

Artificial Intelligence and ESP: Rethinking Professional English Education in Cameroonian Universities

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Submitted: September 04, 2026

Accepted: September 12, 2026

Published: September 20, 2026

Citation: Abdoulaye Daouda (2026) Artificial Intelligence and ESP: Rethinking Professional English Education in Cameroonian Universities. *Epistora J. Artif. Intell. & Intell. Syst.* 1(1), 1-09. Article EJAIS-112

Abstract

This paper examines the transformative potential of Artificial Intelligence (AI) in the teaching and learning of English for Specific Purposes (ESP) within Cameroonian universities. As Cameroon continues to position itself as a bilingual nation with growing economic and technological ambitions, the demand for professionally-oriented English language instruction has never been greater. However, traditional ESP pedagogies in Cameroonian higher education institutions face significant challenges, including limited resources, outdated curricula, and a growing disconnect between classroom instruction and real-world professional communication needs. Drawing on recent developments in generative AI, natural language processing, and adaptive learning technologies, this study argues for a fundamental rethinking of ESP education in Cameroon. Through a critical analysis of existing literature and policy documents, combined with an evaluative framework for AI integration, the paper proposes a roadmap for incorporating AI-driven tools into ESP curricula. The findings suggest that AI can personalize learning experiences, provide authentic professional communication scenarios, and bridge the gap between academic English instruction and workplace language demands. However, the successful implementation of AI in Cameroonian ESP contexts requires addressing infrastructural deficits, teacher training needs, and ethical considerations related to data privacy and algorithmic bias. This paper contributes to the emerging discourse on AI in language education within the African context and offers practical recommendations for policymakers, curriculum designers, and ESP practitioners in Cameroon and beyond.

Keywords: Artificial Intelligence, English for Specific Purposes, Cameroonian Universities, Professional English Education, Higher Education, Language Technology, Generative AI

Introduction

The rapid advancement of Artificial Intelligence (AI) has precipitated a paradigm shift across virtually every sector of human endeavor, and education stands at the forefront of this transformation. From adaptive learning platforms to intelligent tutoring systems, AI technologies are reshaping how knowledge is transmitted, acquired, and assessed. In the domain of language education, particularly English for Specific Purposes (ESP), the implications of this technological revolution are both profound and multifaceted. ESP, as a branch of English Language Teaching (ELT) that focuses on the linguistic and communicative needs of learners in specific professional or academic contexts, has traditionally relied on needs analysis, authentic materials, and task-based approaches to prepare students for real-world communication (Hutchinson & Waters, 1987; -

Dudley Evans & St John, 1998). However, the static nature of many ESP curricula and the limited exposure of learners to dynamic, profession-specific language use have long been recognized as significant pedagogical constraints.

Cameroon, as a bilingual nation with English and French as its official languages, occupies a unique position in the African linguistic landscape. With over 250 indigenous languages and a complex colonial history, the country has developed a distinctive approach to language education that reflects its multicultural identity (Chumbow, 2009). English, in particular, serves as a crucial lingua franca for professional communication, international trade, and academic discourse, especially in the two Anglophone regions (Northwest and Southwest) and increasingly in Francophone urban centers. The teaching of ESP in Cameroonian universities has thus become an essential component of higher education, preparing students for careers in business, law, medicine, engineering, and public administration.

Despite its importance, ESP education in Cameroonian universities faces formidable challenges. These include inadequate teaching materials, large class sizes, limited teacher training in specialized fields, and a persistent gap between the English taught in classrooms and the English actually used in professional Cameroonian contexts (Nkwetisama, 2012; Tanda, 2019). The advent of AI technologies offers unprecedented opportunities to address these challenges. Generative AI tools such as ChatGPT, Claude, and Gemini can generate context-specific language materials, simulate professional communication scenarios, and provide personalized feedback at scale. Natural Language Processing (NLP) applications can analyze authentic workplace texts to identify the specific linguistic features and discourse patterns relevant to different professions. Adaptive learning systems can tailor instruction to individual learner needs, accounting for varying proficiency levels, professional aspirations, and learning paces.

This paper argues that the integration of AI into ESP education in Cameroonian universities is not merely a technological upgrade but a necessary pedagogical evolution. It contends that AI can help overcome the structural limitations of current ESP programs while simultaneously addressing the evolving language needs of Cameroon's professional sectors. The paper is structured as follows : first, it reviews the current state of ESP in Cameroonian higher education and the theoretical foundations of AI-enhanced language learning. Second, it examines specific AI applications relevant to ESP pedagogy, including intelligent tutoring systems, automated writing evaluation, and virtual professional communication environments. Third, it analyzes the challenges and opportunities of AI implementation in the Cameroonian context, considering infrastructural, institutional, and ethical dimensions. Finally, it proposes a framework for AI-integrated ESP curricula and offers recommendations for stakeholders.

Literature Review

ESP in the African and Cameroonian Context

English for Specific Purposes emerged in the 1960s as a response to the growing need for English language instruction tailored to specific professional and academic domains (Strevens, 1977). Unlike General English, which focuses on developing broad communicative competence, ESP is characterized by its emphasis on needs analysis, authenticity, and relevance to learners' target situations (Hutchinson & Waters, 1987). In the African context, ESP has played a particularly important role in post-colonial nationbuilding, serving as a vehicle for professional development, international communication, and access to global knowledge economies (Bangbose, 2014).

In Cameroon, ESP instruction has been institutionalized in university curricula since the 1990s, with programs designed to serve students in faculties of law, medicine, business, engineering, and agriculture (Nkwetisama, 2012). The University of Yaoundé I, the University of Buea, and the University of Ngaoundéré have historically been at the forefront of ESP research and teaching, developing specialized courses for diverse professional fields. However, scholars have consistently identified significant gaps between ESP curricula and the actual language needs of Cameroonian professionals. Tanda (2019) observes that many ESP courses remain grammar-focused and fail to develop the pragmatic competence required for effective workplace communication. Similarly, Nkwetisama (2012) argues that ESP materials used in Cameroonian universities are often imported from Western contexts and lack cultural and professional relevance to the Cameroonian workplace.

The sociolinguistic complexity of Cameroon further complicates ESP delivery. The coexistence of English, French, Pidgin English, and numerous indigenous languages creates a multilingual professional environment where code-switching and translanguaging are common practices (Anchimbe, 2006). ESP curricula that ignore this linguistic reality risk producing graduates who are proficient in “textbook English” but unable to navigate the communicative complexities of actual Cameroonian workplaces.

Furthermore, the Anglophone Crisis that began in 2016 has disrupted education in the Northwest and Southwest regions, leading to school closures, brain drain, and a deterioration of educational infrastructure that has particularly affected English language instruction (Konings & Nyamnjoh, 2019).

Artificial Intelligence in Language Education

The application of AI to language education has evolved significantly over the past two decades. Early Computer-Assisted Language Learning (CALL) systems provided drill-and-practice exercises with limited adaptability. Contemporary AI-powered language learning tools, however, leverage machine learning, natural language processing, and large language models to offer sophisticated, personalized, and interactive learning experiences (Zawacki-Richter et al., 2019).

Generative AI, exemplified by models such as GPT-4, Claude, and Gemini, represents the most recent and potentially transformative development. These systems can generate human-like text, engage in coherent dialogues, translate across languages, and adapt their output to specific registers, genres, and professional contexts (Bender et al., 2021). For ESP, this capability is particularly valuable. A generative AI system can produce authentic-looking business emails, medical case reports, legal briefs, or engineering specifications on demand, providing learners with unlimited exposure to professionspecific language use. Moreover, these systems can simulate professional interactions client meetings, patient consultations, courtroom exchanges allowing learners to practice communicative tasks in low-stakes environments (Kohnke et al., 2023).

Intelligent Tutoring Systems (ITS) represent another significant AI application in language education. ITS use learner modeling to adapt instruction in real-time, identifying areas of weakness and providing targeted practice (VanLehn, 2011). In ESP contexts, an ITS could track a learner's performance across different professional communication tasks writing reports, giving presentations, negotiating contracts and adjust the difficulty and focus of subsequent activities accordingly. Automated Writing Evaluation (AWE) tools, such as Grammarly, Turnitin, and specialized academic writing platforms, provide immediate feedback on grammar, style, and discourse organization, allowing learners to revise their work iteratively (Wilson & Cziko, 2016).

Natural Language Processing (NLP) techniques also enable corpus-based approaches to ESP that were previously impractical. AI can analyze large collections of authentic professional texts corpora of business correspondence, medical records, legal judgments, engineering manuals to identify the specific vocabulary, collocations, grammatical patterns, and discourse structures characteristic of different professions (Flowerdew, 2015). This data-driven approach to needs analysis and materials development promises to make ESP instruction more evidence-based and professionally relevant than ever before.

However, the integration of AI into language education is not without controversy. Concerns about academic integrity, data privacy, algorithmic bias, and the depersonalization of education have been widely discussed (Holmes et al., 2019; Williamson & Eynon, 2020). Critics argue that over-reliance on AI may undermine the development of critical thinking and autonomous learning skills, while the environmental and economic costs of training and deploying large AI models raise questions of sustainability and equity (Bender et al., 2021).

Theoretical Framework: The Technology-Enhanced ESP Model

This paper adopts an integrative theoretical framework that combines Hutchinson and Waters' (1987) learning-centered approach to ESP with Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework. The learning-centered approach emphasizes that ESP should focus not merely on language content but on the learning process itself, taking into account learners' needs, motivations, and learning styles. TPACK extends this perspective by arguing that effective technology integration requires the intersection of technological knowledge, pedagogical knowledge, and content knowledge.

Additionally, the framework draws on Vygotsky's (1978) sociocultural theory, particularly the concept of the Zone of Proximal Development (ZPD). AI tools can function as "more knowledgeable others," scaffolding learners' development by providing support that is gradually withdrawn as competence increases. In ESP contexts, this scaffolding might take the form of AI-generated models of professional communication, interactive feedback on learner productions, or simulated professional environments where learners can practice with AI interlocutors before engaging in realworld interactions.

Methodology

This study employs a critical integrative review methodology combined with a conceptual framework analysis. Unlike empirical studies that rely on primary data collection, this paper synthesizes existing scholarship, policy documents, and technological reports to construct a theoretically grounded and practically oriented argument for AI integration in Cameroonian ESP education.

The methodology involves three phases. In the first phase, a comprehensive literature review was conducted across multiple databases including Google Scholar, ERIC, JSTOR, and SSRN, using search terms such as "AI in language education," "ESP in Africa," "Cameroon higher education," "generative AI and ELT," and "technologyenhanced language learning." Priority was given to peer-reviewed articles published between 2018 and 2025, with seminal earlier works included for theoretical grounding.

The second phase involved analysis of policy documents from the Cameroonian Ministry of Higher Education, reports from the African Union's Digital Transformation Strategy, and UNESCO publications on AI in education. These documents provided contextual understanding of the policy environment within which AI-ESP integration would occur. The third phase involved the construction of an evaluative framework for AI-ESP integration, drawing on existing technology integration models (TPACK, SAMR, PICRAT) and adapting them to the specific constraints and opportunities of the Cameroonian higher education context. This framework serves as the analytical lens through which the potential and challenges of AI in Cameroonian ESP are examined.

AI Applications for ESP in Cameroonian Universities

Personalized and Adaptive Learning

One of the most significant advantages of AI for ESP education is its capacity for personalization. Cameroonian university ESP classes often comprise students from diverse disciplinary backgrounds medicine, law, engineering, business each with distinct language needs. A single ESP instructor cannot feasibly design individualized curricula for each student. AI-powered adaptive learning platforms, however, can assess each learner's proficiency level, identify specific gaps in professional communication skills, and generate customized learning pathways. For example, an AI system could diagnose that a medical student struggles with writing patient case reports but excels at oral presentation skills, while a law student may need intensive work on legal argumentation structures. The system could then allocate differentiated practice activities, adjusting the difficulty, genre, and feedback type for each learner. Platforms such as Duolingo, Babbel, and more specialized academic tools like Grammarly and Write & Improve already demonstrate this adaptive capability, though they are not specifically designed for ESP contexts. The development of Cameroon-specific ESP adaptive systems incorporating local professional genres, bilingual communication patterns, and culturally relevant scenarios represents a significant opportunity for educational technology innovation.

Authentic Materials Generation and Corpus Analysis

The scarcity of authentic, locally relevant ESP materials has long been a challenge in Cameroonian universities (Nkwetisama, 2012). Imported textbooks often feature Western business contexts, American legal systems, or British medical practices that bear little resemblance to Cameroonian professional environments. Generative AI offers a solution by enabling the rapid creation of contextually appropriate materials.

An ESP instructor can prompt a generative AI system to produce business correspondence set in Douala, medical consultations at a Yaoundé hospital, or legal proceedings in a Cameroonian courtroom. These materials can incorporate local names, institutions, cultural norms, and linguistic features (including appropriate code-switching between English, French, and Pidgin). While human review is essential to ensure accuracy and cultural sensitivity, AI-generated materials can dramatically expand the range of authentic texts available to learners.

Furthermore, NLP-powered corpus analysis can identify the specific linguistic features of Cameroonian professional English. By analyzing collections of authentic workplace texts emails from Cameroonian businesses, court judgments from Anglophone regions, medical records from local hospitals AI can reveal the vocabulary, collocations, and discourse patterns that characterize professional communication in Cameroon. This evidence base can inform curriculum design, ensuring that ESP instruction targets the language actually used in local professional contexts rather than an idealized nativespeaker norm.

Simulated Professional Communication Environments

Perhaps the most transformative AI application for ESP is the creation of immersive, simulated professional communication environments. Large language models can roleplay as clients, patients, colleagues, supervisors, or stakeholders, engaging learners in realistic professional interactions. A business student might negotiate a contract with an AI-powered virtual partner ; a medical student might take a patient history from an AI patient ; a law student might present arguments to an AI judge.

These simulations address a critical gap in traditional ESP instruction : the limited opportunity for authentic communicative practice. In large Cameroonian university classes, individual speaking practice is minimal, and role-play activities are often constrained by time, peer proficiency levels, and the artificiality of classroom settings. AI simulations can provide unlimited practice opportunities, with interlocutors that adapt their responses based on the learner's input, creating dynamic, unpredictable, and therefore authentic interactions.

Moreover, AI can provide detailed post-interaction feedback, analyzing the learner's language use, pragmatic choices, turn-taking behavior, and professional etiquette. This feedback can be more comprehensive and consistent than what individual instructors can provide, especially in contexts where teacher-student ratios are unfavorable.

Automated Assessment and Feedback

Assessment in ESP has traditionally relied on subjective evaluation by instructors, who may lack expertise in the specific professional domains they teach. AI-powered assessment tools offer more objective, consistent, and detailed evaluation of learner performance. Automated Writing Evaluation (AWE) systems can analyze the linguistic accuracy, organizational structure, and genre appropriateness of professional texts such as reports, emails, and proposals. Speech recognition and analysis tools can evaluate pronunciation, fluency, and discourse markers in oral presentations and professional conversations. Importantly, AI assessment can be formative rather than merely summative. Rather than providing a single grade at the end of a course, AI systems can offer continuous feedback throughout the learning process, allowing learners to track their progress and identify areas for improvement. This aligns with the learning-centered approach to ESP, which emphasizes process over product and encourages learner autonomy. However, the implementation of AI assessment in Cameroonian universities requires careful consideration. Over-reliance on automated evaluation may discourage creativity and risk-taking, and AI systems trained primarily on native-speaker data may penalize legitimate Cameroonian English features. Any AI assessment system must be calibrated to recognize and value the varieties of English used in Cameroonian professional contexts.

Challenges and Opportunities of AI Implementation in Cameroon

Infrastructure and Connectivity

The most immediate barrier to AI integration in Cameroonian universities is infrastructural. Reliable internet connectivity remains uneven across the country, with significant disparities between urban centers like Douala, Yaoundé, and Buea and rural areas where many universities are located. Power supply is inconsistent, and the cost of data remains prohibitive for many students. AI applications, particularly those based on large language models, require substantial bandwidth and processing power that may exceed the capacity of campus networks. However, these challenges are not insurmountable. The Cameroonian government's National Digital Strategy (2018) and the African Union's Digital Transformation Strategy for Africa (2020-2030) prioritize infrastructure development. Mobile internet penetration in Cameroon has grown significantly, with over 70% of the population having mobile network access as of 2024. Lightweight AI applications, offline-capable language models, and campus-based server installations could mitigate connectivity issues. Partnerships with international technology companies and educational organizations could also provide the hardware and bandwidth necessary for pilot AI-ESP programs.

Teacher Training and Digital Literacy

The successful integration of AI into ESP education depends fundamentally on teacher competence. Many Cameroonian ESP instructors, while expert in their fields, may lack familiarity with AI technologies and may feel threatened by their potential to automate aspects of teaching. Resistance to change, coupled with limited opportunities for professional development in educational technology, poses a significant challenge.

A comprehensive teacher training program is essential. This program should go beyond basic digital literacy to develop what this paper terms AI-TPACK for ESP the intersection of technological, pedagogical, and content knowledge specific to AI-enhanced ESP instruction. Teachers need to understand not only how to use AI tools but also when to use them, how to evaluate their output, and how to maintain their central role as facilitators of learning rather than mere technology operators.

The opportunity here is significant. Investment in teacher training for AI-ESP integration could elevate the status and effectiveness of ESP instruction in Cameroonian universities, attracting talented educators and positioning Cameroon as a leader in technology-enhanced language education in Africa.

Ethical Considerations and Algorithmic Bias

The deployment of AI in education raises profound ethical questions that are particularly acute in the Cameroonian context. Large language models are predominantly trained on data from Western, English-speaking contexts, which may result in cultural bias, linguistic imperialism, and the marginalization of Cameroonian English varieties. If AI systems penalize learners for using Cameroonian Pidgin-influenced constructions or Francophone transfer patterns, they may reinforce harmful linguistic hierarchies and undermine learners' confidence in their own communicative competence.

Data privacy is another critical concern. AI learning systems collect vast amounts of student data writing samples, speech recordings, interaction patterns that could be misused if not properly protected. Cameroon currently lacks comprehensive data protection legislation, and university IT systems may not have the security infrastructure to safeguard sensitive student information.

Furthermore, the environmental impact of AI must be considered. Training and running large AI models consume significant energy, contributing to carbon emissions. For a country like Cameroon, which is already experiencing the effects of climate change, the adoption of energy-intensive educational technologies must be balanced against environmental sustainability goals.

These ethical challenges, however, also present opportunities. Cameroonian universities could become sites for the development of ethically grounded, culturally responsive AI systems. By contributing local language data, professional communication corpora, and culturally informed pedagogical expertise, Cameroonian educators and researchers could help build AI tools that serve African contexts rather than merely importing Western technologies.

Cost and Sustainability

The financial costs of AI implementation software licenses, hardware upgrades, training programs, technical support are substantial. Cameroonian universities operate under severe budgetary constraints, and the additional expense of AI integration may seem prohibitive. However, the long-term cost-effectiveness of AI should be considered. AI systems can reduce the per-student cost of personalized instruction, minimize the need for expensive imported materials, and improve learning outcomes that translate into economic productivity.

Open-source AI models, international educational partnerships, and phased implementation strategies can reduce costs. Rather than attempting comprehensive AI integration across all ESP programs simultaneously, universities could begin with pilot projects in high-demand fields such as business English or medical English, demonstrating efficacy before scaling up.

A Framework for AI-Integrated ESP Curricula in Cameroonian Universities Based on the analysis presented above, this paper proposes a phased framework for integrating AI into ESP curricula in Cameroonian universities. The framework consists of four phases: Foundation, Integration, Transformation, and Sustainability.

Phase 1 : Foundation (Years 1-2). This phase focuses on building the necessary infrastructure, policies, and human capacity. Activities include upgrading campus internet connectivity, establishing data protection protocols, conducting needs analyses across different professional fields, and initiating teacher training programs in AI literacy and AI-TPACK. Pilot AI tools such as grammar checkers, basic chatbots, and corpus analysis software are introduced in select ESP courses to build familiarity and gather feedback.

Phase 2 : Integration (Years 2-3). In this phase, AI tools become regular components of ESP instruction. Adaptive learning platforms are deployed for personalized vocabulary and grammar instruction. Generative AI is used for materials creation, with instructors trained to design effective prompts and evaluate AI-generated content. AI-powered simulations are introduced for speaking and interactive communication practice. Assessment begins to incorporate AI tools for formative feedback, though summative evaluation remains primarily human-mediated.

Phase 3 : Transformation (Years 3-5). This phase represents a fundamental rethinking of ESP pedagogy. The curriculum shifts from a teacher-centered, textbook-based model to a learner-centered, AI-enhanced model. Students engage in project-based learning supported by AI tools, working on authentic professional communication tasks with AI collaborators and human mentors. Corpus-driven needs analysis becomes standard practice, ensuring that curricula remain responsive to evolving workplace language demands. AI assessment becomes sophisticated enough to evaluate complex professional communicative competence, including pragmatic appropriateness and intercultural sensitivity.

Phase 4 : Sustainability (Year 5 onwards). The final phase focuses on institutionalizing AI-ESP integration and ensuring long-term viability. This includes establishing centers of excellence for AI in language education, developing locally trained AI specialists, creating open educational resources specific to Cameroonian ESP contexts, and contributing to international research on AI in African language education. Continuous evaluation and ethical oversight mechanisms ensure that AI use remains pedagogically sound, culturally responsive, and socially beneficial.

Implications for Policy and Practice

The integration of AI into ESP education in Cameroonian universities has significant implications for multiple stakeholders.

For policymakers, the findings of this paper underscore the need for a national strategy for AI in higher education. This strategy should address infrastructure development, data protection legislation, funding mechanisms for educational technology, and quality assurance standards for AI-enhanced programs. The Ministry of Higher Education should establish partnerships with technology providers, international universities, and research organizations to support AI-ESP development.

For university administrators, the paper highlights the importance of strategic planning and resource allocation. AI integration should not be treated as an ad hoc technological addition but as a core component of institutional development. This requires investment in IT infrastructure, faculty development, and curriculum reform. Administrators should also ensure that AI implementation is equitable, providing access for students regardless of socioeconomic background or geographic location.

For ESP practitioners, the paper calls for proactive professional development. Teachers must move beyond fear of technological displacement to embrace AI as a tool that enhances their pedagogical capabilities. This requires developing AI-TPACK competencies, experimenting with new teaching methodologies, and contributing to the ongoing evaluation and improvement of AI tools.

For curriculum designers, the paper emphasizes the need for evidence-based, locally responsive curriculum development. AI-generated materials and corpus-driven needs analysis should supplement, not replace, the expertise of curriculum designers who understand the sociolinguistic and professional context of Cameroon. Curricula should explicitly address the multilingual reality of Cameroonian workplaces, preparing students to navigate code-switching, intercultural communication, and the specific linguistic demands of local professional environments.

For students, the paper suggests that AI-enhanced ESP education can provide more engaging, relevant, and effective learning experiences. However, students must also develop critical digital literacy skills, learning to evaluate AI-generated content, protect their data privacy, and use AI tools ethically and responsibly.

Conclusion

The intersection of Artificial Intelligence and English for Specific Purposes represents a transformative opportunity for Cameroonian higher education. As this paper has argued, AI technologies offer powerful tools for addressing the longstanding challenges of ESP instruction in Cameroonian universities : the scarcity of authentic materials, the difficulty of personalized instruction in large classes, the gap between classroom English and workplace communication, and the limited opportunities for meaningful professional practice.

Generative AI, intelligent tutoring systems, natural language processing, and automated assessment tools can each contribute to a more effective, engaging, and relevant ESP education. AI can generate culturally and professionally appropriate materials, simulate authentic workplace interactions, provide personalized feedback at scale, and analyze the linguistic features of Cameroonian professional English to inform curriculum design. The proposed four-phase framework Foundation, Integration, Transformation, and Sustainability offers a pragmatic roadmap for realizing this potential.

However, the paper has also emphasized that AI is not a panacea. Its successful integration depends on addressing significant challenges related to infrastructure, teacher training, ethics, cost, and sustainability. Moreover, AI must be implemented in ways that respect and value Cameroonian linguistic diversity rather than imposing external linguistic norms. The goal is not to replace human teachers with machines but to empower educators with tools that enhance their capacity to prepare students for the communicative demands of professional life.

As Cameroon continues to develop its digital infrastructure and higher education system, the time is ripe for bold experimentation with AI in ESP. The country's linguistic diversity, its strategic position in Central Africa, and its growing community of language education researchers make it an ideal context for pioneering AI-enhanced language education models that could serve as templates for other African nations. The question is no longer whether AI will transform ESP education in Cameroon, but how quickly, how equitably, and how effectively this transformation can be achieved.

Future research should focus on empirical studies of AI-ESP implementation in specific Cameroonian university contexts, the development of Cameroon-specific language corpora and AI training data, and the long-term impact of AI-enhanced ESP instruction on graduates' professional communication competence. The journey toward AI-integrated ESP education in Cameroon has begun, and this paper hopes to contribute to its direction and success.

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