

# APPLYING INFORMATION TECHNOLOGY IN TEACHING ENGLISH PREPOSITIONS FOR STUDENTS AT ELECTRIC POWER UNIVERSITY, VIETNAM: RECOMMENDATIONS FOR THE CURRENT PERIOD

## ỨNG DỤNG CÔNG NGHỆ THÔNG TIN TRONG DẠY GIỚI THIỆU TIẾNG ANH CHO SINH VIÊN TRƯỜNG ĐẠI HỌC ĐIỆN LỰC VIỆT NAM: KHUYẾN NGHỊ CHO GIAI ĐOẠN HIỆN NAY

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**Abstract** - With the increasing importance of English proficiency in globalized education and professional contexts, universities in Vietnam are seeking innovative instructional approaches. Prepositions, as an essential component of English grammar, have traditionally posed challenges for first-year students. This study investigates the application of Information Technology (IT) in teaching English prepositions at Electric Power University (EPU), Vietnam. Using mixed methods - surveys and tests for students, interviews and questionnaires for teachers, classroom observation, and performance analytics - the research identifies current practices, key challenges, and actionable solutions. Findings show positive student attitudes and statistically significant learning gains when IT tools are integrated, yet highlight gaps in teacher training, infrastructure, and pedagogical design. Based on the evidence, the study provides targeted recommendations for sustainable IT integration tailored to the EPU context.

**Key words** - Information Technology; English prepositions; higher education; blended learning; instructional design; Vietnam

**Tóm tắt** - Tầm quan trọng ngày càng tăng của tiếng Anh trong bối cảnh giáo dục toàn cầu hóa và nghề nghiệp, các trường đại học ở Việt Nam đang tìm kiếm các phương pháp giảng dạy sáng tạo. Nghiên cứu này khảo sát ứng dụng Công nghệ thông tin (CNTT) trong dạy học giới từ tiếng Anh tại Trường Đại học Điện lực (EPU), Việt Nam. Sử dụng các phương pháp kết hợp, khảo sát và kiểm tra đối với sinh viên, phỏng vấn và bảng câu hỏi dành cho giảng viên, quan sát lớp học và phân tích hiệu suất - nghiên cứu xác định các phương pháp thực hành hiện tại, những thách thức chính và các giải pháp khả thi. Các phát hiện cho thấy, thái độ tích cực của sinh viên và kết quả học tập có ý nghĩa thống kê khi tích hợp các công cụ CNTT, đồng thời nêu bật những lỗ hổng trong đào tạo giảng viên, cơ sở hạ tầng và thiết kế sư phạm. Nghiên cứu này đưa ra các khuyến nghị để tích hợp CNTT bền vững phù hợp với bối cảnh EPU.

**Từ khóa** - Công nghệ thông tin; giới từ tiếng Anh; giáo dục đại học; học tập kết hợp; thiết kế giảng dạy; Việt Nam

### 1. Introduction

English proficiency is a core outcome of higher education in Vietnam due to increasing academic mobility, international collaboration, and the demands of a global labor market. At EPU, English language courses are compulsory for first-year students to build foundational communication skills. Among the linguistic subsystems, prepositions represent a persistent challenge due to their abstract meanings, frequent idiomatic usage, and lack of direct equivalence in Vietnamese.

The integration of IT in education has been widely promoted as a way of enhancing learner engagement, enabling personalized practice, and providing interactive feedback. In language learning, technologies such as digital exercises, multimedia contexts, and Learning Management Systems (LMS) have been shown to support grammar mastery. However, systematic studies on how IT supports preposition instruction within Vietnamese university settings, especially at EPU, remain limited. This study addresses that gap with research activities designed to evaluate current practices, measure

outcomes, and propose evidence-based recommendations for the current period.

### 2. Literature Review

#### 2.1. Global Context

International research on IT in language learning consistently emphasizes the transformative role of digital tools in enhancing both teaching effectiveness and learner outcomes. A key contribution of technology is its capacity to foster autonomous learning, allowing students to control the pace, sequence, and depth of their language practice. Through Computer-Assisted Language Learning (CALL) platforms and mobile language applications, learners can engage in repeated exposure to grammatical structures, receive immediate corrective feedback, and monitor their own progress, which is particularly beneficial for mastering complex and abstract forms such as English prepositions [1], [2], [3].

Moreover, technology-enhanced environments have been shown to significantly increase learner motivation by incorporating interactive tasks, gamified activities, and

authentic language use. Mobile applications, in particular, extend learning beyond the classroom and support contextualized practice in real-life situations. Multimedia learning materials that integrate text, visuals, animations, and audio are especially effective in illustrating spatial, temporal, and relational meanings of prepositions. These multimodal representations help learners build clearer mental models of grammatical relationships that are often difficult to explain through traditional, text-based instruction alone. Consequently, international studies provide strong empirical support for the integration of IT in grammar instruction, including preposition teaching, in diverse educational contexts.

## 2.2. National Context

In Vietnam, recent reforms in English language education strongly emphasize the integration of IT as a means to promote learner-centered pedagogy and enhance students' digital literacy. National policy documents and educational strategies encourage teachers to incorporate online learning resources, interactive digital exercises, and LMS to diversify instructional methods and improve learning outcomes [4]. These initiatives aim to shift classroom practices from teacher-dominated instruction to more flexible, interactive, and student-focused learning environments.

Empirical studies conducted in the Vietnamese context report that IT-mediated language learning has led to higher levels of student engagement, increased motivation, and greater learner autonomy. Digital platforms allow students to access learning materials anytime and anywhere, thereby supporting self-directed learning and continuous practice [5]. However, local research also identifies persistent challenges. Unequal access to technological infrastructure, particularly between urban and rural institutions, remains a significant barrier. In addition, teachers' readiness to integrate IT varies considerably due to differences in training, experience, and institutional support. These limitations suggest that while national policies provide a clear direction for IT integration, effective implementation requires sustained investment in infrastructure, professional development, and pedagogical support.

## 2.3. Electric Power University Context

EPU is a public higher education institution in Vietnam specializing in training and research in electricity, energy, engineering, and related technological fields. Established to meet the demands of the national power sector, EPU also offers programs in IT, economics, and foreign languages, including English for specific purposes. With a focus on applied knowledge, EPU emphasizes practical training, industry collaboration, and technological innovation, aiming to equip students with professional skills and English proficiency to meet the requirements of Vietnam's modernization and international integration.

At EPU, instructors use a range of IT tools - PowerPoint presentations, LMS assignments, language apps, and multimedia examples - to augment traditional instruction. Despite these efforts, systematic evaluation of IT's effectiveness for grammar teaching, particularly

prepositions, has not been conducted. This research fills that gap by providing both descriptive and inferential analyses of student and teacher experiences.

## 3. Concepts about Prepositions

Prepositions are function words that play a crucial role in linking nouns or pronouns to other elements within a sentence, thereby expressing relationships of time, place, direction, cause, and manner. Although prepositions are often short and frequent, their meanings are highly context-dependent and governed by subtle spatial and conceptual distinctions [6]. For instance, common prepositions such as *in*, *on*, and *at* reflect different underlying spatial logics that are not always explicit or intuitive for second language learners. As a result, learners frequently struggle to select appropriate prepositions in both written and spoken communication.

Research in second language acquisition consistently identifies prepositions as a major source of learner error due to their polysemous nature and strong dependence on collocational patterns rather than fixed semantic rules [7]. Many prepositional uses must be acquired through exposure and usage rather than direct explanation. Consequently, effective instruction requires repeated exposure across varied contexts, clear and accessible explanations, and ample opportunities for meaningful practice [8]. IT tools can effectively support these conditions by providing multimedia explanations, rich contextualized examples, and interactive exercises with immediate feedback. Such technology-enhanced approaches help learners gradually internalize prepositional usage and reduce persistent errors.

## 4. Current State and Problems

At technical universities such as EPU, English language instruction is closely connected with the demands of specialized academic study and future professional practice. For engineering students, the ability to understand and accurately use English prepositions is particularly important because technical communication frequently relies on precise spatial, procedural, and relational expressions. Engineering documentation, equipment manuals, safety guidelines, and research reports often employ prepositional structures to describe system components, operational processes, and functional relationships (e.g., *connected to the circuit*, *installed on the panel*, *flow through the system*, *operate under high voltage*). Misinterpretation of these linguistic elements may result in misunderstanding of technical procedures or operational instructions. From the perspective of English for Specific Purposes (ESP), language instruction should therefore align with discipline-specific communication needs, enabling students to comprehend professional texts and apply technical knowledge effectively. Consequently, strengthening EPU students' mastery of English prepositions is not merely a grammatical objective but also a practical requirement that supports their ability to engage with specialized materials in later modules and professional contexts [9], [10], [11].

### 4.1. IT Integration Practices at EPU

At EPU, English lecturers increasingly incorporate IT to complement traditional classroom instruction and facilitate the teaching of prepositions. Digital presentation tools, particularly PowerPoint, are widely used to provide visual representations, diagrams, and contextualized examples that help students conceptualize abstract spatial and temporal relationships expressed through prepositions. Visual explanations are especially useful for technical students, as they align with the diagram-based reasoning commonly employed in engineering education.

In addition, online exercises and quizzes are implemented through LMS such as Moodle. These platforms enable students to practice grammar independently while receiving immediate automated feedback and scores. Lecturers also encourage students to engage in supplementary learning activities through mobile-assisted language learning applications such as Quizlet and Duolingo. These applications provide interactive vocabulary practice, grammar drills, and gamified learning experiences that may enhance learner motivation and support out-of-class learning.

Furthermore, multimedia materials - including instructional videos, audio recordings, and contextual demonstrations - are integrated into lessons to illustrate authentic language use. Through these technology-enhanced approaches, instructors aim to create a more interactive and flexible learning environment that supports both conceptual understanding and practical language application for engineering students.

### 4.2. Identified Problems

Despite the growing adoption of IT in English instruction at EPU, several challenges continue to limit its effectiveness in teaching prepositions.

First, the integration of digital tools remains inconsistent across instructors. Survey findings indicate that only 58% of lecturers employ technological resources in more than half of their grammar lessons. This uneven implementation results in disparities in students' learning experiences and access to technology-enhanced instruction.

Second, there appears to be a pedagogical misalignment between technological tools and instructional objectives. Many digital activities focus primarily on recognition-based tasks, such as multiple-choice exercises, rather than encouraging productive language use in speaking or writing. As a result, students may develop passive recognition of correct prepositions without gaining sufficient practice in applying them in authentic communication contexts. Moreover, many available digital resources are designed for general English instruction and lack structured pedagogical frameworks specifically tailored to preposition learning in technical ESP contexts.

Third, infrastructural constraints continue to affect the effectiveness of technology integration. Unstable classroom Wi-Fi connections, inconsistent internet accessibility, and limited availability of digital devices frequently disrupt planned technology-supported activities, reducing their instructional value.

Fourth, teacher preparedness remains a significant concern. Only 33% of instructors reported receiving formal training in technology-enhanced language instruction. Without adequate professional development, lecturers may find it difficult to design pedagogically meaningful digital tasks that integrate grammar instruction with communicative practice.

Finally, issues related to student engagement and learning analytics persist. Existing systems lack comprehensive mechanisms for monitoring students' progress in online grammar exercises, making it challenging for instructors to identify learning difficulties or provide timely and targeted feedback. As a result, the potential of technology to support personalized learning and data-informed instruction remains underutilized.

## 5. Research Methodology

### 5.1. Research Questions

This study investigates the role of IT in supporting the teaching and learning of English prepositions in a technical university context [12]. Specifically, the research addresses the following questions:

- **RQ1:** What are students' perceptions and learning outcomes regarding IT-supported instruction in English prepositions?
- **RQ2:** What teaching practices, attitudes, and challenges do lecturers experience when integrating IT into preposition instruction?

These questions aim to examine both the pedagogical effectiveness of technology-supported learning and the practical conditions influencing its implementation in English language instruction.

### 5.2. Participants

The participants consisted of both students and lecturers from EPU. The student sample comprised 230 first-year undergraduates enrolled in compulsory English courses, including 113 male and 117 female students. These learners represented a range of engineering and technology-related majors and demonstrated varying levels of English proficiency, particularly in their use of prepositions.

In addition to the student participants, 12 English lecturers participated in the study. Their teaching experience ranged from 2 to 18 years, reflecting a diverse range of professional backgrounds. The lecturers also demonstrated different levels of familiarity and confidence in integrating IT into language instruction. Including both students and teachers enabled the study to explore technology-supported grammar instruction from multiple perspectives and to obtain a more comprehensive understanding of instructional practices and learning outcomes.

### 5.3. Research Design

This study employed a mixed-methods research design to investigate the effectiveness of IT in teaching English prepositions. The combination of quantitative and qualitative approaches allowed the study to capture both

measurable learning outcomes and contextual insights into teaching practices [13].

The quantitative component involved the administration of pre-tests and post-tests to measure students’ progress in using English prepositions following technology-supported instruction. While a pre–post design provides useful information about learning development, relying solely on a single-group comparison may not fully establish causal relationships between the instructional intervention and observed learning gains. Improvements may also result from factors such as natural language development, individual learner ability, or increased exposure to English over time.

To address this limitation, the study incorporated additional validation strategies. First, comparisons were conducted across classes that differed in the degree of technology integration in order to approximate a quasi-experimental comparison condition. Although a fully randomized control group without technology use was not feasible due to institutional constraints, this comparative analysis allowed the researcher to observe potential differences in learning outcomes between classes with varying levels of IT-supported instruction.

Second, the reliability of the questionnaire instruments was examined through internal consistency analysis using Cronbach’s alpha, which ensured that the survey items consistently measured students’ perceptions and attitudes toward technology-enhanced learning. Pilot testing of the questionnaires was also conducted with a small group of students prior to the main study in order to refine item clarity and improve measurement validity.

Finally, the study adopted methodological triangulation, integrating data from questionnaires, preposition tests, classroom observations, and semi-structured interviews. Triangulation strengthens research credibility by confirming findings through multiple sources of evidence and reducing the risk of bias associated with any single data collection method.

The qualitative component consisted of interviews with English lecturers and structured classroom observations. These methods provided deeper insights into teachers’ experiences with technology integration, pedagogical strategies used in grammar instruction, and institutional challenges affecting the implementation of digital learning tools [14], [15].

5.4. Instruments

Several research instruments were employed to ensure comprehensive and reliable data collection.

The student questionnaire consisted of 25 items designed to investigate learners’ perceptions of IT in English learning, their self-reported proficiency in using English prepositions, and their motivation toward technology-supported instruction. Responses were measured using a five-point Likert scale ranging from strongly disagree to strongly agree. To ensure reliability, the questionnaire underwent pilot testing and internal consistency analysis using Cronbach’s alpha prior to its administration in the main study.

The teacher questionnaire included 20 items focusing on lecturers’ frequency of technology use in grammar instruction, their confidence in integrating digital tools into classroom teaching, professional development experiences related to educational technology, and perceived challenges in implementing technology-enhanced learning. The results of this instrument provided valuable insights into pedagogical practices and institutional constraints affecting IT integration.

To evaluate students’ grammatical development, standardized preposition tests were administered as both pre-tests and post-tests. These assessments were developed by English curriculum specialists at EPU and were designed to measure students’ understanding of prepositions of time, place, and movement, as well as phrasal verbs, phrasal adjectives, and phrasal nouns containing one or two prepositions. The test items were organized from basic to advanced levels to accurately capture students’ progression in grammatical competence.

In addition, classroom observations were conducted using a structured observation checklist. This instrument enabled the researcher to systematically record patterns of technology use, teacher–student interaction, instructional strategies, and student engagement during grammar lessons. Observation data served as an important qualitative source for verifying whether technological tools were implemented as intended and for interpreting quantitative results more effectively [16].

6. Results and Statistical Analysis

6.1. Student Perceptions and Learning Outcomes

To examine students’ perceptions of IT in learning English prepositions, descriptive statistical analysis was conducted using responses from the student questionnaire. Prior to analysis, the reliability of the questionnaire was evaluated through internal consistency analysis using Cronbach’s alpha. The results indicated a high level of reliability for the instrument ( $\alpha = .87$ ), suggesting that the questionnaire items consistently measured students’ attitudes toward IT-supported learning.

Table 1 presents the descriptive statistics of key perception items.

Table 1. Student Perceptions of IT in Preposition Learning

| Item                               | Mean | Std. Dev |
|------------------------------------|------|----------|
| IT helps understand prepositions   | 4.21 | 0.63     |
| Online exercises motivate practice | 4.05 | 0.71     |
| I use IT regularly outside class   | 3.28 | 0.85     |
| Digital feedback improves accuracy | 3.96 | 0.78     |

Scale: 1 = Strongly Disagree, 5 = Strongly Agree

Overall, students expressed positive attitudes toward the use of IT in grammar learning. The highest-rated item indicated that IT helped students better understand prepositional usage ( $M = 4.21$ ), suggesting that digital tools may facilitate conceptualization of abstract spatial and relational meanings. Students also reported that online exercises increased their motivation to practice ( $M = 4.05$ ), supporting previous findings that technology-enhanced

language learning environments can promote engagement and autonomous learning.

However, the relatively lower mean score for regular IT use outside the classroom ( $M = 3.28$ ) suggests that students' self-directed digital learning remains limited. This finding indicates the need for stronger integration of out-of-class digital activities to encourage learner autonomy. Students also perceived digital feedback as beneficial for improving grammatical accuracy ( $M = 3.96$ ), highlighting the potential of automated feedback systems to support language development.

To examine learning outcomes, students completed a standardized pre-test and post-test assessing their accuracy in using English prepositions. Prior to implementation, the test instrument was reviewed by English curriculum specialists at EPU to ensure content validity. Reliability analysis for the test items yielded an acceptable internal consistency coefficient (Cronbach's  $\alpha = .82$ ).

**Table 2.** Pre-test and Post-test Results (Students)

| Test      | Mean (%) | Std. Dev | N   |
|-----------|----------|----------|-----|
| Pre-test  | 58.4     | 10.9     | 230 |
| Post-test | 72.8     | 9.3      | 230 |

A paired-samples t-test was conducted to determine whether the difference between the pre-test and post-test scores was statistically significant. The results indicated a substantial improvement in students' performance ( $t = 12.7$ ,  $p < .001$ ), suggesting that students demonstrated significantly greater accuracy in using prepositions after participating in IT-supported instruction. Although the pre-post comparison cannot entirely rule out external learning factors, the magnitude of improvement provides preliminary evidence that technology-supported learning activities contributed positively to students' grammatical development.

## 6.2. Teacher Practices and Perspectives

Teachers' perceptions and practices regarding IT integration were also examined through questionnaire responses. Reliability analysis showed that the teacher questionnaire achieved acceptable internal consistency (Cronbach's  $\alpha = .84$ ).

**Table 3.** Teacher Responses on IT Use

| Item                                | Mean | Std. Dev |
|-------------------------------------|------|----------|
| I integrate IT in most lessons      | 3.58 | 0.50     |
| I feel confident using IT           | 3.17 | 0.73     |
| I have received sufficient training | 2.42 | 0.67     |
| IT enhances student engagement      | 4.33 | 0.48     |

The results indicate that instructors generally recognize the pedagogical benefits of IT integration, particularly its ability to enhance student engagement ( $M = 4.33$ ). However, the moderate level of technology integration in lessons ( $M = 3.58$ ) suggests that IT is not consistently implemented across classes.

Teachers' confidence in using IT was relatively moderate ( $M = 3.17$ ), reflecting varying levels of digital literacy among instructors. Notably, the lowest mean score was recorded for professional training ( $M = 2.42$ ),

indicating that many teachers feel insufficiently prepared to integrate technology effectively into grammar instruction. This finding highlights the importance of institutional support and professional development programs to strengthen teachers' technological pedagogical competence.

## 6.3. Observational Insights

Classroom observations provided qualitative evidence regarding how IT was actually implemented in English preposition lessons at EPU. Analysis of observation checklists revealed notable variation in instructional practices across classes.

Interactive quizzes were the most frequently observed activity, appearing in approximately 42% of observed lessons, suggesting that instructors often rely on digital assessment tools that are easy to implement. Around 33% of lessons incorporated multimedia materials such as instructional videos or audio recordings to illustrate prepositional usage in authentic contexts. These resources appeared particularly useful for explaining spatial relationships and contextual meanings.

In contrast, collaborative technology-based activities were relatively uncommon. Only 17% of observed classes utilized online discussion forums or peer-based tasks, indicating that digital tools were primarily used for individual practice rather than communicative learning.

Qualitative coding of observation notes also revealed several recurring challenges. Technical difficulties, including unstable internet connections or malfunctioning digital equipment, were reported in 82% of observed lessons, often interrupting instructional flow. Additionally, 67% of instructors lacked specialized digital materials designed specifically for teaching prepositions, which limited the pedagogical effectiveness of IT integration. Time constraints also emerged as a significant factor, with 75% of lecturers reporting insufficient preparation time for designing technology-supported learning activities.

These findings suggest that while IT has clear pedagogical potential for grammar instruction, its effectiveness depends heavily on institutional infrastructure, teacher training, and the availability of well-designed digital learning materials.

## 7. Discussion

### 7.1. Challenges in Technology-Supported Preposition Instruction

The findings of this study highlight several structural and pedagogical factors that influence the effectiveness of IT in grammar instruction at EPU. Rather than merely reiterating the statistical results, this section interprets the findings in relation to previous research on CALL and technology-enhanced grammar instruction.

One notable issue concerns the pedagogical alignment of digital activities with learning objectives. The classroom observations indicated that many technology-supported tasks focused primarily on recognition-based exercises such as multiple-choice quizzes. While such

tasks can facilitate initial noticing of grammatical forms, they may not sufficiently support the productive use of language in authentic communication. This pattern is consistent with findings reported by Glenn Hegelheimer, whose research on CALL environments demonstrated that digital grammar practice often emphasizes form recognition rather than communicative application. Similarly, recent studies on technology-enhanced language learning argue that grammar acquisition becomes more effective when digital tools are integrated with communicative tasks that require learners to produce language meaningfully [17].

Another challenge relates to technological infrastructure, which can significantly influence the success of digital pedagogy. In the present study, unstable internet connectivity and limited device availability occasionally disrupted technology-supported activities. Comparable constraints have been documented in technology-integrated language classrooms in developing educational contexts, where infrastructural limitations frequently reduce the consistency of digital instruction [17]. When technological tools cannot be reliably implemented, instructors may revert to traditional instructional approaches, thereby limiting the potential advantages of digital learning environments.

A third issue concerns teacher readiness and professional training. Although instructors generally recognized the value of IT in enhancing student engagement, many reported limited experience in designing technology-supported grammar activities. This finding aligns with previous research emphasizing that successful integration of educational technology depends not only on access to digital tools but also on teachers' technological pedagogical knowledge (TPACK). According to recent studies in language education, insufficient training in digital pedagogy can hinder teachers' confidence and reduce their willingness to experiment with innovative instructional approaches [19].

Finally, the findings point to limitations in current digital assessment practices. Many online grammar platforms emphasize objective testing formats, which may not capture students' ability to apply grammatical structures in productive contexts. This limitation has also been highlighted in recent applied linguistics research, which emphasizes the importance of formative assessment systems capable of analyzing learner errors and providing targeted feedback in technology-mediated language learning environments.

## **7.2. Opportunities for Enhancing Technology Integration**

Despite the challenges identified above, the findings also suggest several promising opportunities for improving technology-supported grammar instruction. One key opportunity lies in the implementation of blended learning models, which combine face-to-face instruction with structured digital learning activities. Research in CALL has shown that blended learning environments can enhance learner engagement and provide multiple opportunities for interaction with linguistic forms. For example, studies on technology-

mediated grammar learning have demonstrated that integrating pre-class online practice with in-class communicative tasks can significantly improve students' grammatical accuracy and retention [17], [18]. In this study, the observed improvement in post-test scores suggests that technology-supported activities may contribute to learners' understanding of prepositional usage when combined with classroom instruction.

Another important opportunity concerns the use of learning analytics generated by LMS such as Moodle. Digital learning platforms can record detailed information about students' learning behavior, including participation rates, quiz performance, and common error patterns. Recent research indicates that such data can support data-driven pedagogy by enabling instructors to identify specific linguistic difficulties and design targeted remedial activities [19]. In the context of preposition learning, learning analytics could help lecturers identify recurring errors related to spatial or relational meanings and address these problems more systematically.

Furthermore, collaborative digital environments present opportunities to extend language practice beyond the classroom. Online discussion forums, peer-review platforms, and collaborative writing tools allow learners to negotiate meaning, reflect on linguistic choices, and receive feedback from peers. Studies in CALL have shown that collaborative digital tasks can significantly enhance communicative competence and learner autonomy, particularly in English for Specific Purposes contexts where authentic communication is essential [20].

Overall, the findings suggest that while technological integration in grammar instruction still faces several institutional and pedagogical challenges, it also offers substantial potential for improving language learning outcomes. With appropriate teacher training, improved infrastructure, and more communicative digital tasks, IT-supported instruction can become a valuable component of English language education for engineering students.

## **8. Solutions and Recommendations**

To address the identified challenges and optimize the effectiveness of IT in teaching English prepositions at EPU, this study proposes a set of pedagogically grounded and technologically specific recommendations.

First, teacher professional development should be systematically strengthened through targeted training programs focusing on technology-enhanced language instruction. These programs should include (1) instructional design for digital grammar teaching, (2) effective use of learning analytics within Moodle, and (3) the development of interactive grammar tasks using platforms such as Quizlet, Kahoot!, and H5P. Research in technology-enhanced language learning indicates that teacher competence in digital pedagogy significantly influences the effectiveness of IT integration [12], [19]. In addition, establishing peer mentoring systems - pairing digitally experienced instructors with less experienced colleagues - can facilitate collaborative professional learning and improve instructional confidence.

Second, a centralized repository of digital learning materials should be developed at the institutional level. This repository should include structured modules specifically targeting English prepositions, incorporating multimodal explanations (videos, diagrams), interactive exercises (gap-filling, drag-and-drop), and immediate feedback mechanisms. Tools such as H5P integrated into Moodle allow instructors to design reusable, interactive grammar content aligned with specific learning outcomes. Such structured resources can address the current lack of pedagogically coherent materials and ensure consistency across courses.

From a pedagogical perspective, greater emphasis should be placed on productive and communicative use of prepositions. Rather than relying primarily on recognition-based tasks, instructors should design activities that require learners to actively produce language, such as guided sentence construction, error correction tasks, technical description writing, and simulation-based exercises relevant to engineering contexts. For example, students may be asked to describe electrical systems using target prepositions (*connected to*, *located in*, *flow through*), thereby linking grammar learning with disciplinary content. This approach aligns with research in ESP, which emphasizes the integration of language instruction with domain-specific communication tasks [10].

In terms of instructional models, the implementation of blended learning and flipped classroom approaches should be operationalized more concretely. A recommended model includes:

(1) Pre-class phase: students engage with short instructional videos (e.g., teacher-created or curated from platforms like

YouTube or LMS-integrated media), interactive grammar tutorials (H5P), and vocabulary sets (Quizlet);

(2) In-class phase: students participate in communicative tasks such as pair discussions, problem-solving activities, and collaborative writing exercises requiring the use of prepositions in context;

(3) Post-class phase: students complete reflective quizzes or adaptive practice tasks on Moodle, with automated feedback and error analysis.

Empirical studies have shown that such structured flipped learning models can significantly improve grammatical accuracy and learner engagement in second language contexts.

Furthermore, the use of learning analytics should be expanded to support data-driven instruction. LMS platforms such as Moodle can track student participation, response accuracy, and error patterns, enabling instructors to identify common difficulties with specific prepositions. These data can then inform targeted remedial instruction and differentiated learning pathways, which are essential for addressing learner variability. Recent research highlights the growing importance of learning analytics in enhancing personalized language learning and formative assessment practices.

In addition, collaborative digital tools should be more systematically integrated to promote interaction and learner autonomy. Platforms such as online discussion forums, shared documents (e.g., Google Docs), and peer feedback systems can support collaborative writing and negotiation of meaning. Such activities are particularly valuable in ESP contexts, where learners must develop the ability to use language accurately in professional communication scenarios.

Finally, infrastructural improvements remain a critical prerequisite for effective IT integration. Institutions should prioritize upgrading Wi-Fi stability, ensuring sufficient access to digital devices, and optimizing LMS platforms for mobile compatibility. Given that many students rely on smartphones for learning, mobile-friendly design is essential for promoting equitable access and sustained engagement.

In terms of assessment, a **blended assessment model** is recommended, combining automated online quizzes with teacher-led evaluation of productive tasks. While digital tools can efficiently provide immediate feedback on form-based accuracy, instructor feedback remains essential for evaluating contextual appropriateness and communicative effectiveness. Integrating both approaches can create a more comprehensive assessment system that supports continuous learning and improvement.

## 9. Limitations and Future Research Directions

Despite providing valuable insights into the integration of IT in teaching English prepositions at EPU, this study has several limitations that should be acknowledged.

First, the study employed a single-group pre-test–post-test design, which limits the ability to establish a causal relationship between IT-supported instruction and students' learning gains. Although significant improvement was observed, the absence of a fully randomized control group means that other variables - such as natural language development, prior knowledge, or external exposure to English - may have influenced the results [15]. Future studies should adopt quasi-experimental or experimental designs with control groups to provide stronger evidence of causality.

Second, the research was conducted within a single institutional context, which may limit the generalizability of the findings to other universities or educational settings. As EPU is a technical institution with specific ESP-oriented learning needs, the results may not fully represent students in non-technical disciplines. Future research should involve multiple institutions and diverse learner populations to enhance external validity.

Third, the study relied partly on self-reported questionnaire data, which may be subject to response bias. Although internal consistency reliability (Cronbach's alpha) was established, self-reported perceptions do not always accurately reflect actual learning behavior or competence [12]. Future studies could incorporate learning analytics data, behavioral tracking, or performance-based assessments to obtain more objective measures of learner engagement and progress.

Fourth, the duration of the intervention was relatively limited, focusing on short-term learning outcomes. As a result, the study does not provide evidence regarding the long-term retention and transfer of prepositional knowledge. Longitudinal studies are therefore recommended to examine whether technology-supported instruction leads to sustained grammatical development over time [17].

Finally, while the study explored general IT integration, it did not systematically compare the effectiveness of specific digital tools or instructional models (e.g., flipped classroom vs. blended learning vs. traditional instruction). Future research could conduct comparative studies to identify which technological approaches are most effective for teaching prepositions, particularly in ESP contexts.

In light of these limitations, future research should focus on (1) implementing controlled experimental designs, (2) expanding the research scope across institutions, (3) integrating objective data sources such as learning analytics, (4) conducting longitudinal investigations, and (5) comparing specific technology-enhanced pedagogical models. Such directions would contribute to a more robust understanding of how IT can effectively support grammar instruction in technical and professional education.

## 10. Conclusion

The integration of IT in teaching English prepositions at EPU demonstrates considerable potential in enhancing student engagement, motivation, and learning outcomes. Quantitative findings indicate statistically significant improvements in students' post-instruction accuracy, suggesting that technology-supported instruction can effectively facilitate the acquisition of complex grammatical features such as prepositions. In addition, students reported increased interest and active participation when digital tools were incorporated into lessons.

Despite these positive outcomes, several challenges continue to limit the full effectiveness of IT integration. Issues related to pedagogical alignment, inadequate infrastructure, and insufficient teacher training remain prominent. Many digital activities are not yet optimally designed to support productive language use, and unstable technological conditions disrupt instructional continuity. Moreover, limited professional preparation constrains teachers' ability to implement innovative, technology-enhanced grammar instruction.

To ensure sustainable and meaningful integration of IT, systematic teacher professional development, improved technological infrastructure, and the development of pedagogically appropriate digital content are essential. Adopting blended and data-informed instructional models, strengthening assessment and feedback mechanisms, and

aligning technology use with communicative learning objectives will contribute to long-term improvements. These measures will support effective grammar instruction and promote sustained mastery of English prepositions among first-year students at EPU.

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