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Exploring the Role of AI-Driven Prompt Engineering in Enhancing ESL Pedagogy and Bridging the Digital Divide in Higher Education

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Abstract

The digital divide persists in reducing the opportunity for equitable access to English language learning at colleges. AI- powered tools like prompt engineering have demonstrated great potential in global education; however, how those would affect English as a Second Language (ESL) pedagogy is being less investigated. Prompt engineering have been considered on how it can support digital literacy and language in higher educational research. With the intention of adopting a qualitative methodology, the research undertakes semi-structured interviews with teachers as well as focus groups with students. This article explores teachers' experiences of embedding AI tools into teaching and interrogates student digital literacy and engagement with prompt engineering. The main findings suggest that early engineering supports language, with writing and vocabulary in particular being boosted when taught with increased digital literacy. But there are practical barriers to a full roll-out, including limited teacher training, digital access and socio-economic inequality. Students who have better access to technology see greater gains. The study asserts that AI tools, and especially prompt engineering, can address the digital divide, by suggesting policy changes for teacher training and infrastructure.

*Keywords**: AI-driven tools; Prompt engineering; ESL pedagogy; Digital literacy; Digital divide***

1. Introduction

In the present technologically advanced era, the digital divide continues to hinder educational equity, even in language learning. According to Li et al. (2025), more than 2 billion people worldwide lack internet access, contributing to educational inequality, particularly at the higher

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education level. This gap is even more pronounced in ESL instruction, where high-quality digital tools represent the difference between language growth and stagnation. Although AI-based applications have demonstrated significant success in global education, less attention has been paid to their added value in ESL teaching, particularly in bridging the digital literacy divide (Alkhresheh, 2024; Mannan et al., 2023).

One major field revolutionized by AI has been education, especially language learning. AI-based tools, such as adaptive learning systems and language-processing technologies, have revolutionized how students engage in personalized learning. Rohmiyati (2025) and (Hayath & Maruf (2025) also reveals that platforms like Duolingo and Grammarly provide personalized material with real-time feedback to support language development. Additionally, Mzwri and Turcsányi-Szabo (2025) emphasize that a new approach in prompt engineering is emerging, with tools that generate personalized prompts, leading to better learning outcomes. Digital literacy, i.e., the ability to use digital tools and systems effectively, is a prerequisite for fully benefiting from these AI-based systems. In ESL, learners with greater digital literacy can utilize these technologies more effectively for language development (Mehta et al., 2025). However, studies on ESL pedagogy with a combined focus on AI, digital literacy, and language learning remain scarce, especially in higher education. While AI tools show promise, there is a significant lack of understanding regarding how digital literacy impacts ESL learners' engagement with these technologies. Closing this gap is crucial to narrowing the digital divide and enabling all students to fully benefit from AI-enabled language learning tools.

2. Objectives

The primary objective of this qualitative study is to explore how prompt engineering, as a component of AI-driven tools, can improve ESL pedagogy in higher education while enhancing students' digital literacy and language proficiency. The study aims to investigate the impact of prompt engineering on language acquisition, specifically in writing and vocabulary development in ESL classrooms. Moreover, the research will seek to:

a) Understand educators' experiences with integrating AI-driven tools, particularly prompt engineering, into their ESL teaching practices.

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b) Examine how digital literacy influences students' ability to effectively engage with AI tools for language learning.
c) Identify the challenges faced by educators and students in utilizing AI technologies for ESL education, with particular attention to access, training, and socio-economic disparities.
d) Provide insights on how prompt engineering can be optimized for better student engagement and improved language learning outcomes in ESL contexts.

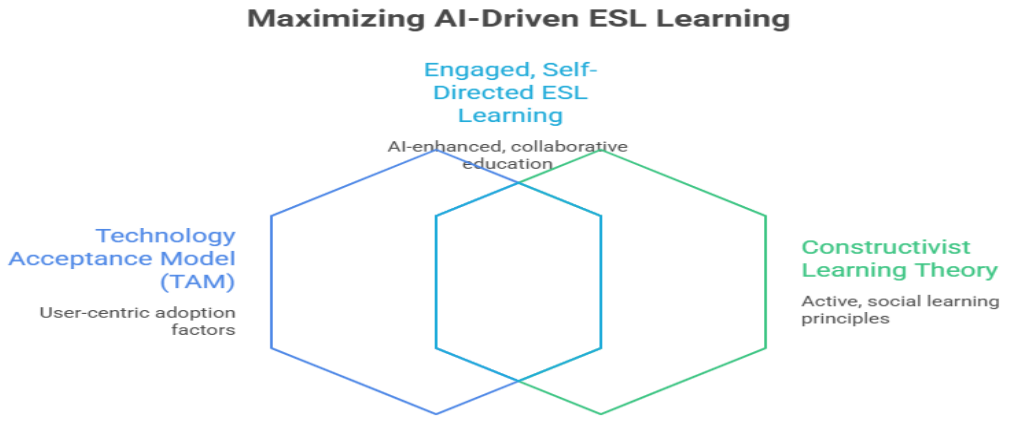
By achieving these objectives, this study will contribute to the growing body of knowledge on the integration of AI in ESL education, providing valuable insights and practical recommendations for educators, institutions, and policymakers. These findings will support the equitable and effective use of AI tools to improve language learning outcomes for students, particularly in underserved communities. The research aims to highlight how AI tools like prompt engineering can help bridge the digital divide in higher education, offering a pathway to more inclusive and accessible ESL education for all students.

3. Literature Review

In recent years, Artificial Intelligence (AI) has revolutionized education, particularly in language learning, by enabling personalized experiences and adaptive teaching strategies (Hasim et al., 2022; Mannan and Maruf, 2024). AI-driven tools, such as language processing technologies and AI-powered platforms, have shown significant potential in improving English as a Second Language (ESL) proficiency (Abu Sahyon et al., 2023). However, despite the growing integration of AI in education, research on the impact of specific AI techniques, such as prompt engineering, on ESL pedagogy remains limited (Enny et al., 2025). This literature review examines the theoretical frameworks guiding this study, identifies gaps in current research, and discusses how this research addresses these gaps in ESL education.

4. Theoretical Frameworks Guiding the Study

This paper presents the nexus of AI-enabled technology, just-in-time engineering and ESL against the backdrop of two main theoretical paradigms – TAM and Constructivist Learning



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Theory.

Figure 1. *Theoretical Framework*

According to TAM (Davis, 1989), the perceptions of ease of use and usefulness influence the adoption of AI technology among EFL learners. Research by Taber (2025) asserted the Constructivist Learning Theory, influenced by the work of Piaget (1972) and Vygotsky (1978), suggests that learners are most likely to construct learning through active experiences with other people. Taken together, these frameworks offer a coordinated approach to integrating applications based on AI in ESL teaching, promoting student engagement, self-directed learning and finding the best role for prompt engineering specifically in this setting (Haque et al., 2024).

5. Controversies and Contrasts in the Literature

AIED research has expanded in education, but large gaps still exist. Most research on tools such as Duolingo and Grammarly focuses on language learning in general, ignoring the role of prompt engineering. There is so far a paucity of studies on the role of AI in mediating digital literacy gap for English as Second Language (ESL) Learning, especially for students exposed to disadvantaged conditions (Zhang et al., 2025).

6. Evidence Gaps and Overlooked Aspects

In spite of having much research in the area of AI in Education (AIED), there are still areas to be explored especially in terms such as prompt generation for ESL learning (Lee et al., 2024). Despite significant research on AI-powered applications like grammar checkers and language learning apps, very little work has been carried out to see how prompt engineering might support writing, vocabulary-building, or general language improvement (Mahjabin, 2025). Rationale mechanisms are designed “by the user”, context-dependent prompts that encourage students by suggesting what to do (Breve et al., 2024). But the influence of immediate engineering on ESL classrooms is not well understood (Mai, 2025).

Finally, there is insufficient research that deciphers the effect of students' digital literacy on their use of AI tools. This influence is recognized, though not much research is there to investigate this direct effect on AI-driven language learning. This is of particular concern for students from less

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affluent communities, who struggle to gain access to technology and whose teachers have less training – both aspects that make the implementation of AI-based tech in class difficult.

7. Why Filling These Gaps Matter?

Bridging these gaps is crucial to the progress of AI in ESL instruction. This work will make actionable contributions to the education community by elucidating how prompt engineering supports pedagogy in order to inform the ways educators can guide AI solutions towards personalized instruction. This individualization will increase skills in basic language arts (writing and vocabulary particularly) resulting in improved ESL student performance.

An important finding will be the contribution of digital literacy to students' usage of AI tools. By investigating this relationship and its impact on performance, the research will provide information to guide practitioners who may need to adapt teaching practices in order for students of all technological backgrounds to access learning technology effectively. This is especially crucial in closing the digital divide, the gap that low income young people face who lack access to technology and need for help with digital literacy.

The study will also identify the challenges educators encounter when using AI tools, including training and technology access. Building on these results, the research will recommend policies that make AI tools available to all students – particularly in communities with few resources. This paper then presents a theoretical framework for the study, notes where gaps exist and the importance of addressing them. The findings will be used to inform policy recommendations, pedagogy, and better access to AI-supported ESL resources.

8. Methods

Design

This qualitative research examines the potential use of AI-driven tools, particularly prompt engineering, for improving ESL teaching and learning in higher education. It studies educators' and students' expectations, challenges, and experiences with AI tools; advances digital literacy as a tool to bridge the language proficiency gaps; and offers practical implications for educators and policymakers.

Population

The study will target **higher education institutions** that have begun integrating AI-driven tools into their ESL curriculum. The participants will include **educators** and **students** engaged in ESL

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education at two universities in Malaysia **University -Unirazak** and **Alfa University College**. The sample will consist of:

Table 1. Respondents Demography

Group	Criteria
Educators	ESL teachers with at least one semester of experience using AI-driven tools, specifically prompt engineering, in their teaching practices.
Students	ESL learners enrolled in degree programs who have varying levels of digital literacy and access to technology, willing to participate in focus groups.

Teachers who have more than one semester experience using AI tools and students enrolled in the ESL class are eligible. The study gives focus to diversity in both digital literacy and socio-Economic Status.

9. Tools & Protocols

On the whole, this study will employ a mixed-method approach to obtain an overall view of the use of AI-based tools in ESL education. One-on-one interviews with teachers will give insight into their views regarding AI applications, particularly prompt engineering, in supporting ESL instruction. Based on an interview protocol that includes open-ended questions, these interviews will inquire about the experiences of educators and what they see as challenges due to the impact on aerial linguistic supersaturate in learners. Focus group discussions with students will explore how they have used AI in their studies, their experience of prompt engineering and views on the ways in which AI helps them to learn. Focus groups will help participants engage with one another and explore ideas in common (Geampana and Perrotta, 2025).

Digital Literacy Survey

An e-survey will be used to determine the Arabic language learner's proficiency with digital tools. This is to understand the role of digital literacy on their use of AI tools.

Measures

Teacher AI integration success will be measured by teachers' perception of student progress and Student engagement and proficiency will be determined via focus group participation, as well as self-reports regarding language development.

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Methods

Data will be transcribed and coded under overarching themes in a thematic analysis to compare educators' expectations with the students' final work at the end of their study, particularly in the area of digital literacy/ accessibility.

Analysis Plan

Thematic analysis will be used to analyze the data to ascertain themes and patterns from the interviews and focus group discussions. The analysis will proceed iteratively and comprise the following steps:

Table 2: Analysis Plan

Step	Description
Familiarization	This is where you read over and have a look at transcribed data to see all of the information as a whole Casual skimming (or reading?)
Initial Coding	Code the information according to emerging themes, such as prompt design, digital literacy, level of AI engagement and language proficiency.
Theme Development	Categorizing codes into themes Looking at the prompt engineering of the Language Learning and digital literacy as key/thematic aspects for language learning.
Interpretation	Examine the themes and relate them to research questions in order to generate conclusions and insights.

Comparison between responses in relation to other attributes (like socio-economic level, digital literacy level and access technology) will also be addressed. This will enable us to deepen our understanding of how such factors impact the effectiveness of AI tools for engineering in ESL education. The results will be utilized to develop evidence-based policy suggestions concerning teacher training, infrastructure creation, and the use of AI tools in ESL teaching.

Through a qualitative methodology including semi-structured interviews, focus groups, and digital literacy assessment, the study will support an enriched understanding of how AI prompt engineering can strengthen ESL instruction and mitigate the digital gap in higher education. The

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results of the research will provide key implications for teaching English as a second language (ESL), and lead to more equitable use of AI tools in ESL education.

10. Results

The first part of the study will perform a qualitative analysis of educators' and students' discussions regarding AI-based tools like prompt engineering implemented in ESL education. For teachers, emphasis in their discussion is on the effect that quick construction had nursed on writing and vocabulary evolution. The study will analyze student's engagement, L2 proficiency gains and self-perceptions of usefulness of the AI tool in order to lay the groundwork and provide initial observations on the role of AI in ESL education in Malaysia.

Outcome-Based Findings Table

The results of this study will be presented in the table below, summarizing major results that follow from the implementation of AI-engineered prompt integration within ESL instruction.

Table 3: Findings & Outcome

Research Objective	**Outcome**	**Findings**
1. Educators' experiences with AI-driven tools	Impact on Language Skills	Educators report significant improvement in students' writing and vocabulary development through AI-driven prompt engineering.
	Pedagogical Integration	Teachers faced challenges due to insufficient training and lack of resources, limiting full tool integration.
2. Students' engagement with AI tools	Enhanced Language Proficiency	Students showed improvement in writing and vocabulary skills after regular use of AI tools for assignments.
	Digital Literacy & Access	Students with higher digital literacy showed better engagement and language improvement than those with limited access

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		to technology.
3. Impact of Digital Literacy on AI tool effectiveness	Engagement Levels & Learning Outcomes	Students with better digital skills were more engaged with AI tools, showing higher levels of proficiency
	Barriers to Effective Use	Students with limited digital literacy struggled with AI tools, showing lower improvement rates in language proficiency.
4. Challenges faced by educators and students	Technology Access & Teacher Training	Limited access to digital tools and insufficient teacher training were identified as primary barriers to full implementation.
	Socio-economic Factors	Disparities in socio-economic status further limited students' ability to fully engage with AI-driven language tools.
5. Optimizing prompt engineering for engagement	Personalization & Interaction	Tailored prompts were found to enhance student engagement by making learning more interactive and personalized.

11. Moving To Critical Analysis

Reviewed and annotated, this bibliography critically examines the use of digital literacy and AI technologies within ESL classrooms and their impact on student engagement. It illustrates the problems faced by students from low-income homes and shows how an access to technology is not as equal. The research also targets educator tensions over the adoption of AI that arise from lack of training and resources. It will be supplemented by visual aids, including infographics, and tables designed to make complex data accessible in order to help educators, policymakers, and higher education leaders understand the strides that students are taking toward linguistic fluency through AI interaction.

This study is not free from some limitations. The small size of the sample, characteristic of qualitative research, prevents any generalization. Furthermore, because only two Malaysian

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universities participated in the study, the findings may not generalize to students and lecturers in other places or other educational systems. In addition, there is a potential for both students and educators not to have provided truthful answers especially in the case of the perceived usefulness of AI tool effectiveness. The study, by considering only the immediate effects of AI on ESL proficiency, does not consider its longer-term consequences. These limitations may be addressed in future study by recruiting more subjects, involving difference organization range of institutions and by investigating the long-term impact of AI on language learning.

The novel approach of this study is the consideration of prompt engineering as an AI technique to enhance ESL pedagogy which, for the most part, has been under-researched. The paper also considers the intersection between digital literacy and AI deployment, particularly for less privileged students, an issue of critical pedagogical concern. The results will have implications for policy, teacher education and school practice from the standpoint of equitable access and digital literacy.

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