, and the need for alignment with school policies or curricula. As such, this growing body of evidence underscores the critical importance of exploring both the functional affordances and real-world limitations of Planboard, thereby contributing to a more nuanced understanding of how digital lesson planning tools operate in diverse educational environments.

The Role of Digital Lesson Planning Platforms (DLPPs)

Digital Lesson Planning Platforms (DLPPs) can significantly reduce the administrative workload by automating repetitive planning tasks. Recent advancements, particularly those involving AI, have further enhanced this potential. For instance, [30] developed a generative AI-based lesson planning tool that demonstrated a substantial reduction in the time teachers spent designing lessons. Complementing this, Reference [28] explored how large language models (LLMs) fine-tuned with Gagné's Nine Events of Instruction can assist educators by automating pedagogically structured lesson development. Their study illustrates that when digital planning tools are aligned with instructional design principles, they not only automate the process but also preserve pedagogical rigor. Together, these findings support the broader view that DLPPs, when thoughtfully implemented, can relieve educators of time-intensive manual tasks while enhancing instructional coherence.

DLPPs promote lesson coherence by providing structured formats that guide teachers in organizing instructional content systematically. This structure is especially beneficial in aligning lesson objectives, activities, and assessments with national or school-based curricula. Reference [15] developed a web-based digital lesson planning tool specifically designed to scaffold teachers' planning in STEAM education. Their platform helped educators break down complex interdisciplinary content into manageable, logically sequenced components, thereby improving lesson clarity and internal consistency. The study underscores the potential of DLPPs to support instructional coherence not only through digital efficiency but also by embedding pedagogical scaffolds directly into the planning interface.

Another significant advantage of DLPPs is their capacity to support differentiated instruction. By enabling teachers to tailor content, tasks, and assessments to students' diverse needs, these platforms facilitate more inclusive and responsive teaching. Reference [30] developed a generative AI-based lesson planner that explicitly incorporates variables such as student demographics, learning objectives, and preferred learning styles, thereby

aligning lesson content with individual learner profiles. Similarly, reference [32] found that pre-service teachers using ChatGPT during lesson planning frequently employed it to generate differentiated questioning strategies, scaffolding prompts, and individualized support. While their study also raised concerns about potential overreliance on AI tools, it highlights how digital platforms can be leveraged to enhance instructional flexibility and responsiveness. Together, these findings affirm the role of DLPPs in promoting pedagogical differentiation through intelligent, adaptive features.

Beyond individual lesson design, DLPPs can also foster professional development and collaborative pedagogical practice. Reference [19] examined a "Shared Collaborative Lesson Planning" (SCLP) model supported by computer-supported collaborative learning (CSCL) tools. Their findings indicated that online collaborative planning platforms not only enhanced teachers' planning capabilities but also facilitated peer learning and adaptation of effective instructional strategies. Although not specific to DLPPs, reference [43] argues that digital mentoring systems and professional development platforms share functional similarities in scaffolding instructional reflection and growth. These insights suggest that DLPPs, especially those with built-in collaboration features, can contribute to teacher learning communities and professional competence beyond mere administrative convenience.

Despite the advantages offered by DLPPs, limited digital literacy remains a critical barrier to their widespread adoption. Reference [29] documented how elementary school teachers in remote regions struggled with digital tools during the COVID-19 pandemic, citing challenges related to confidence, infrastructure, and lack of training. Although somewhat older, reference [23] provided quantitative evidence that digital competence, including skills related to content presentation and knowledge enhancement, is a significant predictor of teachers' ability to effectively utilize learning management systems. Together, these studies underscore that digital literacy is not merely a technical issue, but a foundational requirement for the successful integration of DLPPs into educational practice.

Another key challenge hindering the adoption of DLPPs is the inadequacy of educational infrastructure in many schools. Reference [5] identify several structural impediments including limited access to devices, unreliable internet connectivity, and insufficient technical support, which collectively undermine the consistent use of digital tools in lesson planning. These issues are particularly acute in rural or underfunded schools, where even basic technological requirements remain unmet. Without sustained investment in digital infrastructure and accessible technical assistance, even the most pedagogically sound DLPPs are unlikely to reach their full potential. Thus, while DLPPs hold significant potential, their effective adoption requires careful contextual consideration.

DLPPs in English Language Teaching

The integration of DLPPs into ELT is particularly promising, given the dynamic and multifaceted nature of language instruction. Language teachers are often required to address diverse student proficiency levels, adapt materials for the four macro-skills, listening, speaking, reading and writing, and incorporate communicative and learner-centered strategies. DLPPs such as Planboard can support these needs by enabling structured planning, easy integration of multimedia resources, and alignment with curriculum objectives.

Recent research highlights the potential of digital planning tools to enhance lesson coherence, foster teacher reflection and improve alignment between learning outcomes and classroom activities [40], [18]. Specifically, tools like the Lesson Plan Analysis Protocol (LPAP) offer evaluative frameworks that can be adapted to assess the quality of English lessons and support teacher professional development. In parallel, reference [31] demonstrated the utility of retrieval-augmented systems to help teachers generate lesson plans tailored to national curriculum standards, which is a method that could be particularly useful in ELT contexts requiring differentiated instruction.

Despite these promising developments, research focusing explicitly on DLPPs in ELT within the Malaysian connect remains scarce. The transferability of international findings to local classrooms, especially in private or under-resourced schools, requires further investigation. This study aims to address that gap by exploring how English language teachers perceive and utilize Planboard in Malaysian private school settings.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue XI November 2025

Theoretical Framework

1) Technology Acceptance Model (TAM).

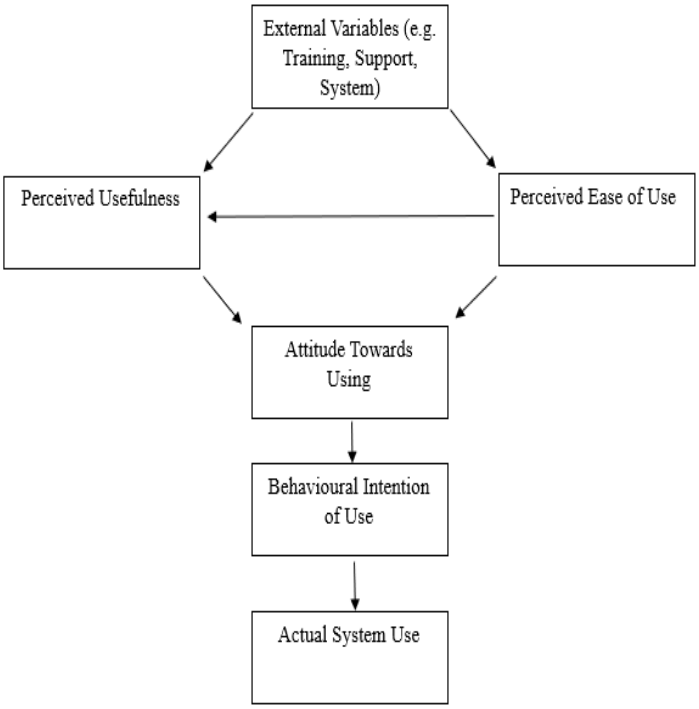

Figure 1: Technology Acceptance Model (TAM)

Several theoretical frameworks have been employed to examine the adoption and effectiveness of DLPPs. The Technology Acceptance Model (TAM), developed by reference [12], has been widely used to assess how perceived usefulness and ease of use influence users' willingness to adopt digital tools. Within the context of lesson planning, TAM suggests that teachers will be more likely to embrace DLPPs if they believe the platforms enhance their productivity and are user-friendly.

This assertion is supported by a growing body of empirical research. For instance, reference [49], in a systematic review of teachers' technology acceptance during the COVID-19 pandemic, identified five key factors influencing educators' intentions to adopt digital technologies: perceived usefulness, perceived ease of use, attitude, social influence, and facilitating conditions. Notably, perceived usefulness and ease of use emerged as dominant predictors, underscoring the foundational principles of the TAM framework. These findings suggest that teachers were more inclined to utilize digital platforms when they believed these tools could enhance instructional delivery and reduce the complexity of integrating technology into their teaching routines.

Complementing these insights, reference [1] conducted a dual-staged PLS-SEM-ANN analysis to explore preservice teachers' behavioral intentions to employ artificial intelligence tools, specifically T-Bots, for lesson planning. Their findings revealed that performance expectancy and effort expectancy were among the most significant positive predictors of technology adoption. These constructs align closely with TAM's core components: perceived usefulness and perceived ease of use. The study demonstrated that preservice teachers were more willing to integrate AI-driven planning tools when they perceived them as effective in enhancing teaching performance and relatively simple to use. These empirically grounded insights provide a strong theoretical justification for the present study's first research question, which investigates how perceptions of utility and usability influence teachers' adoption of digital lesson planning platforms.

In the context of this study, TAM offers a practical lens for interpreting teachers' responses to Planboard. The model's emphasis on perceived usefulness and perceived ease of use is directly reflected in how English language teachers evaluated the platform.

2) Unified Theory of Acceptance and Use of Technology (UTAUT).

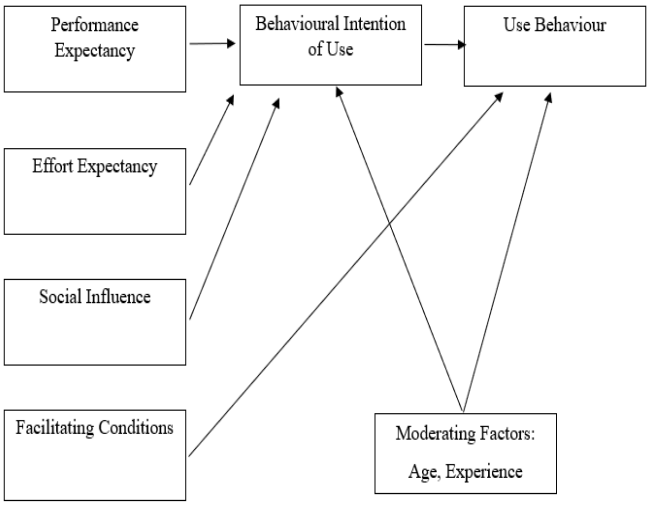

Figure 2: Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), proposed by reference [51], expands upon earlier models such as the Technology Acceptance Model (TAM) by integrating additional constructs including social influence and facilitating conditions. UTAUT posits that technology adoption is significantly influenced by performance expectancy, effort expectancy, social influence, and facilitating conditions, with variables such as age, gender, experience, and voluntariness moderating these relationships. The model synthesizes elements from eight prominent theoretical frameworks and demonstrates superior predictive validity in explaining user intentions to adopt technology.

In educational contexts, the constructs outlined in UTAUT, particularly social influence and facilitating conditions, are especially pertinent due to the organizational and collaborative nature of teaching environments. Institutional support, in the form of administrative encouragement, access to professional development, and reliable technical infrastructure, can significantly lower barriers to technology adoption among educators. Similarly, peer encouragement plays a vital role in shaping subjective norms; when teachers observe colleagues successfully integrating DLPPs, they are more likely to view such tools as beneficial and adopt them themselves.

Empirical evidence supports this interpretation. Reference [1], in their investigation into the use of AI-based educational tools for lesson planning, identified social influence and environmental readiness, key components of UTAUT, as major determinants of preservice teachers' behavioral intention to adopt the technology. Their findings demonstrated that when preservice teachers received positive reinforcement from peers and perceived strong infrastructural support, their willingness to incorporate AI tools into their instructional planning increased substantially. This aligns with UTAUT's assertion that behavioral intention is shaped not only by individual perceptions of usefulness and ease of use but also by the broader social and institutional ecosystem. Thus, UTAUT provides a robust framework for understanding how systemic and interpersonal factors collectively influence the adoption of DLPPs in educational settings.

Recent empirical and review studies continue to affirm the relevance of UTAUT's social influence and facilitating conditions constructed in educational technology adoption. Reference [14] develops an extended UTAUT model for teachers, underscoring that peer influence and organizational support remain strong predictors of adoption in K-12 settings. Meanwhile, reference [17], in a wide-ranging systematic review, shows that social influence and facilitating conditions remain among the four dominant factors across studies of educational technology use. Thus, these studies strengthen the claim that institutional support, peer norms, and infrastructure availability shape teachers' willingness to adopt DLPPs.

In this study, the UTAUT offers a valuable framework for understanding the external factors that influenced English language teachers' adoption of Planboard. The model's focus on social influence and facilitating conditions is particularly relevant, as teachers indicated that peer support and administrative encouragement played a significant role in their willingness to engage with the platform.

3) Technological Pedagogical Content Knowledge (TPACK).

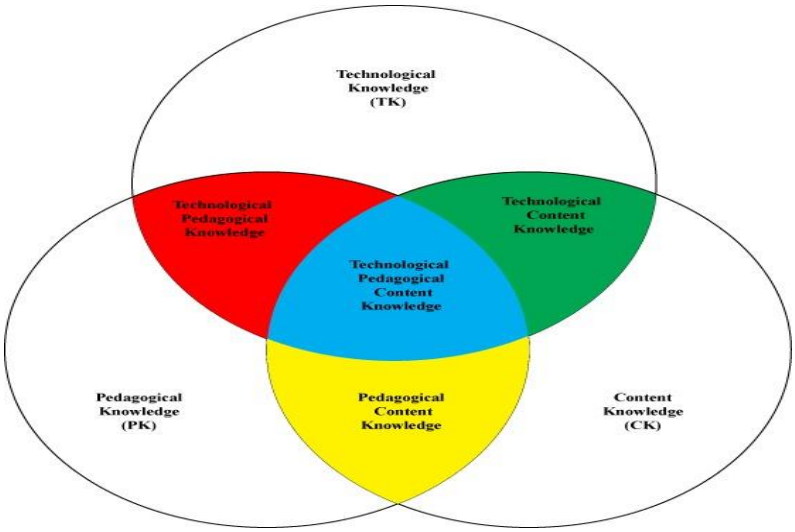

Figure 3: Technological Pedagogical Content Knowledge (TPACK)

In ELT, and other educational contexts, the Technological Pedagogical Content Knowledge (TPACK) framework offers a comprehensive model for understanding how educators integrate technology into their teaching; especially within their lesson planning session. It conceptualizes effective teaching as the intersection of three essential knowledge domains; which are technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK). A bibliometric analysis by reference [26] confirms that TPACK has become a central framework in English language education. Highlighting its growing relevance in ELT research and practice. In health professions education, a systematic review by reference [3] underscores the framework's applicability across disciplines, emphasising its role in improving instructional design and educator competencies.

Importantly, recent research emphasizes that the access to technology alone does not guarantee effective educational technology integration. A systematic review by reference [35] affirms that teachers' TPACK proficiency is strongly associated with enhanced student engagement, motivation and learning outcomes. However, the study also highlights the importance of contextual variables, such as infrastructure availability, institutional support and teachers' prior experience, that shape how TPACK is enacted in practice. Similarly, reference [7] propose a decision-making model for evaluating TPACK constructs in language learning classrooms, identifying technological, pedagogical and content dimensions as critical success factors. These findings support the assertion that digital tools must be embedded within sound pedagogical and content framework to meaningfully enhance teaching and learning, such as in the case of digital lesson planning or teaching-mediated instruction.

In line with these findings, reference [10] emphasize that the development of teachers' TPACK is a critical component in English language education, particularly within English as a second language (ESL) teacher training programs. Their study demonstrates that equipping teachers with integrated technological, pedagogical and content knowledge enables them to design and implement technology-enhanced lessons more effectively. This aligns with broader research indicating that mastering not only technological tools but also understanding how these tools support pedagogy and content is essential for effective technology integration in language teaching.

In the context of this study, while the study is guided by established technology adoption models to explore usability and implementation challenges, TPACK uniquely captures the cognitive and practical complexity teachers face when aligning technological tools with language pedagogy and curriculum content. TPACK is thus essential for understanding not just whether teachers accept Planboard, but how they use it pedagogically to enhance lesson quality, structure and differentiation, making it a valuable complement and potential alternative to broader, less domain-specific frameworks.

Empirical Findings on Digital Lesson Planning Platforms (DLPPs)

Research on Planboard and comparable platforms highlights three recurring themes. First, in terms of usability and usefulness, studies report that teachers value DLPPs' intuitive interface, drag-and-drop functionality, and ability to customize templates to suit different subjects [16], [13], [25], [24]. Teachers also perceive DLPPs as a useful tool for maintaining consistency across multiple classes and subjects. However, some users note that the initial setup can be time-consuming, and adapting to the platform requires a learning curve [13], [24].

Second, regarding the impact on quality, efficiency, and structure, research suggests that DLPPs help teachers create more coherent lesson flows, align activities with learning outcomes, and track student progress more effectively [38], [22], [19]. For example, teachers using such platforms reported improvements in time management, as the platform reduces duplication and allows for easier reuse of lesson templates [13], [16]. Some studies also highlight improvements in collaborative planning, where teachers share and adapt lesson templates across departments [24], [19].

Third, challenges with integration and contextual alignment remain significant. Several barriers persist, including unreliable internet connectivity, lack of formal training, and the difficulty of adapting platforms like Planboard to national curricula. For instance, in the DigUp study, teachers expressed frustration when the platform's structure clashed with their personal pedagogical styles or when overly rigid planning templates limited their instructional flexibility [24]. These concerns align with findings by [25], who emphasizes the importance of context-sensitive implementation and the necessity of designing tools that accommodate diverse teaching needs and local curriculum frameworks. The success of DLPPs ultimately depends on institutional readiness, teacher digital competence, and school infrastructure.

Research Gap

Although DLPPs have been widely studied internationally, research in Malaysia remains limited. For instance, qualitative research from reference [48] describes a small prototype tested with five teachers in Sabah, but it stops short of large-scale adoption or exploring integration into full school systems. Another project by [47], similarly reports promising feasibility but lacks empirical investigation across diverse school types.

Most Malaysian research in educational technology centers around national Information and Communication Technology (ICT) initiatives [54] such as Smart Schools, virtual learning environments and Learning Management Systems (LMS) adoption to name a few, rather than focused studies on DLPPs or lesson planning tools.

Against this backdrop, even fewer studies address DLPPs in private, newly formed schools, where teachers may face particular pressures such as organizational instability, adapting to new institutional cultures, balancing administrative and pedagogical duties. There is essentially no empirical research on how Planboard functions in Malaysian school contexts.

This study therefore aims to fill these gaps by evaluating English teachers' perceptions of Planboard's usability and usefulness, investigating its influence on lesson quality and efficiency, and identifying integration challenges when planning and applying in an English language classroom. By focusing on a private school in Seremban, the research offers contextually grounded evidence to complement both Malaysian and international scholarship on DLPP adoption.

METHODOLOGY

Research Design

This study adopted a qualitative research design, focusing on English language teachers' experiences and practices in using Planboard for lesson planning. A qualitative approach was selected because the purpose of the study was to explore English teachers' perceptions, behaviors, and challenges in depth rather than to quantify outcomes statistically. Data was collected through two main sources, which are, observations and semi-

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue XI November 2025

structured interviews. The combination of these methods allowed for a comprehensive understanding of both the practical effectiveness of Planboard and the teachers' subjective experiences of its integration.

Research Setting and Participants

The study was conducted at Pioneer Quest Academy, an established private school in Seremban, Malaysia. The school adopted Planboard on 1st June 2025 as part of its initiative to digitalize lesson planning practices. This adoption aimed to streamline lesson documentation, promote consistency in instructional design and support teachers in managing their planning tasks more effectively. Within this initiative, English language teachers were among the first to implement Planboard in their instructional routines, offering a unique lens through which to explore its impact on lesson planning in the English language classroom.

1) Participants for Observation. This study employed semi-structured observation as a primary data collection method, specifically focused on teachers' digital lesson plan submissions. The observation focused on two predefined dimensions, which are the consistency and timeliness of lesson plan submission through Google Drive links and the structural pedagogical quality of the submitted plans, as supported by Planboard. Observations were guided by a custom checklist that assessed elements such as adherence to the school's lesson plan format, clarity of objectives, instructional flow and the integration of digital tools. The observation spanned a five-month period, from June to October.

These focal points allowed the researcher to systematically observe and document the planning behaviors and instructional decision-making of English language teachers, while maintaining flexibility to record emergent patterns and contextual factors relevant to digital planning integration. This approach is consistent with established practices in qualitative observation, where researchers balance structure with openness to emergent themes [9]. Observation notes were compiled into narrative records, which were later coded and analyzed thematically, in conjunction with interview data.

The observation phase focused two on English language teachers over a five-month implementation period, from June to October. These participants were selected based on their active use of Planboard for instructional planning during their initial stages of its adoption at the school. While the wider teaching staff included educators from various subject areas such as Bahasa Melayu, Mathematics and Science to name a few, this study concentrated solely on English language teachers. The focus on a small purposive sample is methodologically aligned with qualitative longitudinal research, where depth, contextual insights and temporal tracking are prioritized over breadth [44], [41]. This five-month design and sustained engagement with participants align with best practices for capturing change over time in a practiced-based educational setting [41].

Month	Number of Participants
June	Two
July	Two
August	Two
September	Two
October	Two

Table 1: Number of Participants Under Observation

2) Participants for Interview. In accordance with observational data, two English teachers were selected for semi-structured interviews using purposive sampling to ensure variation in teaching backgrounds and experiences with lesson planning. Purposive sampling continues to be endorsed in recent qualitative research as a way to select information-rich cases aligned with research aims [8], [46].

In terms of the participants' demographic, Participant A, a male teacher at the age of 24, has only one year of teaching English for primary school students in a tuition center where he used Google Docs to create informal lesson plans, whereas Participant B, a female teacher with the age of 50, has over 20 years' experience in teaching English with over 15 years teaching in government school in Malaysia and over 5 years teaching in an international school. Hence, Participant B had experience with traditional logbook-based lesson planning as well as fully written-based lesson planning before adopting Planboard.

Participant	Prior Experience
Participant A	Digital Lesson Planning (Google Docs)
Participant B	Traditional Logbook

Table 2: Participants' Prior Experience in Formal Lesson Planning

The interview process was conducted in two rounds. The first round focused on participants' initial perceptions of Planboard's usability and overall usefulness in lesson planning. The second round, conducted after a period of sustained use, explored the platform's effectiveness in supporting English language teaching specifically, as well as the challenges encountered during integration into daily planning routines. This purposeful variation in participants' prior experience, combined with the two-staged interview structure, ensured the study captured a broad range of perspectives regarding usability, efficiency and integration challenges [38]. Such diversity allowed the study to provide an in-depth understanding of how English language teachers perceive and integrate Planboard into their instructional planning practices.

Data Collection Procedures

1) Classroom Observation and Lesson Plan Analysis: Teachers' lesson planning practices were observed over a five-month period from June to October 2025. The observations focused on two primary dimensions. The first was the submission of lesson plans; specifically whether teachers submitted their plans consistently and in accordance with school expectations. This included the timeliness and completeness of submissions, both before and after the introduction of Planboard. The second dimension examined the structural quality of the submitted lesson plans, with particular attention to whether Planboard-supported plans demonstrated clearer instructional organization, improved alignment with learning objectives and effective integration of digital tools.

Throughout this period, the researcher maintained detailed observation notes, documenting both the planning behaviors of English language teachers and the quality of their submitted lesson plans. Comparative analyses were conducted between pre-implementation practices, characterised by the use of traditional logbooks or informal planning methods, and post-implementation practices following the adoption of Planboard.

2) Semi-Structured Interviews: To gain deeper insights into English language teachers' experiences with Planboard, semi-structured interviews were conducted in two rounds with two participants. The interview protocol was designed to align closely with the study's research questions and was implemented in two phases. The first round of interviews focused on teachers' initial perceptions of Planboard's usability and general usefulness as well as general challenges in lesson planning. The second round, conducted after extended use of the platform, explored its perceived effectiveness specifically within the context of English language teaching, as well as the challenges teachers encountered during integration into their daily instructional routines. Each interview session lasted approximately 10-20 minutes and was conducted in English. All sessions were audio-recorded with participants' consent and subsequently transcribed verbatim to support a rigorous thematic analysis.

Data Analysis

The data collected from both observation notes and interview transcripts were analyzed using manual thematic analysis. The analytical process followed three main stages. The first stage involved familiarization, during which the researcher engaged in repeated readings of all observation notes and interview transcripts to develop

a comprehensive understanding of the data. The second stage was coding, where meaningful patterns were identified and assigned codes related to key concepts such as usability, usefulness, efficiency, lesson structure and integration challenges specific to English language teaching. In the final stage, these codes were grouped into broader themes that aligned with the study's central research questions. This approach incorporated insights from both rounds of interviews and submission-based observations, enabling a holistic interpretation of how Planboard supported English language teachers in enhancing their lesson planning practices.

Ethical Considerations

The study adhered to ethical research practices. Permission to conduct the study was obtained from the school management. All participants were briefed about the purpose of the research and provided signed consent prior to participation. Teachers were assured of confidentiality, with pseudonyms used in transcripts and reporting. Data was stored securely and used solely for academic purposes. Participants were informed of their right to withdraw at any stage without consequences.

FINDINGS

Teachers' Perceptions on Usability and Usefulness

Both participants perceived Planboard as a useful and accessible tool for lesson planning. Participant A, who had previous experience with Google Docs, found Planboard more flexible and convenient due to its pre-set templates and online accessibility. He explained that the platform's structured format reduced the cognitive load of having to remember each lesson component.

Participant A quoted: "The template is already there… easy for me to set up the time and everything."

He also praised the weekly view function, which allowed her to monitor past and upcoming lessons easily. Similarly, Participant B, despite coming from a traditional written-planning background, acknowledged that Planboard provided structure and clarity, although she described typing as similar to writing, she appreciated how Planboard's layout helped maintain planning consistency.

Participant B quoted: "Once I see the structure, I know what I need to do next."

Both participants reported ease of use, with only minor issues such as login problems or initial unfamiliarity. They also noted improved accountability in following school formats, as Planboard offered a standardized template that supported alignment with school expectations.

Influence on Lesson Quality, Efficiency and Structure

Both teachers reported that Planboard positively influences their lesson quality and efficiency. Participant A highlighted improvements in time management, enabled by planning anywhere using various devices, and better sequencing of instructional activities. He noted that Planboard helped ensure lesson objectives, time allocations, and materials were clearly defined.

Participant A quoted: "The process will be manageable for me during the lesson time."

Participant B echoed this, stating that daily planning with Planboard helped her remember lesson goals and adjust activities according to student progress.

As quoted by participant B: "If this step is not successful, then I have to rectify it and then add in more activities."

Participant A especially praised Planboard's impact on English language skills planning. He described how he used Planboard to scaffold activities for varying proficiency levels, integrate multimedia resources such as YouTube and Kahoot, and align his lesson with broader curriculum standards. The visual and interactive design of the tool kept him engaged and allowed for smooth in-class delivery.

Participant B, while less tech-savvy, also found the platform helpful for monitoring progress and structuring grammar lessons based on students' prior performance.

Challenges Faced During Integration

Despite overall positive feedback, both participants faced challenges integrating Planboard into their planning routines. The most consistent issue was internet connectivity.

Participant A noted: "Sometimes I don't have a good internet connection… it affects my ability to write my lesson."

Participant B shared similar concerns, especially about navigating the platform's interface across terms and weeks. While she did not find the tool inherently difficult, she acknowledged that being unfamiliar with digital systems brought her down.

As quoted: "Sometimes it's hard to navigate between weeks or lessons at first."

Another issue was data loss. Participant A reported that some lesson plans vanished from the system after a few weeks, prompting her to keep backup PDFs. Additionally, both teachers felt the need for better institutional support in terms of training and flexible submission policies. Participant B, in particular, emphasized the need for administrative understanding regarding minor delays in submission due to technical or workload-related issues.

Both participants also suggested improvements, such as better CEFR integration, reflective notes, and peer collaboration features to enhance the platform's effectiveness for English language teaching.

In summary, findings reveal that while Planboard significantly supported digital lesson planning by enhancing structure, efficiency, and pedagogical clarity, practical limitations such as technical barriers and user adaptation persisted.

DISCUSSION

Teachers' Perceptions of the Usability and Usefulness of Planboard

The findings indicate that both teachers found Planboard to be generally usable and useful in lesson planning, aligning closely with TAM. According to TAM, perceived usefulness and perceived ease of use are critical in technology adoption. Participant A explicitly highlighted the efficiency of Planboard's templates and online accessibility as advantages that improved his workflow, reflecting high perceived usefulness. Participant B, while more cautious due to limited digital exposure, still found the structure's layout beneficial.

These results affirm the core premise of TAM where users are more likely to adopt and continue using digital tools when they perceive it as improving task performance with minimal effort. Participant A's description of intuitive design features and ease of navigation reflects strong alignment with TAM's ease of use construct. Participant B's neutral stance suggests that while the interface did not hinder her, greater digital familiarity would enhance her engagements.

Furthermore, UTAUT complements this interpretation. Both participants cited support from school administration and colleagues, indicating that social influence and facilitating conditions played an important role in their willingness to engage with Planboard. Participant B noted that while she initially struggled with navigation, peer and administrative support helped ease the transition. This supports UTAUT's assertion that external factors such as organizational readiness and peer collaboration significantly shape user acceptance.

Influence on Lesson Quality, Efficiency, and Structure

The data show that Planboard improved both the structure and efficiency of English language lesson planning. Participant A noted that Planboard allowed detailed time allocation, organized lesson floor and the incorporation

of multimedia materials. These affordances align with the TPACK framework, particularly in how technology, in this case, Planboard, was meaningfully integrated with pedagogical and content knowledge.

The structured templates enabled teachers to scaffold learning activities across skills, which are reading, writing, speaking and listening, reflecting thoughtful pedagogical planning. This aligns with TPACK's emphasis on the intersection between technological, pedagogical and content domains. For instance, Participant A used Planboard to align grammar lessons with CEFR levels, suggesting a nuanced understanding of both curriculum standards and technological affordances.

Moreover, UTAUT's construct of performance expectancy is relevant here. Both teachers reported that Planboard helped them track student learning outcomes and plan responsive follow-ups. Participant B reflected on using reflections to revisit difficult grammar concepts, showing that the platform facilitated instructional responsiveness. Although Participant B did not exploit all features such as the multimedia integration, the consistent use of Planboard contributed to better sequencing and coherence in instruction.

While Participant A demonstrated higher levels of engagement with Planboard's full functionality, both participants ultimately benefited from its structure, suggesting that even partial adoption of DLPPs can yield improvements in planning quality.

Challenges Faced During Integration

Despite the benefits, several challenges emerged. Both teachers reported technical issues, especially related to internet connectivity and data retention. This underscores the significance of UTAUT's facilitating conditions factor. Inadequate infrastructure can undermine the advantages of digital tools, regardless of user motivation or tool quality. The need to back up lesson plans manually, as noted by Participant A highlights risks to digital reliability in low-infrastructure environments.

Moreover, Participant B's experience reflects the importance of digital literacy and gradual onboarding. Her difficulty navigating term structures and lesson sequences illustrates the cognitive demands of transitioning from traditional to digital planning. These findings are supported by [23] on teacher readiness and digital competence.

In terms of pedagogical integration, the TPACK framework reveals an important gap; while technology and content were present, some teachers such as participant B lacked the confidence to integrate technology deeply with pedagogy. This confirms research indicating that without adequate training, teachers may underutilize the full potential of digital platforms.

Participants also raised suggestions for platform improvement, such as CEFR integration and better collaboration features. These insights resonate well with the need for user-centered design and institutional investment in professional development. Participant B's emphasis on flexibility in administrative expectations further illustrates how institutional policies can either support or hinder technology use.

In summary, the findings demonstrate that Planboard was positively received and improved planning efficiency and coherence, but also exposed ongoing challenges related to infrastructure, digital fluency, and systematic support. By applying TAM, UTAUT and TPACK, this discussion has illuminated the complex interplay of user perceptions, institutional context, and pedagogical integration in the adoption of DLPPs.

CONCLUSION

This study explored English language teachers' perceptions and practices in using Planboard, a DLPP, within a private school in Seremban, Malaysia. Guided by TAM, UTAUT and TPACK framework, the research sought to understand the usability and usefulness of Planboard, its impact on lesson quality and the challenges encountered during its integration into instructional planning.

The findings revealed that both participants viewed Planboard as a valuable and user-friendly tool. The platform's pre-set templates, weekly planning views, and accessibility across devices contributed to improved

planning consistency, efficiency and alignment with school requirements. Teachers found the digital format beneficial for visualizing lesson sequence and assessing materials conveniently, thereby enhancing time management and instructional preparedness. These outcomes resonate with TAM and UTAUT, indicating that perceived ease of use and performance expectancy, reinforced by administrative support, significantly influenced the teachers' adoption of Planboard.

In terms of pedagogical impact, Planboard facilitated structures and coherent lesson planning. Participant A, in particular, leveraged the platform's features to scaffold English language instruction, differentiate learning activities, and integrate multimedia tools. This aligns with TPACK, demonstrating the importance of integrating technological, pedagogical and content knowledge. Participant B, with less experience with digital tools, also acknowledged improvements in lesson sequencing and the ability to respond to student needs more effectively through reflective planning.

Despite these benefits, several challenges emerged. Both teachers experienced technical difficulties, particularly related to internet connectivity and occasional data loss. Participant B's limited digital literacy highlighted the learning curve associated with transitioning from traditional to digital lesson planning. These findings underscore the role of infrastructure and professional readiness in the successful implementation of DLPPs.

The study's implications suggest that school leadership should ensure reliable technological infrastructure and provide ongoing support and flexibility in lesson plan submissions. Developers of DLPPs might consider integrating curriculum standards and enhancing collaboration features to better support pedagogical goals. Furthermore, tailored training programs can assist teachers with varying levels of digital proficiency to engage more confidently with planning platforms.

While the study offered valuable insights, it was limited to two participants in one private school, restricting its generalizability. Future research could expand the sample across diverse educational settings and incorporate students and administrative perspectives. Longitudinal or mixed-method approaches could further enrich understanding of DLPP's long-term impact on teaching and learning. Additionally, incorporating classroom observations or lesson plan analyses would provide a more accurate picture of how Planboard is used in practice.

Hence, Planboard was found to be a supportive tool for enhancing English language lesson planning, contributing to greater instructional coherence and efficiency. The platform's benefits were moderated by factors such as digital fluency, infrastructure and institutional support. Addressing these areas will be crucial for maximizing the educational value of DLPPs in Malaysian classrooms and beyond.

REFERENCES

1. Acquah, B. Y. S., Arthur, F., Salifu, I., Quayson, E., & Nortey, S. A. (2024). Preservice teachers' behavioural intention to use artificial intelligence in lesson planning: A dual-staged PLS-SEM-ANN approach. Computers and Education: Artificial Intelligence, 7, 100307.
2. Adnan, E. F., Darus, N. M., Faizal, S. N. F., Mohamad, M., & Kamarudin, R. (2024). Benefits and Challenges of Differentiated Learning in Malaysian Classrooms: Literature Review. International Journal of Academic Research in Business and Social Sciences, 14(8).
3. Ait Ali, D., El Meniari, A., El Filali, S., Morabite, O., Senhaji, F., & Khabbache, H. (2023). Empirical Research on Technological Pedagogical Content Knowledge (TPACK) Framework in Health Professions Education: A Literature Review. Medical Science Educator, 33(3), 791–803.
4. Amemasor, S. K., Oppong, S. O., Ghansah, B., Ben-Bright Benuwa, & Mathias Agbeko. (2025). The influence of digital professional development and professional learning communities in the relationship between school digital preparedness and digital instructional integration. PLoS ONE, 20(7), e0328883–e0328883.
5. Ansari, M., Waris, S., & Zara, C. (2024). Barriers to Educational Technology Adoption: Navigating Challenges in Integration. Qlantic Journal of Social Sciences, 5(3), 240-247.
6. Basister, M. P., Petersson, J., & Baconguis, R. D. (2025). Educational innovations for an inclusive learning environment: Insights from the teachers' collaboration through Lesson Study. In Frontiers in Education, 10.

7. Batool, H., Al-Otaibi, S., & Khan, M. (2025). Decision making model for evaluation of TPACK knowledge constructs as critical success factors for language learning classes. Heliyon, 11(2), e42061.
8. Bouncken, R. B., Czakon, W., & Schmitt, F. (2025). Purposeful sampling and saturation in qualitative research methodologies: recommendations and review. Review of Managerial Science, 1-37.
9. Busetto, L., Wick, W., & Gumbinger, C. (2020). How to Use and Assess Qualitative Research Methods. Neurological Research and Practice, 2(1), 1–10.
10. Choi, L. J., & Chung, S. J. (2025). Preparing Technologically Competent EFL Teachers: A TPACK-based Approach. SAGE Open, 15(3).
11. Chua, N. A., Soon, G. Y., Ibrahim, M. Y., Che Noh, C. H., Mansor, N. R., Zaid, C. M., Abdul Rashid, R., & Shen, M. (2021). VIRTUAL DIFFERENTIATED INSTRUCTION AND ITS IMPLEMENTATION IN MANDARIN TEACHING: A REVIEW. Journal of Nusantara Studies (JONUS), 6(2), 231–249.
12. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340.
13. Dennison, D. V., Ahtisham, B., Chourasia, K., Arora, N., Singh, R., Kizilcec, R. F., Nambi A., Ganu T., & Vashistha, A. (2025). Teacher-AI Collaboration for Curating and Customizing Lesson Plans in Low-Resource Schools. arXiv: 2507.00456, 1.
14. Duqing Z., Liang Y, Ziyan C., & Longkai W. (2024). Rethinking UTAUT in teacher technology adoption research: A quantitative meta-analysis based on a one-stage meta-analytic structural equation model. Modern Educational Technology , 34 (9).
15. El Bedewy, S., Lyublinskaya, I., & Lavicza, Z. (2024). Supporting transdisciplinary STEAM practices: Integrating architectural modelling into mathematics education through a cross-cultural dynamic lesson plan (DLP) tool. Research and Practice in Technology Enhanced Learning, 20, 008.
16. Fan, H., Chen, G., Wang, X., & Peng, Z. (2024). LessonPlanner: Assisting novice teachers to prepare pedagogy-driven lesson plans with large language models. In Proceedings of the 37th Annual ACM Symposium on User Interface Software and Technology, 1, 1-20.
17. Feng, J., Yu, B., Tan, W. H., Dai, Z., & Li, Z. (2025). Key factors influencing educational technology adoption in higher education: A systematic review. PLOS Digital Health, 4(4), e0000764.
18. Großmann, L., & Krüger, D. (2023). Assessing the quality of science teachers' lesson plans: Evaluation and application of a novel instrument. Science Education, 108(1).
19. Guo, C., Chen, X., & Chen, J. (2025). Enhancing Prospective Teachers' Professional Development Through Shared Collaborative Lesson Planning. Behavioral Sciences, 15(6), 753–753.
20. Gurl, T. J., Markinson, M. P., & Artzt, A. F. (2024). Using ChatGPT as a Lesson Planning Assistant with Preservice Secondary Mathematics Teachers. Digital Experiences in Mathematics Education, 11(1), 114-139.
21. Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. Sustainable Operations and Computers, 3(1), 275–285.
22. Hase, A., & Kuhl, P. (2024). Teachers' use of data from digital learning platforms for instructional design: a systematic review. Educational Technology Research and Development, 72(4), 1925-1945.
23. Hizam, S. M., Akter, H., Sentosa, I., & Ahmed, W. (2021). Digital competency of educators in the virtual learning environment: a structural equation modeling analysis. IOP Conference Series: Earth and Environmental Science, 704(1), 012023.
24. Hoem, T. F., Bugge, H. E., Fuglestad, U., Mangen, A., Hanne Egenæs Staurseth, Hildegunn Støle, Margrethe Sønneland, Sæbø, J. U., & Billington, M. G. (2024). The Collaborative Development of an Online Planning Tool for Teachers in Norway: Study Protocol for DigUp. Nordic Journal of Literacy Research, 10(3).
25. Hrastinski, S. (2021). Digital tools to support teacher professional development in lesson studies: a systematic literature review. International Journal for Lesson & Learning Studies, ahead-of-print(ahead-of-print), 10(2), 138-149.
26. Humaera, I., Salija, K., Amin, F. H., Sakkir, G., Nasrullah, N., & Ramdani, A. (2025). The TPACK Framework in English Language Education Practice: A Bibliometric Analysis. The Eastasouth Journal of Learning and Educations, 3(01), 56–63.
27. Iqbal, Md. H., Siddiqie, S. A., & Mazid, Md. A. (2021). Rethinking theories of lesson plan for effective teaching and learning. Social Sciences & Humanities Open, 4(1), 100172.

28. Jia, L., Qi, C., Wei, Y., Sun, H., & Yang, X. (2025). Fine-Tuning Large Language Models for Educational Support: Leveraging Gagne's Nine Events of Instruction for Lesson Planning. arXiv preprint arXiv:2503.09276.
29. Jung, J., Choi, S., & Fanguy, M. (2024). Exploring Teachers' Digital Literacy Experiences. The International Review of Research in Open and Distributed Learning, 25(2), 41–59.
30. Karpouzis, K., Pantazatos, D., Taouki, J., & Meli, K. (2024). Tailoring Education with GenAI: A New Horizon in Lesson Planning. OSF Preprints (OSF Preprints).
31. Kloker, S., Bukoli, H., & Kateete, T. (2024). New Curriculum, New Chance--Retrieval Augmented Generation for Lesson Planning in Ugandan Secondary Schools. Prototype Quality Evaluation. arXiv preprint arXiv:2408.07542.
32. Lee, G.-G., & Zhai, X. (2024). Using ChatGPT for Science Learning: A Study on Pre-service Teachers' Lesson Planning. IEEE Transactions on Learning Technologies, 1–11.
33. Leek, J., Rojek, M., Dobińska, G., & Kosiorek, M. (2024). Navigating the power of time in classroom practices: teachers' and students' perspectives. Educational Review, 1(1), 1–23.
34. Liu, J., Aziku, M., Qiang, F., & Zhang, B. (2024). Leveraging professional learning communities in linking digital professional development and instructional integration: evidence from 16,072 STEM teachers. International Journal of STEM Education, 11(1).
35. Lixia W. & Choi L. J. (2024). TPACK and EdTech Integration in Teaching and Learning Process: A Systematic Literature Review (2014-2024). Communications on Applied Nonlinear Analysis, 31(7s), 487–505.
36. Lo, N. (2023). Digital learning and the ESL online classroom in higher education: teachers' perspectives. Asian-Pacific Journal of Second and Foreign Language Education, 8 (1), 1–22.
37. Mark Lester Gesta, Lozano, L., & Patac, A. V. (2023). Teachers' Perceived Barriers to Technology Integration during Online Learning. International Journal of Technology in Education and Science, 7(3), 415–430.
38. Mohammadi, E., König, T., & Zimmermann, B. (2025). Multi-layered sampling strategy for qualitative interviews: methodical reflections on sampling interviews with the European Research Council review experts. International Journal of Social Research Methodology, 1–13.
39. My Dashboard | Chalk. (n.d.). App.chalk.com.
40. Ndihokubwayo, K., Byukusenge, C., Byusa, E., Habiyaremye, H. T., Mbonyiryivuze, A., & Mukagihana, J. (2022). Lesson plan analysis protocol (LPAP): A useful tool for researchers and educational evaluators. Heliyon, 8(1), e08730.
41. Neale, B. (2020). Qualitative Longitudinal Research : Research Methods. Bloomsbury Academic.
42. Pannullo, L., Böttinger, T., & Winkelmann, J. (2025). Inclusive and Digital Science Education—A Theoretical Framework for Lesson Planning. Education Sciences, 15(2), 148.
43. Pesina, R. (2025). Mentoring Software in Education and its Impact on Teacher Development: An Integrative Literature Review. International Journal on Integrating Technology in Education, 14(1), 29–38.
44. Rees, C. E., & Ottrey, E. (2024). "Lives and times": The case for qualitative longitudinal research in anatomical sciences education. Anatomical Sciences Education.
45. Saliya Nugawela, & Darshana Sedera. (2022). Status Quo Bias in Users Information Systems (IS) Adoption and Continuance Intentions: A Literature Review and Framework.
46. Samuel, A., & Jerusalem Merkebu. (2025). Exploring Sampling Strategies to Maximize Qualitative Research Studies in Adult Education. Adult Learning.
47. Tan, C. K. (2022). A PROTOTYPE SYSTEM FOR GENERATING LESSON PLANS FOR SECONDARY SCHOOL TEACHERS. International Journal on E-Learning Practices (IJELP), 5, 1–11.
48. Tan, C. K., & Kiflee, D. N. (2022). DIGITAL LESSON PLAN GENERATION AND ITS USEFULNESS FOR SECONDARY SCHOOL TEACHERS. International Journal of Education, Psychology and Counseling, 7(47), 481–492.
49. Teo Woon Chun, & Melor Md Yunus. (2023). Exploring teachers' technology acceptance during COVID-19 pandemic: A systematic review (2020-2022). International Journal of Evaluation and Research in Education (IJERE), 12(2), 956–956.

50. Thompson, G., Creagh, S., Stacey, M., Hogan, A., & Mockler, N. (2023). Researching teachers' time use: Complexity, challenges and a possible way forward. Australian Educational Researcher, 51(4), 1647-1670.
51. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information technology: toward a Unified View. MIS Quarterly, 27(3), 425–478.
52. Wafa Naif Alwakid, Nisar Ahmed Dahri, Humayun, M., & Ghadah Naif Alwakid. (2025). Exploring the Role of AI and Teacher Competencies on Instructional Planning and Student Performance in an Outcome-Based Education System. Systems, 13(7), 517–517.
53. Yulin, N., & Danso, S. D. (2025). Assessing Pedagogical Readiness for Digital Innovation: A Mixed-Methods Study. arXiv preprint arXiv:2502.15781.
54. Zainal, A. Z., & Zainuddin, S. Z. (2020). Technology adoption in Malaysian schools: An analysis of national ICT in education policy initiatives. Digital Education Review, 37(37), 172–194.
55. Zhang, Y. (2022). Developing EFL teachers' technological pedagogical knowledge through practices in virtual platform. Frontiers in Psychology, 13, 916060.
56. Zou, Y., Kuek, F., Feng, W., & Cheng, X. (2025). Digital learning in the 21st century: Trends, challenges, and innovations in technology integration. Frontiers in Education, 10(10).