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BLENDING TRADITION WITH TECHNOLOGY: A QUALITATIVE STUDY OF ENGLISH LANGUAGE PEDAGOGY IN ENGINEERING CLASSROOMS

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ABSTRACT

The integration of digital tools in higher education has significantly transformed teaching practices, particularly in language instruction within engineering institutions. This study explores how English language teachers in engineering colleges blend traditional pedagogical approaches with technology-enhanced methods to foster student engagement and improve language proficiency. Situated within the framework of the Technological Pedagogical Content Knowledge (TPACK) model and Vygotsky's sociocultural theory, the study employs a qualitative methodology to capture the lived experiences of educators navigating this pedagogical shift.Data were collected through semi-structured interviews with ten English faculty members and non-participant classroom observations across five engineering colleges in Tamil Nadu, India. Thematic analysis revealed three major themes: pedagogical negotiation, digital engagement and innovation, and constraints in adoption. Findings suggest that while teachers acknowledge the value of technology in enhancing instruction—through tools such as PowerPoint presentations, language lab software, and online platforms—they continue to rely on traditional methods for structure and classroom control. Challenges include limited institutional support, uneven digital literacy among faculty, and resistance from students accustomed to conventional teaching.The study concludes that effective English language pedagogy in engineering settings lies in a pragmatic blend of tradition and innovation, supported by continuous professional development and infrastructural investment. It also underscores the value of qualitative inquiry in illuminating context-sensitive teaching practices, offering insights for curriculum developers, educators, and policymakers aiming to enhance language education in technical institutions.

Keywords: Blended pedagogy; English language teaching; engineering education; qualitative research; digital tools; classroom practice

1. INTRODUCTION

1.1 Background and Rationale

The rapid evolution of educational technology has reshaped the contours of pedagogy across disciplines, with language instruction being no exception. In the context of engineering education, the teaching of English has traditionally relied on grammar-translation and lecture-based methods focused on structural knowledge and rote learning. However, the demands of globalization, the expectations of employability, and the increasing prominence of English as a medium of instruction and professional communication have necessitated a pedagogical shift. Institutions now seek to prepare engineering graduates not only with technical expertise but also with the communicative competence necessary for the 21st-century workplace.

This shift has encouraged educators to explore digital tools and platforms—such as Learning Management Systems (LMS), language labs, multimedia resources, and AI-assisted writing tools—to enhance learner engagement and autonomy. Yet, this technological integration is neither uniform nor frictionless. Language teachers in engineering colleges often find themselves at the intersection of traditional chalk-and-talk methods and emerging digital practices. The transition involves not only infrastructural readiness but also pedagogical negotiation, institutional support, and individual adaptability.

While quantitative studies abound on the benefits and challenges of educational technology, there remains a dearth of qualitative investigations into the lived experiences of English teachers working in engineering settings, especially in the Indian context. This study addresses this gap by examining how educators blend traditional and technology-enhanced methods in their language classrooms, shedding light on their pedagogical decisions, perceptions, and practices.

1.2 Context of English Language Teaching in Engineering Education

In India, engineering education has traditionally prioritized technical proficiency, often relegating language instruction to a supplementary role. However, the current employment landscape requires engineering graduates to exhibit strong communication skills in English—both written and oral. As a result, language departments are now tasked with designing courses that not only address grammatical competence but also nurture presentation skills, group discussion techniques, report writing, and interpersonal communication.

This pedagogical expectation places pressure on English teachers in engineering colleges to innovate their instructional methods. Language laboratories equipped with interactive software, multimedia classrooms with audio-visual capabilities, and blended learning environments facilitated by online platforms are increasingly becoming part of institutional infrastructure. Nevertheless, the effective utilization of such tools depends largely on the teachers' digital literacy, training, willingness to adapt, and understanding of students' learning preferences.

In Tamil Nadu, where this study is situated, engineering colleges affiliated with Anna University and other technical institutions have introduced communication skills and technical English courses at both undergraduate and postgraduate levels. Although curriculum reforms encourage activity-based learning and ICT integration, implementation varies significantly across institutions. Some colleges adopt cutting-edge technological solutions, while others continue to rely on conventional methods due to infrastructural or institutional limitations.

1.3 The Challenge of Blended Pedagogy

Blended pedagogy, understood as the thoughtful integration of face-to-face and digital teaching practices, is not merely a matter of tool adoption but involves a philosophical and practical shift in instructional approach. Language teaching, in particular, requires a balance between real-time interaction, feedback, and the flexibility of asynchronous resources. Teachers must navigate decisions such as when to use a traditional lecture, when to incorporate video or audio content, how to design interactive assessments, and how to sustain student motivation in hybrid settings.

The challenge is further compounded in engineering institutions, where students often approach language classes with a utilitarian mindset, seeing them as secondary to their core technical subjects. This calls for innovative and context-sensitive teaching strategies that blend the familiarity of traditional pedagogy with the dynamism of digital tools.

Despite growing institutional interest in ICT-enabled teaching, many teachers report experiencing a "pedagogical duality." On one hand, they are encouraged to use modern platforms and software; on the other, they face limitations such as unreliable internet access, lack of institutional training, resistance from students, or a lack of confidence in using digital media themselves. These realities demand an inquiry that goes beyond numbers to understand the nuanced experiences of teachers who are actively negotiating this transition in their classrooms.

1.4 Theoretical Framework

This study is informed by two complementary theoretical frameworks: **Technological Pedagogical Content Knowledge (TPACK)** and **Vygotsky's Sociocultural Theory**.

The TPACK framework, developed by Mishra and Koehler (2006), provides a robust model for understanding the knowledge required by teachers to integrate technology effectively into their teaching. TPACK emphasizes that effective technology integration is not merely about digital skills, but about the intersection of content knowledge, pedagogical understanding, and technological fluency. This model offers a lens to examine how English language teachers balance content requirements (such as grammar, vocabulary, or communication skills), pedagogical approaches (task-based, lecture-based, collaborative learning), and the use of digital tools (LMS, multimedia, software) in the engineering education context.

Vygotsky's Sociocultural Theory complements this model by emphasizing the role of mediation, social interaction, and cultural tools in the learning process. According to Vygotsky, learning is a socially situated activity, and tools—including technological ones—mediate cognitive development. This theoretical lens allows the study to consider not just what tools teachers use, but how these tools mediate classroom interactions, student participation, and learning outcomes.

By combining these two frameworks, the study investigates the pedagogical reasoning behind the use of technology, the constraints faced in implementation, and the cultural and institutional factors that shape blended pedagogy in engineering colleges.

1.5 Research Questions

Guided by the above frameworks and grounded in the specific context of English language education in engineering institutions, this study is driven by the following research questions:

1. How do English language teachers in engineering colleges integrate traditional and digital methods in their classrooms?
2. What pedagogical beliefs and institutional factors influence their adoption of blended teaching practices?
3. What challenges and benefits do they perceive in using digital tools to teach English to engineering students?

1.6 Purpose and Significance of the Study

The primary purpose of this study is to explore the pedagogical experiences of English language teachers in engineering institutions as they blend traditional and digital instructional strategies. It aims to provide rich, qualitative insights into how these educators navigate the complexities of transitioning from conventional teaching methods to technology-enhanced environments.

This study is significant for several reasons:

- **Empirical Contribution**: While much research exists on ICT in education, few studies have explored how English faculty in engineering settings engage with blended pedagogy using a qualitative lens. This study offers grounded, experience-based data that captures the everyday realities of language educators.
- **Methodological Relevance**: By employing semi-structured interviews and classroom observations, the study contributes to the growing body of work that values qualitative inquiry in understanding educational transformations.
- **Pedagogical Implications**: The findings can inform curriculum developers, teacher trainers, and policymakers about the professional development needs of language teachers working in technical institutions.

- **Institutional Development**: Understanding the constraints and enablers of blended pedagogy can guide engineering colleges in improving their ICT infrastructure, scheduling, and pedagogical planning for language instruction.
- **Global Relevance**: Although the study is situated in Tamil Nadu, the findings can resonate with similar educational contexts in other developing countries, particularly where there is a push for digital transformation in higher education but limited institutional capacity.

1.7 Structure of the Paper

This paper is structured into six major sections:

- **Section 1: Introduction** — Provides the background, rationale, theoretical framework, and research questions.
- **Section 2: Literature Review** — Reviews existing research on blended pedagogy, ICT in English language teaching, and engineering education.
- **Section 3: Methodology** — Describes the qualitative research design, participant selection, data collection methods, and analysis procedures.
- **Section 4: Findings and Analysis** — Presents emergent themes with interpretive commentary and supporting evidence from the data.
- **Section 5: Discussion** — Interprets findings in light of the theoretical framework and discusses implications for pedagogy and policy.
- **Section 6: Conclusion** — Summarizes key insights, offers recommendations, and outlines directions for future research.

This introduction provides the foundation for a rigorous, methodologically sound, and contextually relevant qualitative inquiry into the evolving nature of English language pedagogy in engineering education. By centering the voices of teachers and situating the analysis within a theoretical and institutional framework, the study seeks to contribute meaningfully to the discourse on blended learning and educational transformation in higher education.

2. LITERATURE REVIEW

The integration of technology into English language teaching (ELT) has garnered significant attention in recent years, especially within engineering education contexts. This literature review examines contemporary research on blended pedagogy, Information and Communication Technology (ICT) integration, and the specific challenges and opportunities associated with English language instruction in engineering institutions. The review is organized into three subsections: (1) Blended Learning in ELT, (2) ICT Integration in English Language Instruction, and (3) ELT in Engineering Education Contexts.

2.1 Blended Learning in English Language Teaching

Blended learning, which combines traditional face-to-face instruction with online learning components, has been increasingly adopted in ELT to enhance student engagement and learning outcomes. Wahyu Ningsih and Yuliana (2024) highlight that blended learning offers flexibility and caters to diverse learning needs, making it a versatile approach in educational settings. Their study emphasizes that while blended learning focuses on student-centered learning outcomes, hybrid teaching emphasizes the teacher's role in achieving optimal teaching effectiveness.

Recent studies have explored the impact of blended learning on various aspects of ELT. For instance, a study by Balahim and Haron (2024) investigated the relationship between blended learning modalities and students' communicative competence. The findings indicated significant positive correlations between blended learning approaches—such as

modular distance learning, online distance learning, and TV-based instruction—and improvements in both oral and written communicative competencies.

Furthermore, research by Haerazi (2024) suggests that ICT integration in English instruction enhances task relevance, promotes learner agency, increases authenticity, and supports self-assessment practices. These benefits contribute to a more engaging and effective language learning experience, particularly when blended learning strategies are employed.

2.2 ICT Integration in English Language Instruction

The incorporation of ICT tools into English language instruction has transformed traditional teaching methodologies, offering new avenues for interactive and personalized learning experiences. A study by Srikanth and Palwekar (2024) compared the integration of modern technology in English language instruction across undergraduate arts and engineering colleges. The research revealed that while both disciplines recognize the importance of technology-enhanced language learning, their approaches and challenges differ. Engineering colleges tend to emphasize technical communication and practical language skills, whereas arts colleges focus more on literature and language appreciation.

Additionally, a study by Haerazi (2024) examined ICT integration in English language teaching-learning within private higher education institutions. The findings indicated that ICT tools, such as learning websites, search engines, educational games, and multimedia presentations, were utilized to make classes more interactive and engaging. However, challenges such as limited teacher training and technical issues were identified as barriers to effective ICT integration.

Moreover, research by Wahyu Ningsih and Yuliana (2024) emphasizes the distinction between blended learning and hybrid teaching, noting that while both approaches integrate online and offline elements, blended learning prioritizes student engagement, and hybrid teaching focuses on enhancing teaching effectiveness through the teacher's role.

2.3 English Language Teaching in Engineering Education Contexts

Engineering education presents unique challenges and opportunities for English language instruction. The technical nature of engineering curricula often necessitates a focus on specific language skills, such as technical writing and communication. Srikanth and Palwekar (2024) highlight that engineering colleges prioritize technical communication and practical language skills, which require tailored instructional approaches.

Furthermore, the integration of technology in engineering education has been explored in various studies. For example, a study by Álvarez Ariza (2024) investigated the use of active learning, experimentation, and student-created videos in engineering courses, integrating online and mobile learning. The research demonstrated that such approaches enhance student motivation, self-efficacy, and academic performance, suggesting potential applications in English language instruction within engineering contexts.

Additionally, the adoption of large language models and chatbots in graduate engineering education has been examined by Abedi et al. (2023). Their study explored the potential of integrating AI-driven tools into engineering courses, highlighting benefits such as self-paced learning, instantaneous feedback, and reduced instructor workload. These findings suggest that similar technologies could be leveraged to support English language learning in engineering education.

The literature indicates a growing trend toward integrating blended learning and ICT tools in English language instruction, particularly within engineering education contexts. Studies have demonstrated the benefits of these approaches in enhancing student engagement, communicative competence, and learning outcomes. However, challenges such as limited

teacher training, technical issues, and the need for discipline-specific instructional strategies remain. Further research is needed to explore effective methods for integrating technology into English language teaching in engineering colleges, considering the unique demands of technical communication and the evolving landscape of educational technology.

3. METHODOLOGY

This study adopts a qualitative research methodology to explore how English language teachers in engineering institutions blend traditional and digital pedagogical practices. Qualitative research is especially suitable for investigating complex, context-bound experiences that cannot be captured through numerical analysis alone. In the context of this study, qualitative inquiry allows for a deeper understanding of the teachers' lived experiences, pedagogical reasoning, and challenges faced in adapting to blended teaching environments.

Guided by the Technological Pedagogical Content Knowledge (TPACK) model and Vygotsky's Sociocultural Theory, this study uses a phenomenological approach to capture the essence of participants' experiences. Data were collected through semi-structured interviews, non-participant classroom observations, and document analysis of instructional materials.

3.1 Research Design

The research design is based on a descriptive qualitative approach using interpretive phenomenology. Phenomenology seeks to uncover the meanings that individuals ascribe to their experiences, making it an ideal method for understanding how teachers interpret, negotiate, and implement blended pedagogical strategies in their classrooms.

The choice of phenomenology is grounded in the belief that teaching is an intentional and reflective act influenced by cultural, institutional, and technological contexts. This approach allows the researcher to document both the overt instructional strategies and the underlying values, attitudes, and perceptions that shape teaching practices.

3.2 Research Questions

This study is guided by the following research questions:

1. How do English language teachers in engineering colleges integrate traditional and digital methods in their classrooms?
2. What pedagogical beliefs and institutional factors influence their adoption of blended teaching practices?
3. What challenges and benefits do they perceive in using digital tools to teach English to engineering students?

3.3 Research Setting

The study was conducted in five engineering institutions affiliated with Anna University, located in various urban and semi-urban regions of Tamil Nadu, India. These institutions were selected based on their availability of ICT infrastructure (such as language labs, smart classrooms, and Learning Management Systems) and the inclusion of English communication or language enhancement courses in their undergraduate curriculum.

These colleges reflect a typical range of contexts found in Indian engineering institutions: some with advanced digital infrastructure and others with moderate or limited resources. This diversity allowed the researcher to explore a range of pedagogical practices and institutional influences.

3.4 Participant Selection

Participants were selected using purposive sampling, a method commonly used in qualitative research to identify individuals who have rich, relevant, and diverse experiences related to the research topic. The inclusion criteria for participants were:

- Minimum of three years' experience in teaching English to undergraduate engineering students.
- Exposure to both traditional and technology-assisted teaching practices.
- Willingness to participate in an in-depth interview and allow classroom observation.

A total of 10 English faculty members (6 women and 4 men) participated in the study. Their teaching experience ranged from 3 to 18 years. All held postgraduate degrees in English or ELT, and five were pursuing or had completed PhDs in English language education. While all had basic ICT skills, their levels of comfort and expertise with digital pedagogy varied.

3.5 Data Collection Methods

3.5.1 Semi-Structured Interviews

Each participant took part in a semi-structured interview lasting approximately 60–75 minutes. The interviews were conducted in English and followed a flexible interview guide that included open-ended questions related to:

- Teaching philosophy and classroom strategies
- Use of technology in language instruction
- Experience with blended or hybrid teaching
- Institutional support and training
- Perceived benefits and barriers of digital tools

All interviews were audio-recorded with consent and transcribed verbatim. This method allowed for the collection of rich, detailed narratives while also offering the flexibility to probe further into emerging themes.

3.5.2 Classroom Observations

To triangulate the interview data and observe pedagogical practices in real-time, non-participant classroom observations were conducted for each participant. Each observation lasted for 90 minutes, focusing on:

- Interaction patterns between teacher and students
- Use of digital tools (e.g., smart boards, videos, lab software)
- Pedagogical structure and activity design
- Student engagement and participation

Field notes were recorded immediately after each session using an observation checklist aligned with the TPACK framework (Content delivery, Pedagogical strategies, Use of technology).

3.5.3 Document Analysis

Participants were also asked to share instructional materials, such as:

- Lesson plans
- PowerPoint slides
- Worksheets
- Screenshots of LMS activities
- Language lab modules

These documents helped contextualize their teaching practices and provided evidence of how digital content was integrated into lesson design.

3.6 Data Analysis

The data were analyzed using Reflexive Thematic Analysis as proposed by Braun and Clarke (2006; 2019). This six-phase process was selected for its flexibility and depth, enabling the researcher to move beyond surface-level coding to interpret underlying meaning.

3.6.1 Phases of Analysis

1. **Familiarization**
   The researcher read transcripts and field notes multiple times to immerse in the data.
2. **Initial Coding**
   Descriptive and interpretive codes were generated across the dataset. NVivo software was used for efficient coding.
3. **Generating Themes**
   Codes were grouped into initial themes related to pedagogical practices, beliefs, and institutional influences.
4. **Reviewing Themes**
   Themes were refined by checking consistency with coded data and across the data set.
5. **Defining and Naming Themes**
   Themes were finalized and defined with clear scope and focus (e.g., "Pedagogical Negotiation," "Digital Engagement and Innovation").
6. **Writing the Report**
   Rich descriptions and illustrative quotes were used to communicate findings, along with critical reflection on their implications.

3.7 Trustworthiness and Rigor

To ensure the credibility and trustworthiness of the findings, the study adhered to **Lincoln and Guba's (1985)** criteria:

3.7.1 Credibility

- **Member Checking**: Participants were invited to review their interview transcripts and offer clarifications.
- **Prolonged Engagement**: Observations and interviews were conducted over a two-month period, allowing for deep engagement with participants.

3.7.2 Transferability

- **Thick Description**: Detailed contextual information about participants and institutions was provided to allow readers to assess applicability to other contexts.

3.7.3 Dependability

- **Audit Trail**: All interview guides, observation notes, and coding procedures were documented and systematically archived.

3.7.4 Confirmability

- **Reflexive Journal**: The researcher maintained a journal to record preconceptions, methodological decisions, and reflections on the evolving analysis.

3.8 Ethical Considerations

This study complied with ethical research guidelines as outlined by the Institutional Research Ethics Committee of Anna University.

- **Informed Consent**: Written consent was obtained from all participants.
- **Confidentiality**: Pseudonyms were used for all participants and institutions to protect identities.
- **Voluntary Participation**: Participants were informed of their right to withdraw at any stage.
- **Data Security**: Audio files, transcripts, and notes were stored in encrypted digital folders accessible only to the researcher.

3.9 Limitations

While the study offers rich insights, it is limited by its scope:

- **Geographic limitation**: The findings are drawn from institutions in Tamil Nadu and may not generalize to other regions.

- **Participant bias**: Teachers who agreed to participate may already be inclined toward reflective practice or innovation.
- **Technological variability**: Institutions differed in their digital infrastructure, which may have influenced participants' responses.

Despite these limitations, the findings provide a valuable foundation for understanding blended pedagogy in technical English education and may inform future comparative or large-scale studies.

4. FINDINGS AND ANALYSIS

This section presents a comprehensive analysis of the qualitative data collected through in-depth interviews, classroom observations, and document reviews involving ten English language teachers across five engineering colleges in Tamil Nadu. Using Braun and Clarke's reflexive thematic analysis (2006, 2019), three dominant themes emerged, reflecting the evolving practices and challenges of English language pedagogy in blended classrooms:

1. Pedagogical Negotiation
2. Digital Engagement and Innovation
3. Constraints in Adoption

These themes are interpreted in light of the TPACK framework (Mishra & Koehler, 2006) and Vygotsky's Sociocultural Theory (1978), which respectively address the intersection of pedagogy, content, and technology, and the role of mediated tools in learning environments.

4.2 Overview of Thematic Frequency

To establish the prevalence and significance of each theme across the ten participants, the frequency of references—either direct or inferred—was tracked. The bar chart below visualizes how many participants engaged with each theme during interviews or observations:

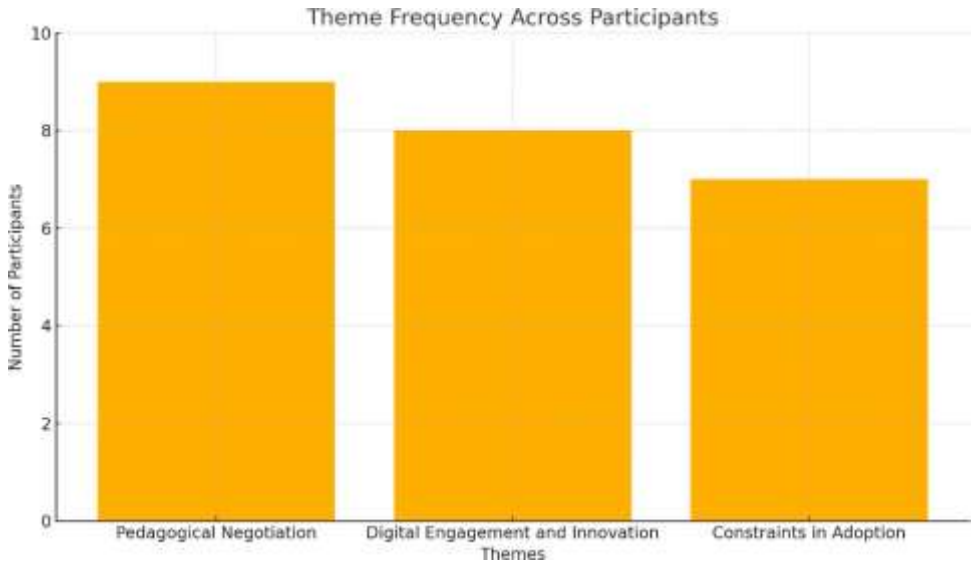

Figure 1: Theme Frequency Across Participants

- Pedagogical Negotiation was referenced by 9 out of 10 participants.
- Digital Engagement and Innovation emerged in 8 participants' responses and observed practices.
- Constraints in Adoption were mentioned or implied by 7 participants.

This visual representation reinforces the centrality of instructional adaptation, the emerging presence of technology-supported teaching, and the persistent institutional limitations that influence blended pedagogical practices.

4.3 Theme 1: Pedagogical Negotiation

The most prevalent theme was the ongoing negotiation between traditional and digital teaching methods, which emerged in almost every participant's response. Teachers reflected on how they consciously balance conventional tools—chalk-and-board, printed materials, dictation, and lecture—with digital enhancements.

"Though I use YouTube videos and smartboards, I still start with blackboard writing. It helps anchor students who are not confident." — P3

"I integrate videos, but for writing tasks, students respond better when I explain formats on the whiteboard first." — P6

Observation field notes confirmed this pattern. For instance, one session began with a verbal explanation of the formal letter format, followed by a video tutorial projected on the smartboard, and ended with a written task on the LMS.

This blending reflects what TPACK conceptualizes as the intersection of pedagogical knowledge (PK) and technological knowledge (TK). Teachers draw on their pedagogical intuition to determine when to use digital tools and when to revert to traditional methods to optimize learning outcomes.

Document analysis showed evidence of hybrid instructional materials—lesson plans combining printable worksheets and multimedia resources, such as PPT slides enriched with audio-visual cues and links to Google Forms-based tasks.

This theme affirms that rather than replacing traditional approaches, technology coexists as a complementary asset, contingent on the teacher's situational judgment and classroom context.

4.4 Theme 2: Digital Engagement and Innovation

Digital tools and innovative pedagogical practices were increasingly integrated by participants, especially after the post-COVID institutional push for online learning. This theme highlights how teachers are redefining their roles from instructors to facilitators, using technology to foster student autonomy.

"I create vocabulary quizzes on Quizizz. Students are competitive and more involved when it's interactive." — P1

"We upload grammar exercises and model essays on Moodle. Students can access them even outside class hours." — P5

Observed sessions revealed the use of:

- Language lab software (e.g., TELL Me More, K-Van)
- Google Forms for real-time polling
- YouTube videos demonstrating pronunciation differences
- Grammarly and Quillbot as AI-assisted writing tools

These practices align closely with the Technological Knowledge (TK) component of TPACK. They demonstrate a growing fluency in integrating multimedia and AI tools to enhance content delivery and student-centered learning.

Additionally, the sociocultural dimension is evident in how teachers use digital tools to mediate collaborative activities. For example, one teacher divided students into groups and assigned them to co-edit a shared Google Doc essay, promoting peer learning and digital literacy.

Innovation was not limited to high-tech interventions. For example, one teacher developed a WhatsApp group where students submitted audio clips of their speeches, which the teacher annotated with voice feedback. Such low-barrier tools reflected resourceful and context-aware innovation.

4.5 Theme 3: Constraints in Adoption

Despite the creative efforts, many participants voiced concerns about persistent barriers that hinder full-scale adoption of digital pedagogy.

"Our lab works only 50% of the time. Sometimes, we go back to blackboard because the projector fails." — P7

"We are told to use Moodle, but there's no proper training. Most of us learned by trial and error." — P9

"Many students resist group work or videos. They prefer lecture notes. Maybe because they're used to it." — P2

Constraints reported included:

- Inconsistent internet connectivity
- Limited digital infrastructure (outdated labs, insufficient systems)
- Lack of training or peer mentoring programs
- Student reluctance due to exam-centric learning culture

Teachers also expressed concern over the digital divide, especially among rural or first-generation students who lacked personal devices or familiarity with online platforms.

This theme reveals a gap between policy and practice, where institutional vision for digitization is not fully matched by infrastructural or human support. It also highlights that teacher agency is constrained by institutional realities and student culture, reaffirming Vygotsky's emphasis on the sociocultural mediation of learning.

4.6 Cross-Case Matrix Using TPACK

To better understand the varying integration levels, the following matrix categorizes five representative participants based on TPACK dimensions:

Participant	Content & Pedagogy (CK+PK)	Technological Knowledge (TK)	Integration Level
P1	Strong	Moderate	High
P3	Strong	Basic	Moderate
P5	Strong	Advanced	High
P7	Strong	Limited	Low
P9	Moderate	Basic	Low

Participants with strong TPACK knowledge demonstrated more fluid transitions between online and offline methods, while those with limited technological confidence struggled with integration despite strong pedagogical skills.

4.7 Reflective Commentary

The researcher's reflexive journal revealed important positionality insights. Initially, the expectation was that teachers would either be resistant or fully enthusiastic about technology. However, the study revealed a nuanced middle ground: teachers were neither technophobic nor wholly tech-reliant. They were pragmatic navigators, balancing institutional constraints, student expectations, and personal pedagogical values.

One particularly powerful observation came from a rural institution where the teacher creatively used a mobile phone camera and Bluetooth speaker to project a video lesson—illustrating that innovation often emerges from necessity.

The findings show that English teachers in engineering institutions are actively negotiating their pedagogical identities in response to evolving technological and institutional

landscapes. The three themes—Pedagogical Negotiation, Digital Engagement and Innovation, and Constraints in Adoption—highlight a blended ecosystem that is still maturing.

The TPACK framework helps understand the varying levels of integration, while sociocultural theory illuminates how technology mediates not just knowledge, but also classroom dynamics and institutional roles.

These insights lay the groundwork for the next section, which discusses broader implications for teacher development, curriculum planning, and institutional policy.

5. DISCUSSION

This section interprets and contextualizes the findings of the study in relation to the research questions, theoretical frameworks, and existing literature. It discusses how English language teachers in engineering colleges negotiate between traditional and digital pedagogical strategies, what enables or hinders this integration, and how their experiences contribute to the evolving discourse on blended language instruction. Anchored in the Technological Pedagogical Content Knowledge (TPACK) model and Vygotsky's Sociocultural Theory, the discussion provides both theoretical insight and practical implications for teaching, learning, and policy in the context of engineering education.

5.1 Blending Tradition and Innovation: A Pragmatic Pedagogical Choice

The first major insight from this study is that blended pedagogy is not a binary transition from old to new but a negotiated practice shaped by experience, context, and learner readiness. Almost all participants emphasized the continued relevance of traditional approaches like chalk-and-board explanation, dictation, and direct grammar instruction. At the same time, they acknowledged the motivational and experiential benefits of digital tools, especially for enhancing pronunciation, vocabulary acquisition, and writing proficiency.

This duality reflects what Puentedura's SAMR model might describe as a combination of augmentation and modification—teachers enhance their existing pedagogical tasks with technology rather than completely redefining them. The coexistence of traditional and digital methods suggests that blended learning in engineering English classrooms is transitional, not transformative in its current form.

In TPACK terms, most teachers demonstrate strong Content Knowledge (CK) and Pedagogical Knowledge (PK), while their Technological Knowledge (TK) varies, directly impacting the integration depth. Those with stronger TK used digital tools to support student autonomy (e.g., Google Docs collaboration, LMS-based assignments), whereas others limited their use to presentation or delivery functions.

This finding supports Wahyu Ningsih & Yuliana's (2024) assertion that blended learning is student-centered when fully embraced, but in many higher education contexts, it remains teacher-controlled due to technological limitations or pedagogical inertia.

5.2 Role of Context and Mediation: A Sociocultural Perspective

The sociocultural lens offered by Vygotsky (1978) helps interpret how tools, people, and institutional settings mediate the teaching-learning process. In this study, technology functioned not just as a medium but as a mediating artifact that reshaped the nature of classroom interactions, teacher-student dialogue, and learner agency.

For example, the use of AI tools like Grammarly or real-time quizzes on platforms such as Kahoot altered feedback loops and promoted instant evaluation, allowing students to reflect on their learning. These tools acted as cultural artefacts, extending the teacher's role and increasing interaction density. However, in classrooms with limited infrastructure, this mediation was minimal or absent, reducing learning to transmission models.

This contextual dependency underscores Vygotsky's claim that higher-order thinking develops through mediated activity in social and cultural environments. In less resource-rich institutions, technology fails to act as a developmental tool, limiting both teacher innovation and student engagement.

Furthermore, student attitudes themselves were found to mediate digital pedagogy. Several participants noted that students resisted online platforms or preferred note-based lectures—indicating that digital mediation must be culturally aligned with learners' expectations and habits.

5.3 Institutional Infrastructure and Professional Development: A Missing Link

One of the strongest recurring themes was that of constraints in adoption. While institutional mandates encouraged the use of digital tools, teachers often faced infrastructural, cultural, and training-related challenges. These findings echo those of Srikanth and Palwekar (2024), who observed that while engineering colleges advocate ICT integration, many offer insufficient support in terms of training, time allocation, or peer mentoring.

Most participants learned to use technology through peer sharing or personal trial-and-error, rather than structured workshops. This "tech improvisation" was often stressful, especially for senior faculty unfamiliar with digital interfaces.

Moreover, the absence of IT support staff or clear pedagogical models discouraged experimentation. Teachers often reverted to traditional practices when systems failed, confirming that technology cannot substitute for robust institutional planning and professional development.

This disconnect points to an urgent need for institutional capacity building. Merely investing in hardware or software is insufficient. A parallel investment in teacher training, curriculum design, and administrative flexibility is essential for meaningful and sustainable blended pedagogy.

5.4 Student Readiness and Digital Divide

The data also revealed a pedagogical dilemma—while teachers innovated with technology, student engagement was inconsistent. Some students resisted interactive or collaborative tasks and preferred exam-focused, lecture-based instruction. Others lacked access to personal devices or stable internet, especially in semi-urban or rural institutions.

This aligns with Haerazi's (2024) findings that ICT-enhanced learning improves performance only when students possess sufficient digital literacy and self-regulation skills. In the absence of these, digital tools may increase cognitive overload or alienate learners.

Moreover, the digital divide—not only between institutions but within student groups—was evident. In some colleges, teachers reported that only 50–60% of students could regularly access the LMS from home, resulting in inequitable learning experiences.

This reality challenges the assumption that digital learning is universally accessible. It calls for adaptive pedagogy that considers the digital readiness of students and offers multi-modal content delivery (print + digital, synchronous + asynchronous) to bridge participation gaps.

5.5 Reframing the Role of the Teacher

A compelling observation from the study is that teachers in blended classrooms are no longer mere "transmitters" of knowledge but "curators," "facilitators," and "tech-mediators." Their roles are expanding, but institutional recognition and workload models often remain unchanged.

"I spend more time preparing LMS-based lessons, but there's no recognition or time allocation for this extra work," said one participant.

This "invisible labor" of digital pedagogy—content curation, tool management, platform updates, and student troubleshooting—needs to be factored into faculty evaluations

and institutional policies. Otherwise, it risks demotivating those pioneering pedagogical innovation.

Furthermore, some participants reflected on how blended teaching reshaped their classroom identity. Younger teachers reported increased confidence and creativity when students engaged with their tech-enhanced lessons. Senior teachers, however, expressed concern about "losing control" of the classroom when technology misfired or students veered off-task.

These reflections reaffirm that teacher identity is relational and evolving, and institutions must support this identity formation through ongoing mentoring, community of practice groups, and recognition frameworks.

5.6 Contribution to Qualitative Methodology

Beyond pedagogical insights, the study also contributes to qualitative research methodology by demonstrating how phenomenology and reflexive thematic analysis can capture the nuanced realities of educational practice. Unlike quantitative surveys that measure frequency of tool use or satisfaction levels, this study provides a thick description of how pedagogical decisions are made in real-time and how they evolve through reflection and context.

The triangulation of interviews, classroom observations, and document analysis offered a holistic view of blended pedagogy, allowing the researcher to contextualize contradictions (e.g., when a teacher espoused digital innovation but used it minimally) and validate emerging themes through observational evidence.

The use of TPACK as a cross-case analytic tool helped illustrate varying levels of integration, while Sociocultural Theory explained why certain innovations thrived or failed based on classroom ecology, student culture, and institutional mediation.

In doing so, this study exemplifies how qualitative inquiry can offer actionable insights for curriculum designers, teacher educators, and academic planners aiming to implement blended models in complex educational ecosystems like engineering colleges.

5.7 Implications for Practice and Policy

Based on the findings and discussion, the following practical implications emerge:

For Teachers:

- Engage in reflective practice to evaluate what blends work best for their specific student groups.
- Adopt low-barrier technologies (e.g., WhatsApp, YouTube, Google Forms) to gradually transition toward blended pedagogy.
- Share best practices through peer mentoring and collaborative lesson design.

For Institutions:

- Invest not only in infrastructure but also in continuous digital pedagogy training.
- Create tech-support teams or resource centers for faculty.
- Provide formal workload recognition for digital teaching efforts.

For Curriculum Designers:

- Embed blended learning objectives and assessment rubrics into the syllabus.
- Encourage multi-modal content formats (text + video + interaction).
- Allow for flexibility in delivery modes based on institutional realities.

This discussion has interpreted the findings through theoretical and practical lenses, showing that the integration of traditional and digital teaching in English classrooms within engineering institutions is a dynamic, context-sensitive, and evolving practice. Teachers are not passive recipients of technology but active negotiators of pedagogy, constrained yet inspired by their contexts.

Blended pedagogy, when effectively supported, has the potential to bridge the gap between communicative needs and institutional realities. However, it requires systemic, pedagogical, and technological alignment—a task that demands long-term planning, stakeholder collaboration, and continued scholarly engagement.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study set out to explore how English language teachers in engineering colleges blend traditional and technology-enhanced pedagogical practices in their classrooms. Through a qualitative, phenomenological approach involving interviews, classroom observations, and document analysis, it has offered valuable insights into the realities, complexities, and potentials of blended English language pedagogy within Indian technical institutions.

The findings revealed three major themes: pedagogical negotiation, digital engagement and innovation, and constraints in adoption. These themes collectively depict a landscape where English teachers are navigating the intersection of content, pedagogy, and technology with creativity, caution, and care. While some instructors have successfully adopted digital tools to enhance language learning—through interactive videos, online assessments, and AI writing assistants—others continue to rely on traditional methods, often due to infrastructural constraints, student resistance, or lack of institutional training.

The study underscores that blended pedagogy in engineering contexts is neither linear nor uniform. It is shaped by multiple mediating factors—such as the teacher's technological fluency, the cultural readiness of students, and the infrastructural support of the institution. Teachers are not abandoning traditional methods; instead, they are blending them with emerging tools to meet both academic outcomes and learner needs.

Interpreting these findings through the TPACK framework highlighted how the interplay between pedagogical, content, and technological knowledge shapes classroom innovation. From a sociocultural perspective, the integration of technology serves as a mediating artifact, transforming the dynamics of language instruction—but only when supported by the larger ecosystem of learners and institutions.

This study contributes to both educational practice and qualitative methodology, offering context-rich evidence that can inform teacher training, curriculum reform, and institutional policy in higher education—particularly within engineering disciplines that seek to balance technical rigor with communicative competence.

6.2 Recommendations

Based on the findings and analysis, the following actionable recommendations are proposed for key stakeholders in engineering education:

6.2.1 For English Language Teachers

- **Adopt a Reflective Blended Approach**: Teachers should reflect on what blend of traditional and digital methods best suits their classroom context and learner profile. There is no one-size-fits-all model.
- **Experiment with Low-Barrier Tools**: Readily accessible platforms like Google Forms, WhatsApp, YouTube, and LMS forums can foster digital engagement without steep learning curves.
- **Develop Digital Pedagogical Literacy**: Teachers should pursue self-directed learning or community-based professional development to enhance their technological knowledge and confidence.

6.2.2 For Institutions

- **Invest in Infrastructure and Support**: Ensure reliable internet access, fully functional smart classrooms, and language labs. Institutions should establish tech-support teams to assist faculty.
- **Facilitate Ongoing Training**: Conduct regular, hands-on workshops focused on practical application of digital tools in English instruction. Peer mentoring programs should be formalized.
- **Recognize Digital Teaching Efforts**: Faculty workload models and evaluation systems should acknowledge the time and labor involved in designing and delivering blended courses.

6.2.3 For Curriculum Developers and Policy Makers

- **Embed Blended Learning Objectives**: Curricula should explicitly include goals and outcomes related to ICT-integrated instruction, ensuring that course structures allow for hybrid delivery.
- **Design Multi-Modal Learning Paths**: Course materials should be available in both digital and print forms, accommodating diverse learner access levels and preferences.
- **Tailor Blended Pedagogy to Discipline Needs**: Since engineering students may prioritize applied communication skills over academic English, blended modules should reflect technical writing, report drafting, and oral presentation formats integrated with digital simulations and task-based learning.

6.2.4 For Future Research

- **Conduct Longitudinal Studies**: Further research can explore how blended teaching practices evolve over time and what long-term impact they have on student outcomes and teacher identity.
- **Explore Student Perspectives**: This study focused on teachers. Future studies should examine students' experiences of blended language learning in engineering contexts to inform more balanced instructional design.
- **Comparative Institutional Studies**: Research across diverse institutional types (private vs. government, urban vs. rural) can reveal how contextual factors mediate blended learning implementation.

6.3 Final Reflection

Blended pedagogy represents more than a teaching strategy—it embodies a philosophical shift toward flexible, learner-centered education. In the case of English language instruction for engineering students, this shift is not just desirable but necessary. As technological communication increasingly becomes a prerequisite for professional success, engineering graduates must be equipped with language proficiency that is both contextually grounded and digitally fluent.

This study reaffirms that the agency of teachers, the adaptability of institutions, and the inclusivity of pedagogical models will determine how effectively the promise of blended learning is realized in engineering education. In placing teacher voices at the center, this research contributes to a more grounded and human understanding of educational transformation—one that acknowledges constraints, celebrates creativity, and advocates for sustainable change.

ETHICAL DECLARATIONS

a. Ethical Approval

This research study was conducted in accordance with the ethical guidelines for educational research. Prior to data collection, approval was obtained from the Institutional Ethics Committee of **Anna University, BIT Campus, Tiruchirappalli–620 024, Tamil Nadu, India**. Informed consent was obtained from all participants, who were assured of confidentiality, anonymity, and the voluntary nature of their participation.

b. Informed Consent

All participants provided written informed consent to participate in the study and to have their interviews recorded and anonymized for academic reporting.

c. Declaration of Interest

The authors declare that there are no conflicts of interest associated with this publication. No financial support, affiliations, or personal relationships influenced the outcome or reporting of this study.

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