

DIGITAL TOOLS IN EDUCATION: A SYSTEMATIC LITERATURE REVIEW ON EFFECTIVENESS OF DIGITAL LESSON PLANNING PLATFORMS

Alat digital dalam pendidikan: ulasan literatur sistematik mengenai keberkesanan platform perancangan pengajaran digital

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Abstract

The digitalization of Education has reformed many aspects of teaching practice, along with the way lesson planning is approached. Digital Lesson Planning Platforms (DLPPs) have developed as tools to assist teachers in designing, organizing, and aligning instructional content efficiently. However, despite their widespread implementation, a comprehensive synthesis of existing empirical studies evaluating their effectiveness is lacking, underscoring the need for a systematic review to consolidate current findings and identify research gaps. This systematic literature review (SLR) investigates peer-reviewed empirical studies published between 2020 – 2025 that explore the use of digital platforms for lesson planning in educational settings. Source quality was ensured through Scopus indexing and journal quality verification using the Scrimago Journal Rank (SJR) quartile classification. Using Scopus as the primary database and following PRISMA guidelines, 16 relevant studies were selected based on strict inclusion criteria such as publication date, relevance, subject area, and language. The review identifies key themes including behavioral intention to adopt AI-based planning tools, teacher competence, integration of emerging technologies like AR and ChatGPT, and challenges related to implementation. Frameworks such as the Technology Accepted Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and Constructivist Learning Theory (CLT) support the analysis. Results indicate that while DLPPs offer measurable benefits in planning efficiency, teacher satisfaction, and instructional alignment, challenges remain in digital literacy, tool adaptability, and contextual integration. The findings provide a structured overview of the current landscape of digital lesson planning and highlight the importance of tailored implementation strategies. This review offers valuable insights for educators, policymakers, and educational technology developers seeking to enhance lesson planning practices through innovative digital solutions.

Keywords: Digital Lesson Planning, Technology in Education, Planning Efficiency, Instructional Design

Abstrak

Pendigitalan pendidikan telah mereformasi banyak aspek amalan pengajaran serta cara perancangan pengajaran dilaksanakan. Platform Perancangan Pengajaran Digital (DLPP) telah dibangunkan sebagai alat untuk membantu guru mereka bentuk, menyusun, dan menyelaras kandungan pengajaran dengan lebih cekap. Walau bagaimanapun, walaupun pelaksanaannya semakin meluas, sintesis komprehensif terhadap kajian empirikal sedia ada yang menilai keberkesanannya masih kurang. Hal ini menekankan keperluan untuk menjalankan ulasan sistematik bagi menggabungkan penemuan semasa dan

mengenal pasti jurang penyelidikan. Ulasan Literatur Sistematis (SLR) ini meneliti artikel terkini yang diterbitkan antara tahun 2020 hingga 2025 yang meneroka penggunaan platform digital untuk perancangan pengajaran dalam konteks pendidikan. Dengan menggunakan Scopus sebagai pangkalan data utama dan mengikuti garis panduan PRISMA, sebanyak 16 kajian relevan telah dipilih berdasarkan kriteria inklusi yang ketat seperti tarikh penerbitan, kerelevanan, bidang subjek, dan bahasa. Ulasan ini mengenal pasti tema utama termasuk niat tingkah laku untuk mengguna pakai alat perancangan berasaskan AI, kompetensi guru, integrasi teknologi baharu seperti AR dan ChatGPT, serta cabaran pelaksanaan. Kerangka teori seperti Model Penerimaan Teknologi (TAM), Teori Penyatuan Penerimaan dan Penggunaan Teknologi (UTAUT), dan Teori Pembelajaran Konstruktivis (CLT) menyokong analisis ini. Hasil kajian menunjukkan bahawa walaupun DLPP memberikan manfaat yang dapat diukur dari segi kecekapan perancangan, kepuasan guru, dan penjajaran pengajaran, masih terdapat cabaran berkaitan literasi digital, kebolehsuaian alat, dan integrasi kontekstual. Penemuan ini menyediakan gambaran berstruktur mengenai landskap semasa perancangan pengajaran digital dan menekankan kepentingan strategi pelaksanaan yang disesuaikan. Ulasan ini menawarkan pandangan bernilai kepada pendidik, pembuat dasar, dan pembangunan teknologi Pendidikan yang berhasrat meningkatkan amalan perancangan pengajaran melalui penyelesaian digital yang inovatif.

Kata Kunci: Perancangan Pengajaran Digital, Teknologi dalam Pendidikan, Kecekapan Perancangan, Reka Bentuk Pengajaran

1.0 INTRODUCTION

The rapid advancement of digital technology has significantly transformed the educational landscape globally, influencing numerous aspects of teaching and learning practices, with implications for language instruction. In Malaysia, the instruction of English as a second language (ESL) has increasingly been prioritized within national educational policies, underscoring the need to integrate digital tools effectively. This integration aligns with broader educational trends, such as Education 4.0, aimed at developing learners' 21st-century skills (Bakar et al., 2021). Educational technology's integration is not merely about enhancing instructional methods but also about preparing learners for a digitally interconnected world.

Traditionally, lesson planning in education has relied upon static documents and conventional methodologies that often lack dynamic, collaborative features (Fan et al., 2024). These traditional methods can become disconnected from real-time classroom interactions and evolving student needs. Given the increasing complexity of contemporary classrooms and the demand for blended and hybrid learning models accelerated by global events such as the COVID-19 pandemic, traditional lesson planning methods may be inadequate (Børte & Lillejord, 2024). Consequently, there is an urgent need for innovative, digital solutions capable of streamlining lesson planning processes, enhancing instructional flexibility, and fostering collaborative practices among educators.

In Malaysia, digital initiatives in education have already begun demonstrating significant impacts on instructional practices. Notably, digital storytelling and blogging platforms have become widely adopted tools that facilitate reflective teaching and student engagement. Lim and Hashim (2020) discuss how digital storytelling significantly enhances ESL classrooms by enabling students to contextualize learning experiences meaningfully, actively engaging in content creation, and developing critical thinking skills. Similarly, James et al., (2022) explores the role of community blogging platforms as powerful tools for teacher professional development, offering

educators opportunities to collaborate, reflect on their teaching practices, and share insights with a broader professional community. Given the country's strategic push toward technology-integrated pedagogy, Malaysia provides a valuable context for exploring how digital tools are reshaping core teaching components such as lesson planning, especially in ESL and professional development settings.

Digital technology has shown significant potential for overcoming infrastructural and resource challenges common in rural or marginalized educational settings in Malaysia. Donald and Hashim (2021) document how rural ESL teachers effectively employ digital platforms to mitigate limited infrastructure, maintain instructional continuity, and enhance pedagogical effectiveness, even amidst resource scarcity. These narratives emphasize digital technology's transformative potential, particularly in bridging gaps in educational quality and access between urban and rural contexts.

Despite the evident benefits and successful adoption of various digital tools in education, the specific domain of Digital Lesson Planning Platforms (DLPPs) remains significantly under-investigated. DLPPs are innovative platforms designed explicitly to streamline instructional planning processes (Kussin et al., 2024). They typically provide user-friendly interfaces for teachers to align instructional objectives with national standards, embed multimedia resources seamlessly, manage scheduling dynamically, and facilitate collaborative lesson planning among educational teams (Bedewy et al., 2025). Such tools potentially offer solutions to longstanding educational challenges, including excessive workload, ensuring compliance with curricular standards, and improving coordination among educators.

However, while DLPPs have considerable theoretical appeal and practical potential, important questions remain concerning their widespread adoption and practical effectiveness. Critical considerations include the actual usability of these platforms from the teachers' perspectives, their pedagogical value, contextual factors influencing their integration into everyday teaching practices, and their adaptability across various school environments with differing infrastructural capabilities (Henne et al., 2024). These concerns are particularly relevant within the Malaysian educational context, where digital readiness and resource availability vary significantly across different regions and institutions.

Given these complexities, it becomes essential to systematically explore and understand the landscape of digital lesson planning platforms within Malaysian education. This systematic literature review (SLR) aims to address this critical research gap by synthesizing empirical studies conducted between 2020 and 2025. The review is specifically anchored within the Malaysian educational context but also informed by global trends and perspectives. It investigates pedagogical, technological, and institutional factors shaping the adoption, use, and impact of DLPPs, offering a comprehensive examination of their effectiveness and challenges.

The systematic literature review is guided by three central research questions:

- a) What digital tools are currently utilized in lesson planning platforms, as reported in recent literature?
- b) How effective are these digital platforms in enhancing lesson planning practices?
- c) What challenges and limitations do teachers encounter in implementing digital lesson planning platforms?

By systematically synthesizing the available research, this study seeks to generate insights to inform teacher training programs, guide the development and refinement of digital lesson planning platforms, and influence policy-making. Ultimately, the findings from this review aim to support educational stakeholders,

including teachers, administrators, and policymakers, in creating environments conducive to effective digital tool integration, thereby improving instructional quality, enhancing teachers' professional satisfaction, and fostering educational equity across diverse Malaysian educational contexts.

2.0 LITERATURE REVIEW

The integration of DLPPs in education has become increasingly significant, particularly within the Malaysian context, where the need for digital transformation in pedagogical practices continues to grow. This literature review synthesizes empirical findings from studies published between 2020 and 2025, focusing on three core themes: planning efficiency, user experience, and integration barriers. The review is theoretically grounded in the Technology Acceptance Model (TAM), the Unified Theory of Acceptance and Use of Technology (UTAUT), and Constructivist Learning Theory (CLT), offering a comprehensive understanding of the pedagogical and technological dynamics involved in DLPP adoption.

These themes were selected based on their direct relevance to the research questions, which investigate the tools currently employed in digital lesson planning, their effectiveness in enhancing planning practices, and the obstacles educators encounter during implementation. By structuring the review around these thematic areas, the analysis moves beyond description to identify cross-study patterns, contextual applications, and theoretical implications, ultimately highlighting how the existing body of research informs and justifies the need for this systematic review.

2.1 Planning Efficiency.

DLPPs have shown considerable potential in enhancing the efficiency of instructional planning. Acquah et al. (2024) employed a dual-stage partial least squares structural equation modelling-artificial neural network (PLS-SEM-ANN) approach, demonstrating that perceived ease of use and performance expectancy, central constructs of TAM, significantly influenced Malaysian preservice teachers' intention to adopt DLPPs. Their findings suggest that DLPPs not only streamline content development but also facilitate alignment with national curricular standards, leading to reduced planning time and increased instructional coherence.

This model was further extended and elaborated by previous researchers such as Chun & Melor (2023), Acquah et al. (2024) and Dornburg & Davin (2024) and is still widely adopted by educational researchers to study users' technology acceptance because of its simplicity and understandability. It posits that two key constructs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), determine an individual's intention to use a system, which subsequently predicts actual system use. PU refers to the degree to which a user believes that using technology will enhance their job performance, while PEOU refers to the extent to which the system is free from effort. TAM has been extensively validated in educational contexts to explain teachers' adoption of learning management systems, instructional technologies, and more recently, artificial intelligence-driven tools. Its application to DLPPs provides a robust lens for examining how educators evaluate both the functional value and usability of such systems.

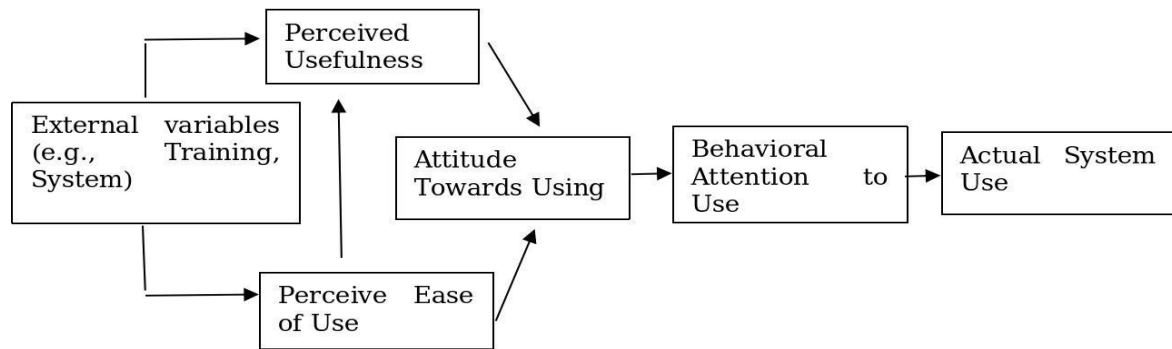


Figure 1: Technology Acceptance Model (TAM)

CLT posits that individuals actively construct knowledge through interaction, reflection, and contextual adaptation, rather than passively receiving information (Romdhon et al., 2024; Wibowo et al., 2025). In educational settings, this theory emphasizes learner agency, prior knowledge, and meaningful engagement with tools and environments. When applied to teachers, CLT highlights the importance of reflective practice, pedagogical autonomy, and the adaptation of resources to fit diverse classroom contexts. DLPPs, when designed to support exploration, customization, and feedback, can function as constructivist learning environments that scaffold professional growth and instructional decision-making.

Similarly, Børte and Lillejord (2024) emphasized that embedding pedagogical models within DLPPs enhances teacher confidence and accelerates the planning process. This aligns with CLT, which posits that tools aiding reflective practice and contextual decision-making improve the overall instructional design experience. Donald and Hashim (2025) provided empirical evidence from Malaysian rural schools, indicating that DLPPs helped ESL teachers address infrastructural constraints and manage instructional loads effectively, especially during the pandemic-induced shift to online and hybrid teaching environments.

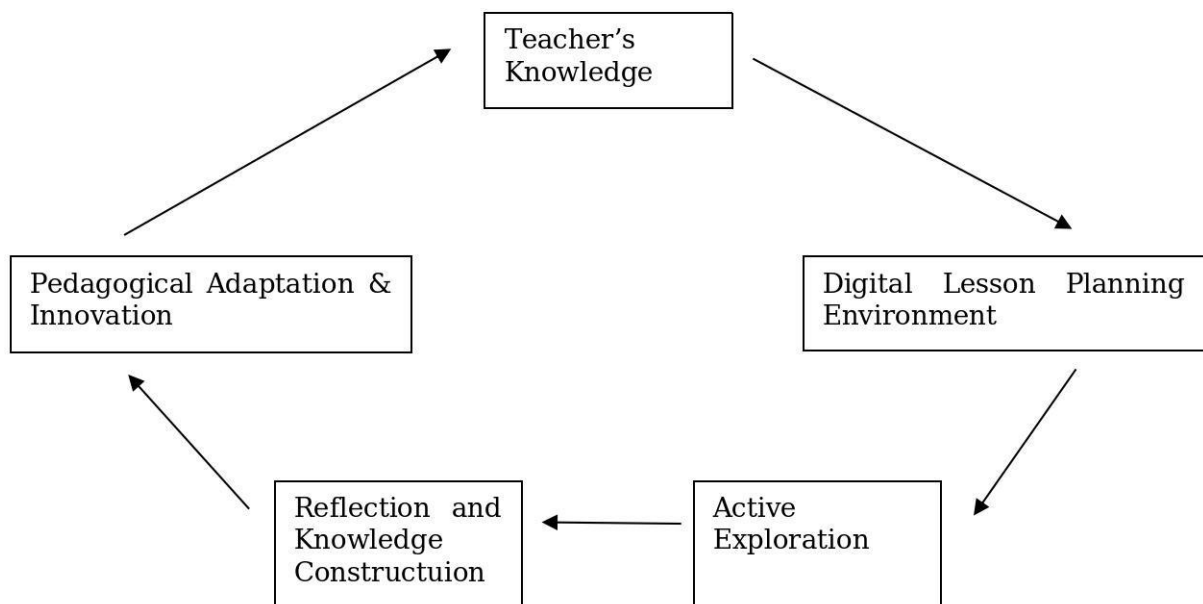


Figure 2: Constructivist Learning Theory (CLT)

Further studies have reinforced these conclusions. For instance, Bedewy et al. (2025) found that incorporating transdisciplinary features into lesson planning platforms allowed teachers to engage in more holistic and dynamic instructional

design. Such approaches are aligned with 21st-century education goals, fostering interdisciplinary thinking and digital fluency. Likewise, Børte & Lillejord (2024) reported that integrating pedagogical tools within DLPPs empowered teachers to visualize, structure, and refine their lessons more efficiently, ultimately supporting differentiated instruction.

2.2 User Experience and Teacher Satisfaction

UTAUT is particularly suited for complex, institutional contexts like education, where both individual and systemic factors shape technology adoption as used in researchers such as Acquah et al. (2024) and Ivanova et al. (2023). Applying UTAUT to DLPPs enables a multidimensional understanding of how teachers engage with these tools based on usability, peer influence, and infrastructural support. This theoretical framing is central to the present review, as it helps map the different personal and institutional drivers that influence the teacher experience with DLPPs in real-world classroom settings.

The adoption and sustained use of DLPPs are closely linked to teacher perceptions of usability and pedagogical relevance. Within the framework of UTAUT, factors such as effort expectancy, social influence, and facilitating conditions have been shown to significantly influence DLPP adoption. While comprehensive studies on user experience are still emerging, initial research underscores critical insights. These insights are crucial to understanding how and why certain DLPPs succeed or fail in practical contexts, providing a foundation for evaluating user satisfaction and sustainability across different platforms.

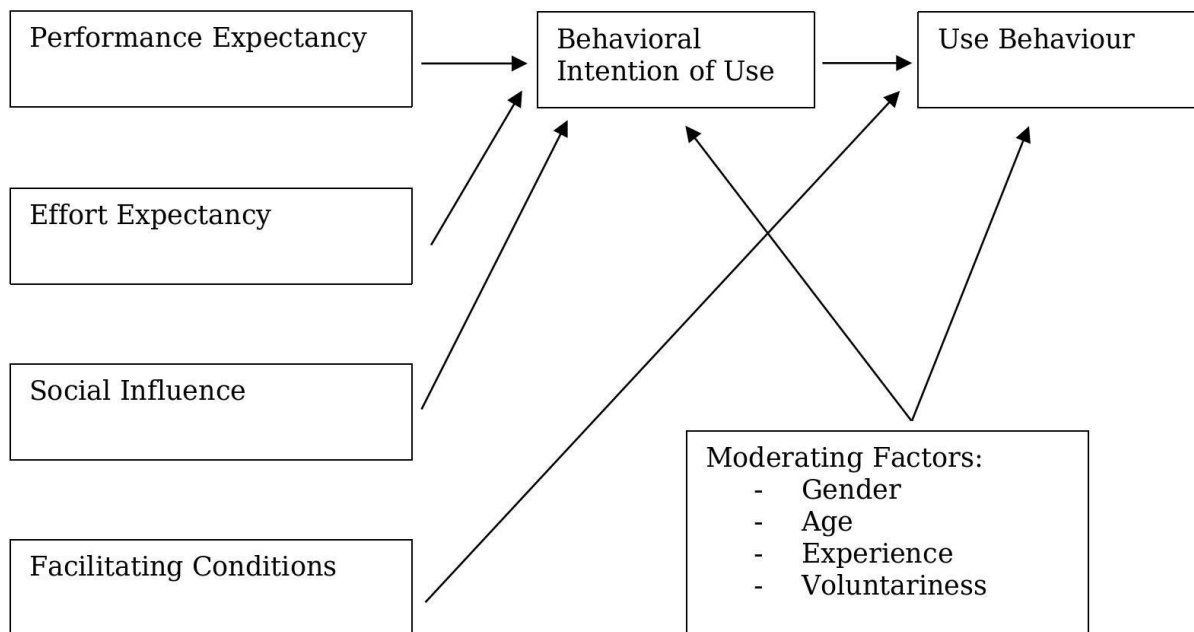


Figure 3: Unified Theory of Acceptance and Use of Technology (UTAUT)

For instance, Dornburg and Davin (2024) investigated the integration of ChatGPT in foreign language lesson planning. Their study revealed that AI-generated content improved thematic organization and content scaffolding. However, concerns about factual accuracy and limited pedagogical nuance led to a cautious stance among educators, highlighting the tension between automation and instructional integrity. This underscores the importance of designing DLPPs that balance technological efficiency with educator control, ensuring that tools enhance rather than override pedagogical agency. These findings highlight a key

consideration for this review: user experience cannot be separated from pedagogical trust, which is especially relevant when synthesizing teacher feedback on DLPPs used in real lesson planning scenarios.

Dornburg & Davin (2024) echoed these findings in their analysis of generative AI in lesson planning, noting that while teachers appreciated the organizational support offered by DLPPs, they also expressed the need for more adaptive and culturally contextual features. Such feedback points to the importance of human-centered design principles in developing DLPPs that are not only functional but also responsive to diverse instructional settings. This pattern across studies reinforces a broader theme of this SLR, how personalization, cultural relevance, and flexibility are emerging as key components of satisfactory user experience in lesson planning tools.

Moreover, Ivanova et al. (2023) emphasized that teacher satisfaction with DLPPs is significantly influenced by training quality and institutional support. Their study showed that sustained professional development initiatives, along with access to intuitive user interfaces and customizable features, substantially improved teachers' perceptions of DLPP utility and relevance. These insights highlight the interplay between systemic support structures and individual user experiences in shaping technology adoption outcomes. In the context of this review, such evidence underscores the importance of evaluating DLPPs not only by their features but also by the ecosystems in which they are deployed, a perspective that this SLR adopts in analyzing implementation practices and success factors across settings.

2.3 Integration Barriers and Contextual Challenges

Despite the documented advantages, DLPP implementation continues to face substantial barriers. Henne et al. (2024) identified that novice teachers often struggle with the sophisticated features of advanced DLPPs, particularly those incorporating emerging technologies like Augmented Reality (AR). This complexity can impede effective use, especially among users with limited technical proficiency. This aligns with broader findings in the literature that indicate a steep learning curve for DLPPs can limit their practical application, especially when intuitive design and training are absent, making this a key dimension to evaluate in the present SLR.

Abu Bakar et al. (2021) highlighted disparities in digital literacy among Malaysian educators, which further obstruct DLPP integration. These challenges are compounded by infrastructural issues such as inconsistent internet connectivity and lack of access to updated devices, particularly in underserved and rural areas. Such structural constraints reveal that the success of DLPPs in enhancing lesson planning is not merely a matter of platform design, but also of equitable access, an essential consideration in assessing implementation outcomes across diverse educational contexts.

Additionally, Wei (2021) employed narrative inquiry to explore how teacher identity, personal agency, and pedagogical beliefs significantly influence the adoption of digital tools. In rural Malaysian schools, these personal factors intersect with structural constraints, creating a multifaceted landscape of resistance and adaptation. Wei's findings suggest that successful DLPP integration requires not only technological infrastructure but also professional development programs that are responsive to the lived experiences and evolving identities of educators. This reinforces the notion that teacher-centered factors, such as beliefs, autonomy, and context, must be accounted for in DLPP evaluations, particularly when analyzing variability in lesson planning adoption across user groups.

Cultural and linguistic diversity within the Malaysian education system further complicates DLPP deployment. Teachers working in multilingual classrooms often require digital tools that support content delivery in multiple languages and

accommodate varied literacy levels. Lim and Hashim (2020) demonstrated that digital storytelling within lesson planning can bridge linguistic gaps and foster student engagement but also noted the limitations of current platforms in addressing these nuanced needs. These insights highlight a critical gap in DLPP design; the underrepresentation of tools that support multilingual and multicultural instruction. For this review, this underscores the importance of evaluating how well DLPPs accommodate local instructional diversity.

Furthermore, institutional inertia and policy fragmentation often hinder DLPP integration. Ivanova et al. (2023) noted that without coordinated efforts between school leadership and policy bodies, even well-designed platforms struggle to gain traction. Effective integration thus requires not only teacher readiness but also strategic alignment across all levels of the educational system. This suggests that systemic coherence, spanning policy, leadership, and training is a foundational condition for successful DLPP implementation. For this SLR, it becomes essential to identify not only barriers, but also the contextual enablers that support sustainable integration into lesson planning routines.

3.0 METHODOLOGY

3.1 PRISMA 2020 Framework

The PRISMA approach was selected because of its wide acceptance in educational and health sciences research for ensuring methodological transparency. The 2020 update addresses complexities introduced by new digital and AI tools, making it apt for reviewing technological interventions like DLPPs (Page et al., 2021).

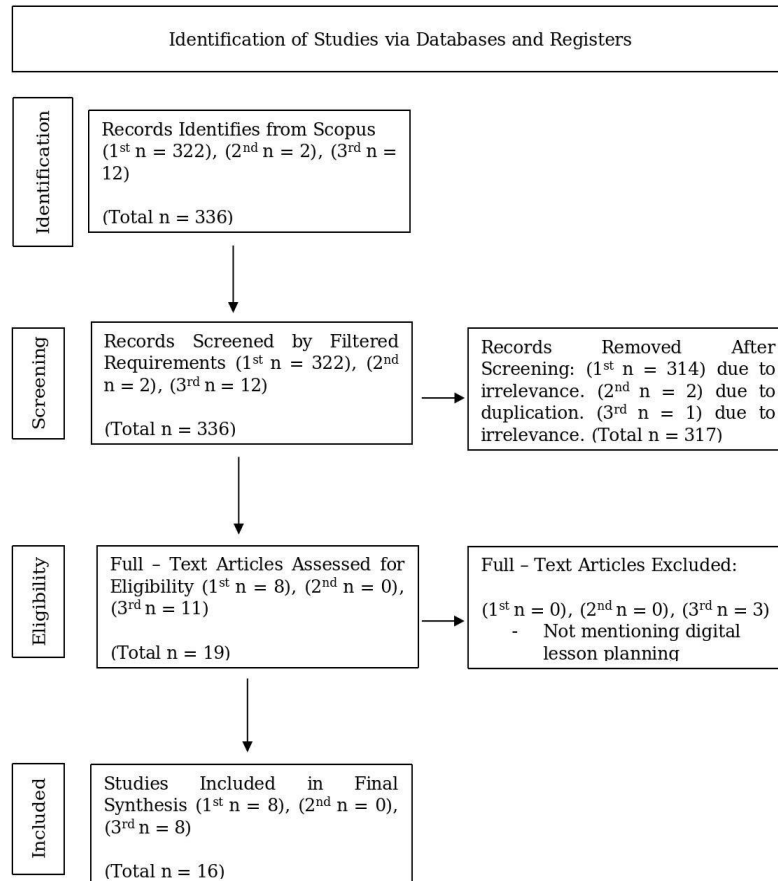


Figure 4: Flow Diagram of the Study

The methodology followed a four-phase structure: Identification, Screening, Eligibility, and Inclusion. Each of these stages plays a critical role in narrowing the scope of literature to the most relevant and high-quality studies. By adopting a structured framework, the study ensures clarity, transparency, and reproducibility in the review process.

The four-phase structure begins with a comprehensive search across a relevant academic database. Next, irrelevant or duplicate articles are screened out. The third phase involves assessing the full-text eligibility of the remaining articles, followed by the inclusion of those that meet all predefined criteria.

3.2 Search Strategy

The search was conducted using Scopus, a comprehensive academic database recognised for its rigorous indexing standards and extensive coverage of peer-reviewed journals in education and social sciences (Yan et al., 2024). Scopus was selected due to its strong quality control mechanism, citation tracking capabilities and international recognition in systematic review research.

Three Boolean search strings were developed to capture relevant studies addressing digital tools in lesson planning, artificial intelligence integration and implementation practices. Searches were limited to publications between 2020 and 2025 to ensure the inclusion of recent developments in educational technology. Although 336 records were initially identified and 19 were found eligible for full-text assessment, this reflects the specialised and emerging nature of DLPPs as a distinct research domain. While broader research exists on educational technology, only a limited number of studies explicitly focus on digital platforms design specifically for lesson planning. Therefore, the focused number of eligible studies is consistent with the conceptual specificity of the review rather than a limitation in search rigor.

Figure 1: Search Strings Used

Database	Search String
Scopus	TITLE-ABS-KEY ("technology" AND "lesson planning") AND PUBYEAR > 2020 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "SOC")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Lesson Planning")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all"))
	TITLE-ABS-KEY ("lesson planning" AND "artificial intelligence" OR "AI") AND PUBYEAR > 2020 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "SOC")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Lesson Planning")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all"))
	TITLE-ABS-KEY ("lesson planning" AND "implementation") AND PUBYEAR > 2020 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "SOC")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (EXACTKEYWORD , "Lesson Planning")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all"))

Each search was limited to articles published between 2020 and 2025, written in English, classified under the Social Sciences subject area, and indexed with the exact keyword "Lesson Planning." Only journal articles with open access or full-text availability were included.

These search queries were strategically crafted to capture diverse aspects of digital lesson planning, including general technological applications, integration of artificial intelligence, and implementation practices.

1. Phase 1: Identification

During the first identification phase, the initial database search yielded a total of 322 articles (Refer to Appendix A) while the second identification phase yielded a total of 2 articles (Refer to Appendix B), and the third identification phase yielded a total of 12 articles (Refer to Appendix C).

2. Phase 2: Screening

The next phase involved a thorough screening of the identified articles. This stage laid the foundation for ensuring all potentially relevant studies were considered before applying more stringent inclusion and exclusion criteria.

Table 2: Inclusion & Exclusion Criteria

Criterion	Inclusion	Exclusion
Title and abstract	Teachers, technology	Students, parents
Type of article	Journal articles	Other than journal articles
Language	English	Other than English
Publication year	2020 - 2025	Before 2020
Source journal	Open access	Limited access

Following the initial database search, 336 records were identified. After the removal of duplicates and the application of predefined inclusion and exclusion criteria, 19 studies were deemed eligible for full-text assessment. The high exclusion rate reflects the strict conceptual focus on digital platforms explicitly designed to support lesson planning, ensuring direct alignment with the research questions and maintaining methodological precision.

3. Phase 3: Eligibility

The eligibility phase involved an in-depth examination of the full texts of the remaining articles. Each article was assessed based on its methodological soundness, relevance to DLPPs, and contribution to understanding digital lesson planning in educational settings. Articles that focused exclusively on unrelated topics or lacked methodological transparency were excluded. Consequently, 16 studies met all eligibility criteria and were included in the final analysis.

The relatively small number of eligible studies highlights the emerging and specialised status of DLPP-focused research within the broader field of educational technology. In systematic literature reviews, conceptual alignment and methodological quality are prioritised over study volume (Page et al., 2021). Therefore, strict inclusion criteria were maintained to ensure relevance and scholarly rigor rather than expanding the dataset at the expense of focus and quality.

4. Phase 4: Inclusion Criteria

To ensure the relevance and quality of the selected studies, the following inclusion criteria were applied. First, only articles published between 2020 and 2025 were considered, ensuring the inclusion of recent research reflective of current trends in educational technology. Second, all selected studies were required to be peer-reviewed journal articles to maintain scholarly rigor. Third, only publications written in English were included to ensure linguistic accessibility for the researchers. Fourth, the focus of each study had to be on digital lesson planning tools within educational contexts. Additionally, articles needed to be indexed in Scopus, which was chosen for its extensive and reputable academic coverage. Only studies with open access or

full-text availability were included, and finally, articles had to be categorized under the Social Sciences subject area to align with the study's disciplinary focus.

3.3 Source Quality Assessment

To ensure methodological rigor and transparency, journal quality was systematically assessed for all included studies. Only articles published in peer-reviewed journals indexed in Scopus were considered eligible. Scopus indexing requires journals to meet established editorial and peer-review quality standards. In addition to database indexing, journal quality was verified using the Scimago Journal Rank (SJR) quartile classification (Q1-Q4). Quartile rankings provide an internationally recognised indicator of journal impact and academic reputation.

Analysis of the 16 included studies indicates that the majority were published in Q1 and Q2 journals, reflecting strong representation from high-impact and well-established academic outlets in educational technology and teacher education. A smaller proportion of studies originated from Q3 journals, while no studies were drawn from Q4 or non-indexed journals. This quality assessment strengthens the credibility of the review by demonstrating that the synthesized evidence is grounded in reputable and quality-controlled scholarly sources.

Table 3: Distribution of Included Studies by Journal Quartile

Quartile	Number of Studies
Q1	9
Q2	4
Q3	3
Q4	0
Total	16

4.0 FINDINGS

4.1 Emerging Tools and Technologies in Digital Lesson Planning

The review identifies a dynamic range of digital tools that are transforming the landscape of lesson planning. These include Intelligent Tutoring Systems (ITS) (Gunawan et al., 2020), educational physical computing and robotics (ePCR) (Zha et al., 2022), Augmented Reality (AR) (Børte & Lillejord, 2024), metaverse-based environments (Bedewy et al., 2025), and AI-powered platforms such as ChatGPT (van den Berg & Plessi, 2023; Lee & Zhai, 2024; Valdez et al., 2024). Platforms like ILUKS (Moundridou et al., 2024) and the Dynamic Lesson Plan (DLP) tool (Acquah et al., 2024) exemplify the evolution toward pedagogically anchored, culturally responsive, and collaborative digital planning tools. These innovations represent a significant departure from static, document-centric lesson planning toward interactive, adaptive, and context-sensitive systems.

This transformation aligns with broader shifts toward 21st-century education, where tools must support interdisciplinarity, critical thinking, and learner agency. GenAI tools facilitate personalized instruction, provide formative feedback, and automate lesson scaffolding, augmenting the cognitive load management of teachers (Moundridou et al., 2024). EVAR, developed for AR integration, provides structured evaluation criteria that enable educators to assess both content quality and technological appropriateness (Børte & Lillejord, 2024). The use of ITS exemplifies how technology supports higher-order thinking and curriculum integration, particularly in science education (Gunawan et al., 2020).

Additionally, many emerging technologies integrate collaborative functionalities, enabling co-creation of lesson plans among teachers and across institutions (Moundridou et al., 2024; Acquah et al., 2024; Bedewy et al., 2025).

This collaborative dimension is vital for fostering peer support, sharing best practices, and maintaining instructional consistency. Digital repositories and AI-assisted planning environments support iterative feedback and communal editing (Lee & Zhai, 2024; Moundridou et al., 2024), aligning lesson planning with constructivist and participatory learning models.

4.2 Effectiveness and Pedagogical Impact

The integration of DLPPs has consistently shown benefits in planning efficiency, instructional coherence, and alignment with curricular objectives (van den Berg & Plessi, 2023; Valdez et al., 2024; Bedewy et al., 2025; Moundridou et al., 2024; Acquah et al., 2024; Lee & Zhai, 2024). Studies revealed that DLPPs reduce planning time, enhance content relevance, and promote structured pedagogical design. These benefits are particularly evident among pre-service teachers, who often rely on scaffolding tools like ChatGPT to construct coherent and standards-aligned lesson plans. In-service teachers tend to outperform pre-service teachers in utilizing DLPPs for high-level learning activities, highlighting a need for improved technology training in teacher education (Liu & Bangou, 2022).

DLPPs also foster reflective practices and encourage innovative pedagogical strategies, especially in virtual microteaching environments (Bedewy et al., 2025). The application of TAM and UTAUT in the reviewed studies confirms that perceived usefulness, effort expectancy, and social influence are key predictors of DLPP adoption (Lee & Kim, 2025). DLPPs also support CLT by enabling teachers to contextualize planning based on classroom dynamics, adapt resources flexibly, and construct knowledge through iterative feedback (Moundridou et al., 2024; Acquah et al., 2024).

However, the effectiveness of DLPPs is mediated by technological fluency, institutional readiness, and professional development quality. Tools that incorporate reflective, inquiry-based frameworks, such as ILUKS, are more effective in promoting teacher learning and engagement. Novice teachers, particularly in mathematics education, face persistent challenges due to gaps in professional knowledge and task analysis skills (Hammer et al., 2024; Henne et al., 2024). Thus, the pedagogical value of DLPPs lies not only in automation but in their support for critical thinking, teacher agency, and sustained instructional improvement.

DLPPs also contribute to the development of professional identity among educators. By promoting engagement with pedagogical principles, they help redefine teachers' roles as facilitators, designers, and critical thinkers in digital learning environments (Moundridou et al., 2024; Acquah et al., 2024; Bedewy et al., 2025). This aligns with transformative education goals that emphasize reflective, data-informed practices.

4.3 Barriers to Implementation and Sustainability

Despite promising outcomes, DLPP implementation is constrained by technical, contextual, and pedagogical barriers. A key issue is the variability and unreliability of AI-generated content, which can lead to factual inaccuracies and reduce instructional trust (Valdez et al., 2024). Inexperienced users, particularly novice teachers, often struggle with advanced features in AR or robotics-enhanced DLPPs (Zha et al., 2022; Børte & Lillejord, 2024). Its use, while supportive of curriculum

integration, still requires refinement for consistent implementation quality (Gunawan et al., 2020).

Cultural and psychological factors also influence adoption. Teachers' beliefs about technology, metaphorical views of lesson planning, and sense of agency shape DLPP engagement (Hammer & Ufer, 2023; Dornburg & Davin, 2024; Cevikbas et al., 2024; Wekerle & Kollar, 2022). Educators who view lesson planning as rigid or bureaucratic may resist DLPPs unless perceptions are addressed through reflective professional development (Dornburg & Davin, 2024).

Structural challenges persist in rural and underserved contexts, where digital infrastructure, internet connectivity, and device access are limited (Acquah et al., 2024; Bedewy et al., 2025). Policy fragmentation and weak institutional leadership also hinder integration. Addressing these barriers requires systemic change, including infrastructure development, coherent policy frameworks, and supportive institutional cultures (Acquah et al., 2024).

Moreover, most studies emphasize short-term outcomes, leaving a gap in understanding long-term DLPP impact on teaching quality and student achievement. Longitudinal research is needed to assess sustainability and guide continuous improvement (van den Berg & Plessi, 2023; Valdez et al., 2024; Lee & Zhai, 2024; Acquah et al., 2024).

4.4 Synthesis and Implications

The reviewed studies provide a comprehensive understanding of DLPPs as transformative yet complex tools. Their effectiveness is greatest in ecosystems that promote pedagogical flexibility, professional growth, and digital equity. Adoption is most successful when DLPPs are viewed not as administrative burdens but as tools that support autonomy, creativity, and learner-centered teaching.

Key implications include the need for ongoing educator training that extends beyond technical skills to critical digital literacy and pedagogical integration. For developers, designing DLPPs that are culturally responsive, user-friendly, and pedagogically aligned is essential. Policymakers must integrate DLPPs into national digital education strategies, ensure equitable infrastructure, and prioritize sustained professional development to support successful, long-term adoption.

5.0 DISCUSSIONS

5.1 Tools currently used in lesson planning platforms

A wide range of digital tools are reshaping the landscape of instructional design. These include AI-powered platforms such as ChatGPT, interactive environments like ILUKS, and platforms supporting inquiry-based learning models and virtual microteaching. Tools embedded with CLT principles are supporting adaptation, reflection, and collaboration. These are especially notable for enhancing teacher autonomy and contextual responsiveness.

These tools reflect a shift from static lesson planning documents toward dynamic, participatory environments that enable cross-disciplinary teaching and formative scaffolding. As such, DLPPs are evolving from simple content management systems into intelligent pedagogical assistants.

The effectiveness of these platforms in improving lesson planning practices The review confirms that DLPPs improve planning efficiency, promote curricular alignment, and support reflective teaching. Drawing from the TAM and UTAUT, the findings show that perceived usefulness, ease of use, and social support significantly influence DLPP adoption and sustained use.

Moreover, DLPPs that foster teacher agency and critical thinking such as ILUKS and ChatGPT with structured prompts are more effective in cultivating instructional quality. They assist in scaffolding tasks, differentiating instruction, and developing professional identity, particularly among preservice teachers. Hence, DLPPs are not merely administrative tools but pedagogical catalysts with transformative potential.

1. RQ3: The challenges and limitations teachers face

DLPPs encounter significant challenges that hinder their effective implementation. Based on UTAUT, these challenges involve low effort expectancy, weak facilitating conditions, and limited social support. Technically, teachers face inaccuracies and limited pedagogical nuance in AI-generated content, which reduces perceived usefulness. Pedagogically, novice teachers, especially in under-resourced environments often lack the digital literacy and support needed to engage with these tools. Institutionally, issues such as policy fragmentation, inadequate infrastructure, and inconsistent training exacerbate access disparities, particularly in rural and multilingual settings. Overcoming these challenges requires coordinated efforts involving policy reform, inclusive platform co-design, and sustained professional development.

Beyond these challenges, DLPPs also face structural limitations. Many platforms lack adaptability to culturally and linguistically diverse classrooms, and few provide multilingual support, reducing their relevance and usability. Additionally, the long-term pedagogical impact of DLPPs remains under-researched, and current AI tools fall short of replicating human pedagogical reasoning, requiring ongoing teacher oversight. These limitations further constrain behavioural intention and actual system use, as explained by UTAUT. Addressing them demands research-driven improvements in platform design, inclusive feature development, and rigorous longitudinal evaluation.

5.2 Strategic Implications and Future Directions

The review emphasizes a paradigm shift from viewing DLPPs as time-saving aids to recognizing them as tools for pedagogical transformation. Effective integration depends on participatory design, critical digital literacy, and a supportive institutional culture.

Furthermore, the lack of longitudinal studies on DLPP impact reveals a pressing research gap. Future research should examine long-term effects on teaching quality, student learning outcomes, and cross-cultural applicability. Addressing this will enable better evaluation of DLPPs as sustainable innovations in educational planning.

While the number of eligible studies was limited, this reflects the early developmental stage of research explicitly addressing DLPPs. Future systematic review may expand database coverage or include interdisciplinary subject areas to capture evolving developments in AI-driven and digitally supported lesson planning research.

6.0 CONFLICT OF INTEREST

There are no conflict of interest related to the writing of this article.

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8.0 AUTHOR CONTRIBUTIONS

All authors contribute their knowledge and time to the writing of this article.

9.0 CONCLUSION

This systematic literature review synthesized 16 empirical studies published between 2020 and 2025 to explore the use, effectiveness, and challenges of DLPPs in educational contexts, with a focus on Malaysia. Guided by the research questions, the findings reveal a growing array of digital tools, ranging from AI-powered platforms to augmented and virtual environments, being integrated into lesson planning. These tools demonstrate clear benefits in enhancing planning efficiency, promoting curricular alignment, and fostering reflective teaching practices.

The second research question concerning the effectiveness of DLPPs is addressed through evidence of increased teacher satisfaction, structured pedagogical design, and support for differentiated instruction. The findings underscore the utility of DLPPs not only for experienced teachers but also for pre-service educators navigating complex instructional contexts. However, the data also highlights significant variation in outcomes based on institutional support, user proficiency, and the contextual adaptability of the platforms.

Regarding challenges, the review identifies critical barriers such as digital literacy gaps, infrastructural limitations, and variability in AI-generated content. Furthermore, cultural and pedagogical beliefs, particularly in multilingual and rural settings, pose additional complexities that need to be addressed for DLPPs to be sustainably integrated.

Based on these insights, the study offers the following recommendations, for educators, professional development should emphasize pedagogical integration and critical digital literacy, rather than technical proficiency alone. For developers, platform design must prioritize intuitive interfaces, cultural responsiveness, and features that support collaboration and reflective practice. For policymakers, equitable infrastructure, coherent digital strategies, and sustained investment in teacher training are essential to ensuring DLPPs are more than isolated technological interventions.

In conclusion, while DLPPs hold considerable promise in transforming instructional planning, their impact is contingent upon systemic alignment, user-centered design, and ongoing support structures. By addressing both technological and human factors, stakeholders can better harness the potential of digital platforms to enrich teaching and learning practices in a rapidly evolving educational landscape.

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