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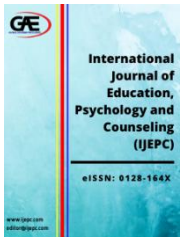

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CHALLENGES OF USING PIXLR EXPRESS AI IMAGE GENERATOR AMONG RESOURCE-CONSTRAINED RURAL PRIMARY SCHOOL ENGLISH TEACHERS

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Abstract:

This study explores the challenges faced by resource-constrained rural primary school English teachers in using the Pixlr Express AI Image Generator for instructional purposes. Grounded in the process-oriented framework (before, during, and after teaching) and informed by the Technological, Pedagogical, and Content Knowledge (TPACK) model, the study adopts a qualitative case study design to provide an in-depth understanding of AI integration in a low-enrolment rural school context in Malaysia. Data were collected through semi-structured interviews with four non-specialist English teachers and analysed using thematic analysis. The findings reveal four major interrelated challenges across all instructional phases: limited digital infrastructure, lack of professional development training, time constraints, and insufficient teaching qualifications. Before teaching, unstable internet connectivity, lack of AI-related training, and heavy workloads restricted teachers' ability to prepare effective teaching aids. During teaching, non-English major teachers struggled to generate accurate prompts, leading to less relevant AI-generated content, while time limitations hindered real-time instructional adaptation. After teaching, the lack of training and content knowledge limited the use of AI tools for remedial instruction and assessment, further compounded by persistent connectivity issues. The study concludes that although Pixlr Express has the potential to enhance visual pedagogy and support differentiated learning, its practical implementation in rural low-enrolment schools remains constrained by systemic and contextual barriers. The findings highlight a critical

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imbalance in TPACK competencies, particularly in technological and pedagogical domains. To address these issues, the study recommends targeted professional development, improved digital infrastructure, workload management strategies, and policy interventions to support non-specialist teachers. Overall, this research contributes to rural education literature by providing empirical insights into the realities of AI integration in under-resourced educational settings.

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Keyword:

Artificial Intelligence in Education, Pixlr Express AI, Rural Education, Teacher Challenges, TPACK Framework

Introduction

Teachers in low-enrolment schools, often located in rural or semi-urban areas, frequently encounter significant challenges such as digital inequality (Naidoo, 2025), limited internet connectivity (Naidoo, 2025), and insufficient professional training in educational technology (Hennessy et al., 2022). These issues often arise due to geographical constraints that hinder the transmission of stable internet signals necessary for effective teaching and learning (Dean & Wenner, 2026). Consequently, teachers in these settings often rely on traditional teaching methods, such as using blackboards, to facilitate instruction (Meredith, 2026). In this context, a primary school with fewer than 150 students is considered a low-enrolment school (Medina et al., 2018). This scenario is particularly prevalent in rural areas, such as estate communities, which are characterized by their location within plantation estates, predominantly for palm oil or rubber production (Decent Rural Living Initiative, 2020).

Schools in these areas face challenges related to student population, as they primarily serve children of estate workers. Given the relationship between the number of workers and school-aged children, these schools often experience low enrolment and are categorized accordingly. In addition, the low student population is typically accompanied by a limited number of staff, including both teachers and administrators. As a result, teachers are required to manage multiple roles and responsibilities, which limits their capacity to explore and adopt new technologies. Furthermore, teachers often lack the support networks and digital expertise required to effectively utilise these tools.

Moreover, low-enrolment schools frequently experience non-specialist teaching, where teachers are required to teach subjects outside their area of expertise (Medina et al., 2018). For instance, a teacher trained in Mathematics Education may also be required to teach English, History, and Physical Education. Non-specialist teachers are those who teach subjects without

formal training or specialization in those areas (Haukas et al., 2022). This lack of specialized training can result in gaps in instructional quality and student learning outcomes. The situation is further compounded by limited access to professional development opportunities and resources that could support teachers in enhancing their teaching across multiple subjects. Sukri and Yunus (2019) reported that many non-English major teachers experience uncertainty when teaching English vocabulary and grammar due to their disciplinary background.

The cumulative effect of these challenges highlights the complex educational context of low-enrolment schools, where structural and pedagogical issues intersect. To address these challenges, image-generative artificial intelligence tools such as Pixlr Express offer a potential solution. Pixlr Express, a user-friendly online photo editor, enables teachers to create and modify images without requiring advanced design skills (Pixlr, 2024; Sims, 2024). By inputting textual prompts, teachers can generate customised visuals that support instruction, foster creativity, and save time (Eisenmann et al., 2025; Ringvold et al., 2023). This cost-effective tool has the potential to enhance instructional practices by making learning more visually engaging and accessible despite limited resources.

The advancement of technology has enabled teachers to allocate more time to teaching and learning activities (Huang et al., 2021). Current trends in artificial intelligence (AI) in education highlight benefits such as increased learner engagement, improved assessment accuracy, and time efficiency for educators (Chen et al., 2020). However, the rapid development of AI technologies requires continuous curriculum updates to remain relevant, which presents significant challenges for schools (Karataş & Yüce, 2024). In addition, Oldham (2026) found that many teachers lack the necessary technological knowledge to effectively utilise AI tools, while existing professional development programs often fail to address these needs.

Although Pixlr Express is widely accessible and user-friendly, there is limited research on how primary school teachers use it in real classroom settings. To address this gap, this study adopts a process-oriented framework from Abdous (2011), which consists of three instructional phases: (1) before teaching (pre-instruction), (2) during teaching, and (3) after teaching (post-instruction). While this framework is commonly applied in online learning contexts, it remains relevant for this study as it provides a structured approach to examining technology integration across different stages of teaching. Previous studies, such as Tingare et al. (2024), have also applied this framework to evaluate teaching and learning processes.

This framework enables a comprehensive analysis of how teachers prepare, implement, and reflect on their instructional practices, providing insights into the practical challenges and opportunities associated with using generative AI tools such as Pixlr Express in low-enrolment school settings. Understanding these challenges is essential to improving the adoption and effectiveness of such tools, as well as guiding school administrators and policymakers in providing appropriate support for teachers in under-resourced environments (Tran & Nguyen, 2025).

This study is particularly relevant to rural education contexts, where teachers often face challenges related to geographical isolation, limited technological infrastructure, and restricted access to professional development opportunities. In many rural and estate-based primary schools, teachers rely on creative and low-cost approaches to produce engaging instructional materials.

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Therefore, exploring the challenges associated with using artificial intelligence tools such as Pixlr Express among teachers in resource-constrained rural schools is essential for understanding how technological innovations can be realistically integrated into teaching practices. The findings of this study are expected to contribute to the literature on rural education by highlighting the practical realities faced by teachers in low-enrolment schools.

To explore the challenges faced by low-enrolment primary school non-specialist English teachers in using Pixlr Express in the preparation of teaching based on the following:

1. To explore the challenges faced by primary school English teachers in using Pixlr Express before teaching particularly in planning and preparing teaching aids.

2. To explore the challenges faced by primary school English teachers in using Pixlr Express during teaching especially in enhancing the lesson delivery.

3. To explore the challenges faced by primary school English teachers in using Pixlr Express after teaching in the preparation of remedial materials and assessment activities.

Literature Review

While originally designed for online teaching, the process-oriented framework (Figure 1) by Abdous (2011) offers a valid structure for integrating technology such as image generative artificial intelligence (AI) into face-to-face instructions. The three phases framework (i. Before teaching: preparing, planning and designing, ii. During: facilitating, interacting, providing feedback, iii. After: reflecting, drawing lesson learned) provide a systematic approach to leverage AI tools such as Pixlr Image to enhance teaching and learning. Abdous (2011) emphasizes that effective technology integration such as Pixlr Express requires pedagogical alignment, student-centered design and continuous reflection and this can be translated into the context of low-enrolment school, where tools like Pixlr Express can transform how teachers prepare, deliver and reflect on their lessons.

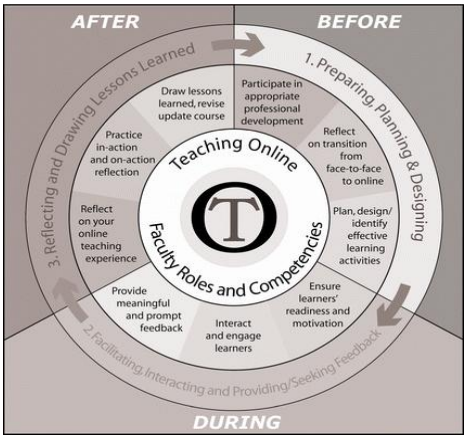

Figure 1: A Process-Oriented Framework

Source: Abdous (2011)

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Before: Preparing, Planning and Designing

Pixlr Express enables teachers to plan and create innovative teaching resources that align with lesson objectives before instruction begins. For example, in an English language classroom, visual aids such as flashcards, posters, vocabulary charts and grammatical infographics are some of the essential teaching aids for clarifying abstract concepts, particularly for primary school students who often struggle with abstract verbs or prepositions (Fadillah & Bariyyah, 2024). For example, by using descriptive prompt in Pixlr Express (e.g), "a boy reading under a tree at the beach", to generate images that visually reinforce themes like action verbs or spatial prepositions. These visuals act as concrete guides, making abstract language concepts more accessible and engaging for students (Fadillah & Bariyyah, 2024).

During the planning phase, AI tools allow teachers to design learner-centered activities that cater to diverse learning needs. For instance, teachers can prepare differentiated materials in advance, such as simplified or enriched visuals, to support students at varying proficiency levels (Abdous, 2011). This proactive approach ensures that lessons are inclusive and adaptable, addressing potential gaps in understanding before the class even begins. Additionally, AI-driven tools can update and refine content based on emerging educational trends, ensuring that teaching materials remain current and effective (Ogunleye et al., 2024). By incorporating AI-generated visuals into lesson plans, educators can create a structured yet flexible framework that aligns with the learner-centered syllabus advocated by Abdous (2011).

During: Facilitating, Interacting and Providing Feedback

AI tools like Pixlr Express enhance real-time facilitation and interaction in the classroom. Teachers can use these tools to dynamically adjust materials based on students' needs, fostering a more responsive and engaging learning environment. For example, during a speaking lesson, a teacher might display AI-generated images of activities at the beach. For weaker students, the images can be simplified to focus on basic actions, while advanced learners can be challenged with more complex scenes (Yeh, 2025). This real-time differentiation supports active learning and ensures that all students are appropriately challenged (Ali et al., 2024).

Besides, AI tools also able to encourage collaboration and creativity (Medina et al., 2018). Teachers can invite students to create their own visuals using simple prompts, such as describing characters or settings from a story. The generated images can then be used to support group discussions or writing tasks, allowing students to see their ideas come to life visually (Lively et al., 2023). This approach not only deepens engagement but also promotes peer interaction and student-centered learning, key components of the "During" phase (Abdous, 2011). By integrating AI-generated content into interactive activities, teachers can maintain student motivation and foster a sense of ownership over the learning process.

After: Reflecting and Drawing Lessons Learned

Pixlr Express is one of the invaluable tools for post-lesson reflection and remedial support. After assessing student performance, teachers can use AI to quickly generate or modify images tailored to the needs of struggling students (Gan et al., 2019). For instance, if a writing lesson reveals gaps in comprehension, teachers can promptly create remedial visuals to reinforce key concepts. This addresses a common challenge in education: the neglect of remedial activities due to time constraints (Gan et al., 2019). By using AI to generate customized materials,

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teachers can provide targeted support without the extensive effort traditionally required, ensuring that no student is left behind.

Furthermore, the reflection phase of the process-oriented framework encourages teachers to analyse the effectiveness of AI-generated materials and student responses. By reviewing how students interacted with the visuals such as their engagement in storytelling or writing tasks, teachers can identify areas for improvement and refine future lessons (Abdous, 2011). This iterative process ensures continuous enhancement of teaching strategies and materials, aligning with the framework's emphasis on lessons learned and topic revisions.

Technological, Pedagogical and Content Knowledge (TPACK)

The TPACK framework underscores that technological knowledge alone is insufficient for effective AI integration (Saharuddin et al, 2025). It must be combined with pedagogical and content knowledge to ensure that AI tools are used in ways that align with educational goals and enhance learning outcomes. For instance, while Pixlr Express offers advanced AI-enhanced editing capabilities that can support vocabulary assessment through visual and interactive elements, its full potential can only be realized if teachers possess the pedagogical and content knowledge to integrate these features meaningfully into their teaching practices. Without this integration, there is a risk of over-reliance on AI-generated outputs (Zhai et al., 2024), which can lead to a decline in critical thinking and analytical skills among students (Zhai et al., 2024). Moreover, the contextual barriers in low-enrolment schools, such as resource constraints (Hava et al., 2025), professional development gaps (ibid), and lack of institutional support (ibid), further complicate the effective use of AI tools. These barriers highlight the urgent need for comprehensive training and professional development programs that equip non-specialist teachers with the necessary competencies to navigate the complexities of AI-supported language teaching.

Recent studies support the argument that TPACK is essential for meaningful AI integration in language education (Shoukat et al., 2024). For example, the Intelligent-TPACK framework (Celik, 2023) extends the traditional TPACK model to include ethical assessments and AI-specific knowledge, emphasizing the importance of technological and pedagogical knowledge in effectively integrating AI-based tools. Similarly, the AI-TPACK framework (Ning, 2024) underscores the need for teachers to possess AI-specific technological, pedagogical, and content knowledge to deploy AI in education efficiently. These frameworks highlight the critical role of TPACK in ensuring that AI tools are used ethically and effectively, maximizing their potential benefits while mitigating risks.

Empirical findings also demonstrate the struggles of non-specialist teachers with AI-supported assessment tools in under-resourced settings. A study by Ning et al. (2024) remarked that the TPACK framework helps ensure a balanced integration of technology, particularly generative AI tools in English language teaching, considering practices, challenges, and practical strategies for applying these tools. This aligns with the broader literature that calls for comprehensive training and professional development to equip teachers with the necessary skills to use AI tools effectively and ethically, addressing the contextual barriers that hinder their adoption in low-enrolment schools.

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In looking into Technological, Pedagogical and Content Knowledge (TPACK) framework, teaching using technology such as Pixlr Express is not for mere sake of joining the world wagon of using AI in education, it portrayed that the TPACK framework is indispensable for meaningful AI integration in language education, particularly in low-enrolment schools where non-specialist teachers face unique challenges. The framework's emphasis on the interdependent nature of technological, pedagogical, and content knowledge highlights how limited proficiency in any one domain can undermine the potential benefits of AI tools like Pixlr Express, leading to superficial or ineffective use rather than transformative educational outcomes. This is especially critical in under-resourced contexts where teachers often lack comprehensive training and institutional support, exacerbating the difficulties in effectively leveraging AI for vocabulary assessment and language learning.

Factors That Hinder the Use of Artificial Intelligence in Teaching and Learning

Limited Digital Infrastructure

The issue that the low enrolment teachers are facing before teaching is poor internet connectivity in rural areas (Gordon & Grunberg, 2022). Many rural and low-enrolment schools, especially those situated in estate areas surrounded by dense forests, suffer from unreliable Wi-Fi or mobile data connectivity (Gordon & Grunberg, 2022; Lee, 2020). This restricts teachers' consistent access to AI tools, making it difficult to evaluate the sustained use and impact of such technologies in these environments. The absence of studies on connectivity challenges limits understanding of AI's practical longevity and adaptability in under- connected contexts (Dean & Wenner, 2026).

These challenges are often more pronounced in rural primary schools where access to digital infrastructure, technical support, and professional training is limited. Teachers in rural settings frequently need to develop instructional materials independently with minimal institutional support. As a result, the adoption of artificial intelligence tools for educational purposes may present both opportunities and significant challenges for these educators. Understanding these challenges is particularly important in rural education contexts because teachers' ability to integrate innovative tools directly influences the quality of learning experiences available to students in geographically isolated communities.

Lack of Professional Development Training

Research based on the context of low enrolment school by Morris et al (2021), highlighted that teachers are lacking in image editing skills meanwhile Taylor and Wang (2022) revealed that teachers have difficulty in creating a good prompt due to their limited background in English language instruction as they are not English majors. This shows that teachers required professional development training (PDT) to harness AI tools effectively (Meredith, 2026). In addition, there is a notable lack of targeted workshops or training programs that focus on using AI tools in differentiated instruction classrooms, particularly for remedial activities (Ding et al., 2024). Teachers working with students who require additional support often face challenges in tailoring AI-generated content to suit varying proficiency levels, especially when they lack formal guidance on how to adapt these tools effectively (Roberts & Chan, 2023). Thus, remedial students in under-resourced schools often miss out on the benefits of personalized AI-assisted learning experiences that could otherwise enhance engagement and academic progress (Taylor & Wang, 2022). Hence, it can be concluded that the rapid evolution of AI technology

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further complicates efforts, as available training often lags behind current innovations, creating a persistent gap in knowledge and skill development (Holmes et al., 2021; Williams & Brown, 2023).

Time Constraints

Furthermore, teachers in low enrolment schools face time constraints because they have multi responsibilities, where they are required to manage multiple responsibilities beyond teaching, which limits their capacity to fully integrate digital tools into their lessons (Müller et al., 2022). Teachers in rural schools often juggle multiple roles, such as managing joint classes (e.g., Year 2 and 3, or Year 4 and 5 combined), which significantly limits their time to explore or integrate new AI tools (González & García, 2021). In low-enrolment joint-classroom schools, teachers are required to handle multiple grade levels simultaneously, resulting in limited time or capacity to experiment with unfamiliar tools (Müller et al., 2022). Teachers are also worried that an over-reliance on AI tools may hamper teacher-student relationships, reducing learning to automated interactions rather than fostering meaningful engagement (Holmes et al., 2021; Roberts & Chan, 2023).

In low-enrolment schools, teachers are often required to take multiple roles beyond their primary teaching responsibilities, due to the limited number of staff (Müller et al., 2022). For example, the low-enrolment school in this study has only six teachers, making it common for a single teacher to simultaneously serve as a senior assistant for administration, student affairs and curricular coordinator, subject head panel, and class teacher (González & Lee, 2022).This heavy multitasking workload significantly reduces the time available for lesson planning, innovation, or professional development, including the integration of emerging technologies like AI (Roberts & Chan, 2023).

Teaching Qualifications

In low-enrolment schools, many teachers are not English language majors, making it challenging for them to create accurate prompts required by AI content generation tools (Taylor & Wang, 2022). In addition, non-specialist teachers struggle in assessing students' vocabulary skills while using Pixlr Express due to limited training in both language pedagogy and AI-supported assessment practices (Smith & Zhang, 2020). This increases the risk of generating irrelevant or ineffective outputs, which in turn diminishes the perceived usefulness of the technology in the classroom (Shambare & Jita, 2025).

Many AI generative tools, such as Pixlr Express AI Image Generator, require users to input precise prompts in English to generate accurate educational content outputs (Zhang et al., 2021). However, in low-enrolment rural schools, where teachers are often not English majors, face a higher risk of misconstructing prompts, which results in ineffective or irrelevant educational content, as they are not skilled in assessing students' grasp of vocabulary (González & Lee, 2022).

Teachers in rural schools often come from non-English major backgrounds, which can hinder their ability to accurately assess students' vocabulary skills (Smith & Zhang, 2020). Without formal training in English language pedagogy, these teachers struggle to identify nuanced gaps in vocabulary knowledge or to apply appropriate instructional strategies to support language development (Puspawati et al., 2024). This limitation extends beyond classroom instruction, as

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it also affects their ability to craft precise prompts or select suitable AI-generated content that aligns with students' language proficiency levels (Taylor & Wang, 2022; González & Lee, 2022).

Methodology

Research Design

This research adopts a qualitative case study design to explore the challenges faced by primary school English teachers in using the Pixlr Express AI Image Generator before, during and after teaching when preparing teaching aids in low-enrolment schools. The case study design is justified as this research seeks to obtain an in-depth understanding of a bounded system. Specifically, a small group of teachers within a unique educational context rather than to generate theory or focus solely on lived experiences. Yin (2014) emphasizes that case studies allow for rich and contextualized analysis of a phenomenon within its real-life setting. This makes it particularly suited to examining how AI-based teaching tools are integrated into a specific school environment.

This study was conducted in a rural Tamil national-type primary school located in Jempol, Malaysia. The school has fewer than 15 pupils, which is well below the 150-student threshold for low-enrolment schools. The school is situated in a community with limited access to advanced digital resources. Internet connectivity is available but often unstable and ICT infrastructure consists of a small computer room with basic facilities. This rural resource-constrained setting provides an important backdrop for a case study in understanding the challenges teachers face in adopting AI tools for instructional purposes.

The study was conducted in low-enrolment primary schools located in rural estate communities in Malaysia. These schools typically operate with limited resources, smaller student populations, and reduced access to advanced technological infrastructure compared to urban schools. Such characteristics make them representative of many rural educational settings where teachers must adapt their instructional practices to overcome resource constraints.

Research Sampling Technique and Respondents Profile

A purposive sampling technique was employed to select four English teachers who met the study's inclusion criteria. The selection was guided by two criteria: (1) participants must currently be teaching English at the school, and (2) participants must have at least one year of teaching experience to ensure they have sufficient classroom exposure to reflect meaningfully on the topic (Merriam, 1998).

The sample size of four participants is considered adequate and appropriate within the context of this case study for several reasons. First, all teachers responsible for teaching English in the selected school were included, representing a complete and bounded sample of the case. This aligns with case study research, which prioritizes depth of understanding within a specific context rather than broad generalization (Yin, 2014).

Second, the relatively homogeneous background of participants (all holding bachelor's degrees in Tamil language and having 10–14 years of teaching experience) supports a focused exploration of shared challenges within a consistent professional context.

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Third, data saturation was achieved, as no new themes emerged from the responses after analysing the data from all four participants. The recurring patterns across participants—such as limited infrastructure, lack of training, and time constraints—indicate that the data collected were sufficient to address the research objectives comprehensively.

While the small and homogeneous sample limits generalizability, it is consistent with qualitative case study approaches that emphasize analytical depth, contextual richness, and detailed understanding of a specific phenomenon.

Data Collection Procedures

There are four steps in data collection procedures involved in this study.

Step 1: Application to the school
This step involved submitting an official application letter to the school, outlining the research objectives, methodology, and expected outcomes. Approval was granted via email.
Step 2: Obtaining formal approval and permission
Formal approval was obtained from the school authority. In addition to written approval, the Headmistress communicated verbal consent through a phone call.
Step 3: Preliminary meeting with participants
A preliminary meeting was conducted via phone call to establish rapport with the participants. During this session, the purpose of the study was explained, and the date, time, and method of data collection were confirmed.
Step 4: Data collection
Data were collected using a semi-structured written interview protocol, administered to participants via written responses. This approach was chosen to provide participants with flexibility and sufficient time to reflect on their answers, given their workload constraints. Participants were given three days to complete and return their responses. The use of written interviews ensured consistency in questioning while allowing for in-depth qualitative responses.

Research Instrument: Semi-Structured Written Interview Protocol

The semi-structured written interview protocol was developed systematically to explore the challenges faced by primary school English teachers in using Pixlr Express before, during, and after teaching.

First, the research objectives were clearly defined to guide the development of the instrument. Second, key themes identified from the literature review informed the construction of the interview questions. The questions were designed to elicit detailed responses related to planning, lesson delivery, and post-teaching practices.
The protocol consisted of four sections:

Part A: Demographic information
Part B: Before teaching (planning and preparation)
Part C: During teaching (lesson delivery)
Part D: After teaching (remedial and assessment practices)

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To ensure validity, the instrument underwent face validity and construct validity checks by two experts in the field. Their feedback helped refine the clarity, relevance, and alignment of the questions with the study objectives.

Furthermore, the researcher emphasizes the importance of informed consent and included it in the structured written interview protocol. Informed consent is a critical component of ethical considerations in qualitative research. Hence, the consent form clearly explains the participants' rights, including their ability to withdraw at any time without consequences, their right to refuse answering specific questions and the assurance that their data will remain confidential. Additionally, participants are given the option to withdraw permission for the use of their data within two weeks of the interview, after which their material will be securely deleted. These measures demonstrate the researcher's commitment to respecting participants' autonomy and maintaining ethical standards throughout the study.

Data Collection and Ethical Considerations

Ethical approval for this study was obtained from the school Headmistress and written informed consent was secured from all participants prior to data collection. This involves securing authorization from the relevant authorities to proceed with the study. The authority of the school granted the permission and sent an approval letter via email to the researcher. Participants were assured of confidentiality, and pseudonyms were used in reporting to protect their identities.

The researcher implemented pseudonym technique by assigning labels such as Participant 1, Participant 2, Participant 3 and Participant 4. This pseudonym technique is to anonymize participant identities. This approach ensures that the actual names of participants are not disclosed in the study reports or any related publications, protecting their confidentiality and privacy. By anonymizing participants, the researchers prevent potential identification and ensure that sensitive personal information remains confidential throughout the study. After the research was conducted, the researcher diligently preserved all raw data, including semi-structured interview protocol interviews from the four participants. This practice serves crucial ethical purposes including promoting transparency and reproducibility of the study's findings, facilitates peer review and validation of research methods and ensures that original data sources remain accessible for future scrutiny or verification.

Data Analysis

A deductive thematic analysis approach was employed, guided by Braun and Clarke's (2006) six-phase framework. The deductive approach was selected because the analysis was informed by existing theoretical frameworks, namely the process-oriented framework and TPACK model, which provided predefined categories for analysis.

The analysis followed six stages: familiarization with the data, generation of initial codes, identification of themes, review of themes, definition of themes, and reporting. Manual coding was conducted to allow for close engagement with the data and careful interpretation of participants' responses.

To enhance methodological transparency, the coding process involved systematically linking raw data excerpts to codes and subsequently grouping these codes into broader themes. For

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example, responses related to "poor Wi-Fi" and "unstable internet" were coded under *connectivity issues*, which were later categorized under the broader theme of *limited digital infrastructure*. This step-by-step process ensured a clear connection between the data and the identified themes.

Furthermore, the coding process was conducted iteratively to ensure depth and accuracy in the analysis. After the initial coding stage, all data were re-examined to refine and verify the consistency of the assigned codes. Similar codes were compared across participants and merged where appropriate to avoid redundancy and to ensure conceptual clarity.

For example, statements such as "terrible Wi-Fi signal" and "very poor mobile data connection" were not only identified as indicators of connectivity issues but were also interpreted within the broader context of instructional challenges faced by teachers in rural settings. These codes were then consolidated under the theme of limited digital infrastructure, demonstrating how individual responses contributed to the development of overarching themes.

This iterative process of reviewing, refining, and categorising codes aligns with Braun and Clarke's (2006) recommendation that thematic analysis should involve continuous reflection and adjustment to ensure that themes accurately represent the data. By incorporating multiple rounds of coding and refinement, the study strengthens the transparency and rigour of the analytical process.

Trustworthiness of the Study

Several strategies were employed to enhance the trustworthiness of the findings. First, data consistency was ensured by using the same semi-structured protocol for all participants. Second, peer review was conducted through discussions with supervisors to verify the interpretation of codes and themes. Third, an audit trail was maintained by documenting all stages of data collection and analysis, ensuring transparency in the research process.

Additionally, the use of direct participant excerpts in the findings strengthens the credibility of the study by demonstrating clear links between the data and the interpretations.

Findings

Research Objective 1: Challenges Faced in Using Pixlr Express AI Image Generator Before Teaching Particularly in Planning and Preparing Teaching Aids

Before teaching, three main challenges emerged: limited digital infrastructure, lack of professional development training and time constraints.

Theme 1: Limited Digital Infrastructure

The first theme is limited digital infrastructure. The teachers face challenges with poor internet connectivity, which directly limits their ability to integrate digital tools in lesson planning. Participant 1 highlighted the "terrible Wi-Fi signal", while Participant 2 mentioned reliance on "mobile data connection" that is "very poor". Similarly, Participant 3 and Participant 4 reported using ICT only "twice per week" or "rarely" because of "poor" or "really bad" Wi-Fi.

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These responses indicate that teachers are consistently constrained by unreliable internet access rather than occasional technical issues. The similarity across all participants suggests that connectivity is a systemic barrier within the school context. As a result, teachers' use of Pixlr Express is inconsistent and limited, despite its potential benefits for teaching and learning.

Poor internet access has been documented as a major hindrance to technology-supported pedagogy, especially in developing countries. Thus, limited digital infrastructure in schools hinders teachers in planning and preparing teaching aids before the lesson.

The second theme is lack of professional development training. The data suggest that teachers lack professional development opportunities in using Pixlr Express and related digital tools, which restricts their ability to design effective teaching aids. Participant 1 and Participant 4 admitted that they "did not attend training programs or workshops" on Pixlr Express. Participant 2 expressed interest in designing but noted a lack of "skill in image editing", while Participant 3 stated that they had "never learned any image editing skills".

These responses indicate that teachers lack both formal training opportunities and practical competencies required to effectively use AI tools. This creates a gap between teachers' willingness to adopt technology and their actual ability to implement it in classroom practices. Consequently, teachers are less confident and less likely to integrate Pixlr Express into lesson preparation.

Insufficient training is widely recognised as a factor limiting ICT integration in education. Therefore, the lack of professional development training hinders teachers in planning and preparing teaching aids before the lesson.

The third theme is time constraints. The findings reveal that teachers experience significant time limitations, which reduce their capacity to prepare digital teaching aids using Pixlr Express. Participant 1 stated that there are "too many tasks" to complete, while Participant 2 and Participant 3 emphasized the difficulty of managing "two classes in one lesson" or "joint classrooms". Participant 4 added that "multi role responsibilities" further restrict time.

These responses suggest that time constraints are structurally embedded within the context of low-enrolment schools rather than being individual limitations. Teachers are required to manage multiple roles simultaneously, which reduces the time available to explore or integrate new technologies. As a result, the use of Pixlr Express becomes secondary to immediate teaching responsibilities.

Previous studies confirm that excessive workload negatively affects teachers' capacity to integrate digital tools into instruction. Thus, time constraints act as a major barrier to adopting Pixlr Express in lesson preparation.

Research Objective 2: Challenges Faced in Using Pixlr Express AI Image Generator During Teaching Especially in Enhancing the Lesson Delivery

During teaching, challenges centred on teaching qualification and time constraints.
The first theme is teaching qualification. The findings indicate that teachers' academic backgrounds and teaching qualifications influence their ability to effectively use Pixlr Express in English lessons. Participants 1 to 4 consistently noted difficulty in "creating good prompts"

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because they are "not majoring in English". Participant 2 specifically mentioned being "qualified in Tamil language", highlighting a mismatch between training background and instructional demands.

These responses indicate that limited English language proficiency directly affects teachers' ability to generate accurate prompts required for AI tools. Since Pixlr Express relies heavily on precise language input, insufficient content knowledge results in less relevant or inaccurate outputs. This demonstrates that the challenge is not purely technological but also rooted in content knowledge limitations.

Research highlights that teachers' qualifications influence their ability to integrate technology effectively. Therefore, limited qualifications in English language teaching reduce teachers' ability to maximise AI-based tools during lesson delivery.

The second theme is time constraints. The findings demonstrate that teachers face significant time limitations, which hinder effective lesson delivery using Pixlr Express. Participant 1 emphasized having "a lot of responsibilities", while Participant 2 and Participant 3 highlighted challenges of "controlling two classes in one lesson" and "handling joint classrooms". Participant 4 also referred to "multi-responsibilities in school".

These responses indicate that real-time teaching demands limit teachers' ability to utilise AI tools effectively during lessons. Managing multiple classroom responsibilities simultaneously reduces opportunities to adapt or generate AI-based materials in real time. As a result, the use of Pixlr Express during teaching becomes limited despite its potential benefits.

Research confirms that workload remains a major barrier to technology integration in classrooms.

Research Objective 3: Challenges Faced in Using Pixlr Express AI Image Generator After Teaching in the Preparation of Remedial Materials and Assessment Activities

After teaching, three main challenges persisted. These include lack of professional development training, teaching qualification, and limited digital infrastructure.

The first theme is lack of professional development training. The findings highlight that teachers lack training related to using Pixlr Express for remedial activities. Participant 1 and Participant 3 stated that they "did not join training programs", while Participant 2 and Participant 4 emphasized a "lack of training program especially for remedial activities".

These responses indicate that teachers are not adequately prepared to use AI tools for post-lesson purposes such as remediation and assessment. The absence of targeted training limits their ability to design appropriate materials for weaker students. This suggests that professional development is essential for extending the use of AI tools beyond basic teaching practices.

Research indicates that targeted training is crucial for supporting differentiated instruction.
The second theme is teaching qualification. The findings reveal that limited teaching qualifications affect teachers' ability to use Pixlr Express effectively for assessment activities. All participants noted difficulty in applying the tool for vocabulary assessment due to lack of training and subject knowledge.

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These responses suggest that insufficient subject-specific knowledge affects teachers' confidence and ability to use AI tools for assessment. Without strong content knowledge, teachers struggle to align AI-generated materials with learning objectives, particularly in evaluating students' understanding.

Research shows that teacher qualification plays a key role in technology-supported assessment practices.

The third theme is limited digital infrastructure. The findings indicate that poor digital infrastructure continues to be a critical barrier in post-lesson activities. All participants reported not involving students in creating images due to "bad Wi-Fi" or "poor mobile data connections". Participant 3 and Participant 4 also described the Wi-Fi as "poor".

These responses indicate that unreliable internet access prevents both teachers and students from engaging in AI-supported remedial and assessment activities. This limitation extends beyond lesson preparation and delivery, affecting overall technology integration in teaching and learning. As a result, the potential of Pixlr Express in post-lesson activities remains underutilised.

Limited connectivity has been identified as a major obstacle to ICT-supported learning in rural schools.

Discussion and Conclusion

This study confirms that connectivity constraints in rural or low-enrolment schools significantly hamper the effective use of AI tools such as Pixlr Express for lesson preparation. Limited or unreliable internet infrastructure not only restricts access to technology (technological knowledge, TK) but also disrupts its integration with pedagogy and content knowledge (PK, CK, and TPK) within the TPACK framework (Frontiers, 2025). This suggests that infrastructure is not merely a technical issue but a foundational condition that determines whether meaningful technology integration can occur.

This finding is consistent with studies conducted in other rural contexts. For instance, research on rural teachers in South Africa highlights that even when teachers are willing to integrate technology, unreliable infrastructure weakens the development of technological competence (Mazzuki, 2025). Similarly, Gou et al. (2024) found that primary school teachers in rural China demonstrate lower TPACK proficiency compared to urban teachers due to limited access to stable internet and professional development opportunities. These findings reinforce that infrastructural limitations create systemic barriers that extend beyond access and affect overall teaching effectiveness.

In addition to infrastructure, the lack of professional development training further constrains the use of AI tools. While previous studies have identified training gaps in various educational contexts (Kfouri & Rowe, 2024), the present study shows that this issue is compounded by time and infrastructural limitations. As a result, teachers are unable to develop the necessary technological pedagogical knowledge (TPK) and technological content knowledge (TCK) required for effective AI integration. This aligns with findings by Shambare and Simuja (2024), which indicate that even when teachers initiate the use of technology, the absence of formal training limits meaningful pedagogical integration.

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Research on rural science and virtual laboratory integration further supports this argument, showing that teachers may possess adequate content knowledge (CK) and pedagogical knowledge (PK), but demonstrate weaknesses in technological domains (TK and TPK) when training and infrastructure are insufficient (Cain et al., 2024). This imbalance highlights a critical gap in TPACK development, where teachers are unable to translate their existing knowledge into effective technology-supported practices.

Time constraints also emerged as a significant barrier, particularly in the context of joint classrooms and multiple teacher responsibilities. Teachers in low-enrolment schools are required to manage administrative duties, multi-grade teaching, and additional roles, which limits the time available for lesson preparation and technology integration. This reflects a broader global issue, as studies in Australia have shown that teachers often rely on personal time to learn and apply new technologies, leading to superficial implementation (Zunica, 2023). From a TPACK perspective, insufficient time restricts teachers' ability to refine and integrate technological, pedagogical, and content knowledge effectively. Even when access and training are available, time limitations result in shallow use of technology, preventing deep and meaningful integration. Similarly, Gou et al. (2024) identified time and logistical constraints as key barriers that limit professional development and technology adoption among rural teachers.

The study also highlights that limited English language content knowledge among non-specialist teachers affects the effectiveness of AI tool usage, particularly in prompt generation. Since AI-generated outputs depend on the precision of input prompts, weak content knowledge (CK) in English restricts teachers' ability to produce accurate and pedagogically relevant materials. This finding supports Kfouri and Rowe (2024) and Zhang et al. (2021), who emphasise that prompt literacy is essential for leveraging AI tools effectively in education.

Furthermore, recent studies on AI-TPACK indicate that insufficient content knowledge, combined with limited technological knowledge, results in reduced pedagogical value during lesson delivery (Nguyen, 2024; Saharuddin, Nasir, & Mahmud, 2025). In this study, this gap manifested in the production of irrelevant or misaligned images, which negatively affected student engagement. This demonstrates that effective AI integration requires not only access and training, but also strong subject-specific knowledge.

Time constraints during lesson delivery further limit teachers' ability to adapt AI-generated outputs in real time. Even when appropriate materials are generated, the inability to modify or refine them during teaching reduces their pedagogical effectiveness. This finding is consistent with González and García (2021), who argue that limited instructional time restricts teachers' capacity to integrate digital tools flexibly. From a TPACK perspective, this reflects challenges at the intersection of technological pedagogical knowledge (TPK) and pedagogical content knowledge (PCK), where teachers are unable to translate their knowledge into effective classroom practices.

Similarly, research by Kong et al. (2023) highlights that time pressure often forces teachers to rely on pre-prepared materials rather than dynamically integrating technology during lessons. This reinforces that effective AI integration requires not only access to tools but also sufficient time for adaptive and responsive teaching.

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Professional development plays a crucial role in enabling teachers to use AI tools for assessment and remedial purposes. Studies have shown that teachers with higher levels of AI-TPACK competence are better able to align AI tools with instructional goals, particularly when supported by institutional training and resources (Howard et al., 2021; Nguyen, 2024; Saharuddin, Nasir, & Mahmud, 2025). However, in the present study, the lack of such training resulted in the production of generic or misaligned remedial materials, indicating a gap in TPK and TCK domains.

Research on digital assessment further emphasises that teachers require targeted training to design differentiated learning activities (Cahyadi & Osman, 2022). Without such training, AI-generated materials are often reused without adaptation, limiting their effectiveness in addressing specific learning needs. This supports Saharuddin et al. (2025), who argue that professional development should focus on reflective and context-specific practices to enhance meaningful technology integration.

Teaching qualification also plays a significant role in shaping the effectiveness of AI integration. Studies by Zhang et al. (2021) and Taylor and Wang (2022) indicate that teachers with stronger subject expertise are better able to generate accurate prompts and align AI outputs with learning objectives. In contrast, non-specialist teachers often produce less relevant materials, reducing the effectiveness of technology in supporting student learning.

This study confirms that limited subject expertise, combined with insufficient training, restricts teachers' ability to use AI tools effectively for assessment and remedial purposes. As highlighted by Howard et al. (2021), teachers from non-specialist backgrounds require additional support to develop both technological and pedagogical competencies.

Finally, the findings reinforce that digital infrastructure remains a decisive factor in the successful integration of AI in education. Studies by Li (2025) and Ahiaku et al. (2025) demonstrate that inadequate connectivity and limited access to digital resources significantly constrain teachers' ability to implement technology for both instruction and assessment. These findings align with the present study, which shows that without reliable infrastructure, the potential of AI tools such as Pixlr Express cannot be fully realised.

Limitation and Recommendation of the Study

This study involved only four participants all of whom shared similar academic backgrounds, subject specialization and extensive teaching experience in the same rural Tamil national-type primary school. While this homogeneity allowed for a focused exploration of the phenomenon within a consistent context, it also limits the generalizability of the findings. The insights derived are context-specific and may not be applicable to teachers in other school types, geographic regions or with different professional profiles. Furthermore, the small sample size reflects the constraints of the case study approach, which prioritizes depth over breadth, but it may reduce the diversity of perspectives captured. Future research could address this limitation by incorporating a larger and more diverse participant pool across multiple schools to enhance the transferability of findings.

The District Education Office must organize and develop a digital resource bank or online collaborative platform so that the teachers can share artificial intelligence AI-generated materials and prompt ideas tailored to different students' proficiency levels. Second, the

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Ministry of Education must make an effort to assign English language option teachers to low enrolment schools. Third, the Curriculum Development Division (BPK) by the Ministry of Education must come up with language support modules to non-option English language teachers to teach English in low enrolment schools.

From a policy perspective, the results underscore the urgent need to improve rural school connectivity and to design targeted professional development programs that equip teachers with both the technical and pedagogical skills to use AI tools effectively. At the school level, workload management strategies particularly in joint-classroom contexts should be implemented to allow time for meaningful technology integration. For teacher education and training, interventions must address not only technical competencies but also subject-specific needs, such as English proficiency for prompt creation and assessment.

Future research should explore intervention-based studies that test the effectiveness of targeted PD, infrastructure improvements, and workload adjustments in similar under-resourced settings. Comparative studies across different rural regions could also provide a broader understanding of how local contexts influence AI adoption in education.

Conclusion

This study shows that while Pixlr Express has strong potential for enhancing lesson preparation, delivery, and remedial assessment, its effectiveness in low-enrolment primary school settings is severely constrained by systemic barriers due to limited infrastructure, lack of qualified English specialists, insufficient time, and inadequate professional development. These challenges align with recent findings in the literature, such as Ning et al., 2024's study which shows the misalignment between content and pedagogical knowledge in using AI to teach. Thus, the promise of AI tools like Pixlr remains theoretical rather than practical.

From the results of the study, there exists a need to reconceptualize policy and institutional responses. Teacher qualifications must be matched by targeted training, especially for non-English-major teachers, to ensure that prompt creation and content alignment are pedagogically meaningful. Similarly, sufficient professional development programs beyond workshops must be provided, together with contextualized support and time allocations for teachers to experiment with AI before, during, and after classes. Infrastructural investment in connectivity and reliable devices is necessary to ensure that technological, pedagogical, and content knowledge (TPACK) can improve remedial and assessment practices. With these interventions, AI tools like Pixlr Express could improve learning in meaningful ways.

From a rural education perspective, this study provides important insights into the practical challenges faced by teachers attempting to adopt artificial intelligence tools in low-resource environments. Addressing these challenges requires greater support for rural schools, including improved access to digital infrastructure, targeted professional development, and policies that recognize the unique constraints experienced by educators in rural communities.

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References

Abdous, M. H. (2011). A process-oriented framework for acquiring online teaching competencies. *Journal of Computing in Higher Education,* 23, 60-77.

Adamopoulou, E., & Moussiades, L. (2020). An overview of chatbot technology. *In Artificial Intelligence Applications and Innovations* (pp. 373–383). Springer. https://doi.org/10.1007/978-3-030-49186-4_31

Ahiaku, P. K. A., Uleanya, C., & Muyambi, G. C. (2025). Rural schools and tech use for sustainability: the challenge of disconnection. *Education and Information Technologies, 1-15.*

Al-Abdullatif, A. M., & Gameel, S. M. (2023). Students' satisfaction with AI-based personalized learning systems: A cross-sectional study. *Education and Information Technologies,* 28, 9441– 9462. https://doi.org/10.1007/s10639-023-11935-2

Ali, S., Ravi, P., Moore, K., Abelson, H., & Breazeal, C. (2024, March). A picture is worth a thousand words: Co-designing text-to-image generation learning materials for k-12 with educators. *In Proceedings of the AAAI Conference on Artificial Intelligence* (Vol. 38, No. 21, pp. 23260- 23267).

Aljemely, Y. (2024). Challenges and best practices in training teachers to utilize artificial intelligence: A systematic review. *Frontiers in Education,* 9, Article 1470853. https://doi.org/10.3389/feduc.2024.1470853

Anderson, L., & Liu, Z. (2021). Prompting and language generation in AI tools: Challenges for non- major teachers. *Journal of Educational Technology,* 24(3), 185-200. https://doi.org/10.1177/2332858421101234

Aziz, N. A., Nor, F. M., & Hassan, R. (2021). Barriers in integrating ICT in teaching among Malaysian rural secondary school teachers. *International Journal of Academic Research in Progressive Education and Development*, 10(1), 400–410.

Belda-Medina, J. R., & Kokošková, S. (2023). The who, why, and how of AI-based chatbots for learning and teaching in higher education: Students' and teachers' perspectives. *Education and Information Technologies.* https://doi.org/10.1007/s10639-024-13128-6

Blonder, R., Feldman-Maggor, Y., & Rap, S. (2024). Are they ready to teach? Generative AI as a means to uncover pre-service science teachers' PCK and enhance their preparation program. *Journal of Science Education and Technology,* 1-10.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.

Chekhratova, O. (2024). Utilising AI Image Generators in an English Classroom.

Brooks, J. L., Moore, B. A., & Finnerty, M. S. (2026). Building school, family, and community partnerships that support rural diverse and exceptional learners. *The Rural Educator,* 47(1), 1

Cain, E. J., Valauri, A., Perry, J. R., & DeLoach, A. (2024). Exploring how rural schools and communities influence the academic journeys of college students in STEM majors. *The Rural Educator,* 45(3), 1

Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020). Application and theory gaps during the rise of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, 1, 100002. https://doi.org/10.1016/j.caeai.2020.100002

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches.* Sage publications.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives*, 8(1), 1–44.

Dean, S. N., & Wenner, J. A. (2026). From classroom to field: Rural teachers' integration of science and the outdoors. *The Rural Educator,* 47(1), 1

Fadillah, R., & Bariyyah, N. A. (2024). Implementation of The Use of Artificial Intelligent (AI) Based Animation Media to Enhance Vocabulary Lintening Skills of Elementary School Student. *In SHS Web of Conferences* (Vol. 202, p. 06004). EDP Sciences.

Feldman-Maggor, Y., Blonder, R., & Alexandron, G. (2025). Perspectives of generative AI in chemistry education within the TPACK framework. *Journal of Science Education and Technology,* 34(1), 1-12.

Gan, W., Sun, Y., Ye, S., Fan, Y., & Sun, Y. (2019, October). AI-tutor: Generating tailored remedial questions and answers based on cognitive diagnostic assessment. *In 2019 6Th international conference on behavioral, economic and socio-cultural computing* (BESC) (pp. 1-6). IEEE.

González, S., & García, M. (2021). Overcoming time constraints in small schools: AI and the multi- role teacher. *Journal of Rural Education,* 29(1), 112-128.https://doi.org/10.1080/01587919.2020.1810262

González, S., & Lee, M. (2022). The impact of language proficiency on AI tool effectiveness in rural schools. *Journal of Rural Education*, 30(2), 144-159. https://doi.org/10.1080/01587919.2022.1876452

Gordon, T., & Grunberg, D. (2022). The challenges of implementing AI in low-connectivity environments. *Educational Technology Research and Development*, 70(3), 823-839. https://doi.org/10.1007/s11423-022-09989-2

Gudmundsdottir, G. B., & Hatlevik, O. E. (2018). Newly qualified teachers' professional digital competence: *Implications for teacher education. European Journal of Teacher Education,* 41(2), 214–231.

Harry, M. (2023). Evaluating the evaluators: A comparative study of AI and teacher grading accuracy. *Educational Technology Research and Development*, 71(3), 345–362. https://doi.org/10.1007/s11423-023-10123-4

Hennessy, S., D'Angelo, S., McIntyre, N., Koomar, S., Kreimeia, A., Cao, L., ... & Zubairi, A. (2022). Technology use for teacher professional development in low-and middle-income countries: A systematic review. *Computers and Education Open*, 3, 100080.

Kfouri, C. K., & Rowe, M. W. (2024). Curriculum inquiry to strengthen teacher preparation for supporting multilingual learners in rural settings. *The Rural Educator,* 45(4), 49–61. https://doi.org/10.55533/2643-9662.1528

Mazzuki, B. D. (2025). Preparing preservice teachers for rural teaching through professional learning during teaching practice. *The Rural Educator*, 46(2), 1

Meredith, J. (2026). Impacts of literacy programming during the COVID 19 and recovery school years. *The Rural Educator,* 47(1), 1

Oldham, A. N. (2026). Challenges to equity leadership: Rural leadership for marginalized students. *The Rural Educator,* 47(1), 1

Sari, T., & Nayir, F. (2020). Challenges in distance education during the COVID-19 pandemic in Turkey. *Educational Process: International Journal,* 9(3), 147–162.

Shambare, B., & Jita, T. (2025). Understanding the adoption of virtual labs in rural secondary schools: A descriptive analysis of perceived usefulness, ease of use, and behavioral intentions. *The Rural Educator,* 46(2), 50–67. https://doi.org/10.55533/2643-9662.1490

Shambare, B., & Simuja, C. (2024). Unveiling the TPACK pathways: Technology integration and pedagogical evolution in rural South African schools. *Computers and Education Open*, 7, 100206.

Shoukat, S., Mamoon, R., & Arif, M. F. (2024). Enhancing language proficiency through TPACK model and AI applications a study on effective integration strategies in english language instruction. Pakistan Languages and Humanities Review, 8(2), 540-554.

Smith, J., & Zhang, Q. (2020). Overcoming language barriers in AI-powered education tools: Challenges and strategies. *Educational Technology & Society*, 23(4), 15-29. https://doi.org/10.1016/j.edtech.2020.01.005

Smith, T., & Lee, M. (2021). Bridging the gap: Professional development in AI for educators. *Journal of Educational Technology,* 20(2), 88-101. https://doi.org/10.1177/2332858421100625

Sukri, S. I. A., & Yunus, M. M. (2018). Looking through the lenses of non-native English teachers: Native English trainers in the Pro-ELT Programme. Creative Education, 9(09), 1396.

Taylor, M., & Wang, J. (2022). The role of language proficiency in AI integration in schools. *Educational Research and Development*, 38(4), 432-446. https://doi.org/10.1007/s11423-021- 09984-2

Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2019). Enhancing teachers' digital competence: The role of professional development. Computers & Education, 137, 283–293.

Tran, T. T., & Nguyen, T. B. (2025). AI-Infused Visual Pedagogy: Enhancing EFL Instruction With Tailored Image Generation and Academic Insights. In AI Applications for English Language Learning (pp. 179-194). IGI Global Scientific Publishing.

Williams, D., & Brown, R. (2023). The role of professional development in AI integration. *Journal of Technology and Education*, 15(2), 77-91. https://doi.org/10.1080/21584787.2023.1831685

Yeh, H. C. (2025). The synergy of generative AI and inquiry-based learning: transforming the landscape of English teaching and learning. *Interactive Learning Environments,* 33(1), 88-102.

Yesilyurt, Y. (2023). AI-enabled assessment and feedback mechanisms for language learning: Transforming pedagogy and learner experience. In Advances in Artificial Intelligence and Education (pp. 215–230). *Springer.* https://doi.org/10.1007/978-3-031-20212-4_15

Zhang, Q., Liu, L., & Zhang, H. (2021). Challenges in AI prompt generation for non-major educators in rural settings. *Journal of Educational Technology Research and Development,* 69(3), 435-448. https://doi.org/10.1007/s11423-021-09972-6