INOMATEC: Jurnal Inovasi dan Kajian Multidisipliner Kontemporer
Vol. 01, No. 03, Tahun 2026, Hal. 1704-1711, ISSN: 3123-5573 (Online)

Digital Technologies Supporting English Communication Skills in Informatics Undergraduate Education: A Conceptual Framework

Asef Wildan Munfadlila
Universitas Bina Sehat PPNI Mojokerto
Email: acheif90@gmail.com

Article Info

Article history:

Received January 04, 2025
Revised January 09, 2025
Accepted January 11, 2025

Keywords:

English For Specific Purposes; Informatics Undergraduate Education; Digital Technologies; English Communication Skills; Technology-Enhanced Language Learning

ABSTRACT

The increasing globalization of the information technology sector has intensified the need for Informatics undergraduates to develop effective English communication skills. English functions as a key medium for technical documentation, academic discourse, and professional collaboration within the field of Informatics. At the same time, the rapid expansion of digital technologies in higher education has created new opportunities to support language learning in more contextual and discipline-relevant ways. Despite the growing body of research on technology-enhanced language learning, a clear conceptual understanding of how digital technologies can support English communication skills in Informatics undergraduate education remains limited. This conceptual paper explores the role of digital technologies in supporting the development of English communication skills among Informatics undergraduates. Drawing on perspectives from English for Specific Purposes (ESP), communicative language teaching, and educational technology, the article examines how learning management systems, online collaborative tools, multimedia resources, and AI-assisted technologies can function as pedagogical enablers of meaningful language use. A conceptual framework is proposed to illustrate the relationships between digital technologies, learning activities, and English communication outcomes within Informatics education. The paper highlights key pedagogical implications for integrating technology-enhanced English learning into Informatics curricula and discusses potential challenges related to access, pedagogical readiness, and ethical considerations. By offering a conceptual framework rather than empirical findings, this article aims to inform instructional design and support future research on technology-supported English communication learning in Informatics undergraduate contexts.

Article Info

Article history:

Received January 04, 2025
Revised January 09, 2025
Accepted January 11, 2025

ABSTRACT

Perkembangan globalisasi sektor teknologi informasi telah memperkuat kebutuhan bagi mahasiswa sarjana informatika untuk mengembangkan keterampilan komunikasi bahasa Inggris yang efektif. Bahasa Inggris berfungsi sebagai media utama untuk

Kata Kunci:

Bahasa Inggris untuk Tujuan Khusus; Pendidikan Sarjana Informatika; Teknologi Digital; Keterampilan Komunikasi Bahasa Inggris; Pembelajaran Bahasa dengan Bantuan Teknologi

dokumentasi teknis, diskusi akademis, dan kolaborasi profesional di bidang Informatika. Di sisi lain, perluasan teknologi digital yang pesat di pendidikan tinggi telah menciptakan peluang baru untuk mendukung pembelajaran bahasa secara lebih kontekstual dan relevan dengan disiplin ilmu. Meskipun terdapat banyak penelitian tentang pembelajaran bahasa yang didukung teknologi, pemahaman konseptual yang jelas tentang bagaimana teknologi digital dapat mendukung keterampilan komunikasi bahasa Inggris dalam pendidikan sarjana Informatika masih terbatas. Makalah konseptual ini mengeksplorasi peran teknologi digital dalam mendukung pengembangan keterampilan komunikasi bahasa Inggris di kalangan mahasiswa sarjana Informatika. Dengan mengacu pada perspektif English for Specific Purposes (ESP), pengajaran bahasa komunikatif, dan teknologi pendidikan, artikel ini menganalisis bagaimana sistem manajemen pembelajaran, alat kolaboratif online, sumber daya multimedia, dan teknologi yang didukung AI dapat berfungsi sebagai enabler pedagogis untuk penggunaan bahasa yang bermakna. Kerangka konseptual diusulkan untuk menggambarkan hubungan antara teknologi digital, aktivitas pembelajaran, dan hasil komunikasi bahasa Inggris dalam pendidikan Informatika. Artikel ini menyoroti implikasi pedagogis utama untuk mengintegrasikan pembelajaran bahasa Inggris yang didukung teknologi ke dalam kurikulum Informatika dan membahas tantangan potensial terkait akses, kesiapan pedagogis, dan pertimbangan etis. Dengan menawarkan kerangka konseptual daripada temuan empiris, artikel ini bertujuan untuk memberikan wawasan bagi desain instruksional dan mendukung penelitian masa depan tentang pembelajaran komunikasi bahasa Inggris yang didukung teknologi dalam konteks pendidikan sarjana Informatika.

Corresponding Author:

Asef Wildan Munfadlila
Universitas Bina Sehat PPNI Mojokerto
Email: acheif90@gmail.com

INTRODUCTION

Informatics has become one of the most globally connected disciplines, where communication across linguistic and cultural boundaries is an integral part of academic study and professional practice. English plays a central role in this context, functioning not only as a medium of instruction but also as the dominant language of technical documentation, software development, academic publications, and international collaboration. Informatics undergraduates are therefore expected to possess adequate English communication skills to participate effectively in coursework, collaborative projects, and future professional environments within the global IT workforce (Astuti & Kokom Nurjanah, 2023).

Despite this expectation, many Informatics students face persistent challenges in using English for academic and professional communication. These challenges often include limited confidence in oral communication, difficulties in producing technical written texts, and struggles with understanding discipline-specific vocabulary and complex technical materials. For students whose primary focus is computing or programming, English is frequently perceived as a peripheral subject rather than a meaningful professional tool, which may reduce engagement and limit opportunities for authentic language use (Zhang, 2024).

At the same time, higher education has experienced rapid growth in the use of digital technologies to support teaching and learning. Learning management systems, online collaboration platforms, multimedia resources, and AI-assisted tools have reshaped how students access content, interact with peers, and engage in learning activities. In the context of language education, these technologies offer new possibilities for creating authentic, interactive, and flexible learning environments that align more closely with students' disciplinary needs (Mhlongo et al., 2023).

Given these developments, there is a growing need for pedagogical approaches that integrate English learning with Informatics education in a contextual and relevant manner. Rather than treating English as a separate subject, technology-enhanced learning environments can position English communication as an integral component of disciplinary practice. However, while numerous studies have examined the use of digital technologies in language learning, there remains a need for a clear conceptual understanding of how such technologies can systematically support English communication skills in Informatics undergraduate education (Choi-Lundberg et al., 2023).

Accordingly, this paper aims to **conceptually explore how digital technologies can support the development of English communication skills among Informatics undergraduates**. By synthesizing insights from research on English for Specific Purposes (ESP), technology-enhanced language learning, and higher education pedagogy, this article proposes a conceptual framework that illustrates the relationships between digital technologies, learning activities, and English communication outcomes in Informatics education (L. A. T. Nguyen & Habók, 2024).

Although studies on technology-enhanced language learning have explored digital feedback and collaborative platforms, little attention has been given to discipline-specific frameworks for integrating technology into English communication learning for Informatics students. This conceptual paper addresses this gap by proposing an integrative framework grounded in constructivist and communicative pedagogies.

ENGLISH COMMUNICATION SKILLS IN INFORMATICS EDUCATION

English communication skills in Informatics education extend beyond general language proficiency and are closely tied to the specific communicative demands of the discipline. Within an English for Specific Purposes (ESP) perspective, these skills are shaped by the academic and professional contexts in which Informatics students are expected to operate.

Written communication is a fundamental component of Informatics education. Students are required to produce various forms of technical writing, such as project documentation, system descriptions, reports, emails, and user manuals. These tasks demand not only

grammatical accuracy but also clarity, conciseness, and the ability to explain technical concepts to diverse audiences (Kohut & Shyshkina, 2020).

Oral communication skills are equally important. Informatics undergraduates frequently engage in presentations, group discussions, and collaborative meetings, both in academic settings and simulated workplace contexts. Effective oral communication involves the ability to explain technical processes, justify design decisions, and respond to questions, often using English as a shared language among participants with different linguistic backgrounds (Velic & Orlovic, 2018).

Reading skills also play a crucial role, as Informatics students must comprehend technical texts, research articles, online documentation, and programming resources that are predominantly available in English. The ability to extract relevant information from complex texts is essential for problem-solving and continuous learning within the field (Karakus et al., 2012).

Finally, discipline-specific vocabulary forms the foundation of effective communication in Informatics. Technical terms, acronyms, and specialized expressions are integral to understanding and producing meaningful discourse. From an ESP standpoint, mastery of such vocabulary is inseparable from communicative competence, as it enables students to participate legitimately in disciplinary communities of practice.

Given Informatics students' digital fluency, their engagement with English learning may benefit from tasks that combine linguistic objectives with digital production processes. Embedding English communication within programming documentation, digital storytelling, or online technical discussions can thus align language learning with students' technological competencies (Lou, 2025).

While each technology provides distinct affordances, their pedagogical value depends on how they enable interaction and negotiation of meaning. For instance, AI tools can scaffold feedback, but communicative competence develops only when learners actively respond to and reflect upon automated suggestions within social learning contexts

DIGITAL TECHNOLOGIES IN ENGLISH LANGUAGE LEARNING

Digital technologies have become central to contemporary English language learning, particularly in higher education contexts where flexibility, collaboration, and authenticity are increasingly emphasized. In Informatics education, these technologies offer opportunities to bridge the gap between language learning and disciplinary practice.

Learning Management Systems (LMS) provide structured environments where instructional materials, assignments, and feedback can be integrated. LMS platforms allow English learning activities to be aligned with Informatics coursework, enabling students to engage with language tasks that are directly relevant to their academic projects (et al., 2022).

Online collaborative tools, such as shared documents, discussion forums, and project management platforms, support collaborative learning and peer interaction. These tools encourage students to use English for real communication purposes, including negotiating meaning, providing feedback, and co-constructing knowledge in group settings.

Multimedia and video-based learning resources offer rich input that supports listening comprehension and contextual understanding. Instructional videos, recorded presentations, and

demonstrations can expose students to authentic language use in technical and professional contexts, while also allowing repeated access for self-paced learning (T. N. Nguyen, 2023).
AI-based tools, including grammar checkers and automated feedback systems, have gained increasing attention in language education. When used appropriately, these tools can support revision processes, raise awareness of language accuracy, and promote learner autonomy. However, their pedagogical value depends on how they are integrated into instructional design rather than on their technical features alone.

Mobile learning applications further extend learning beyond the classroom, enabling students to engage with English in flexible and informal ways. These applications can support vocabulary development, micro-learning activities, and continuous exposure to English, complementing formal instructional settings (Jiang et al., 2017).

Importantly, digital technologies should be viewed as **learning enablers** rather than as isolated tools. Their effectiveness in supporting English communication skills depends on pedagogical alignment, task design, and the active involvement of both instructors and learners.

CONCEPTUAL FRAMEWORK: DIGITAL TECHNOLOGIES AND COMMUNICATION SKILLS

This article proposes a conceptual framework that illustrates how digital technologies can support the development of English communication skills in Informatics undergraduate education. At the core of the framework is the relationship between **digital technologies**, **learning activities**, and **English communication outcomes**.

Digital technologies serve as mediating tools that enable the design of meaningful learning activities, such as project-based tasks, collaborative writing, presentations, and discussions. These activities create opportunities for students to use English as a functional means of communication within authentic Informatics-related contexts (Wang & Dou, 2024).

Figure 1. Hierarchical flow of digital technologies mediating English communication skill development in Informatics education

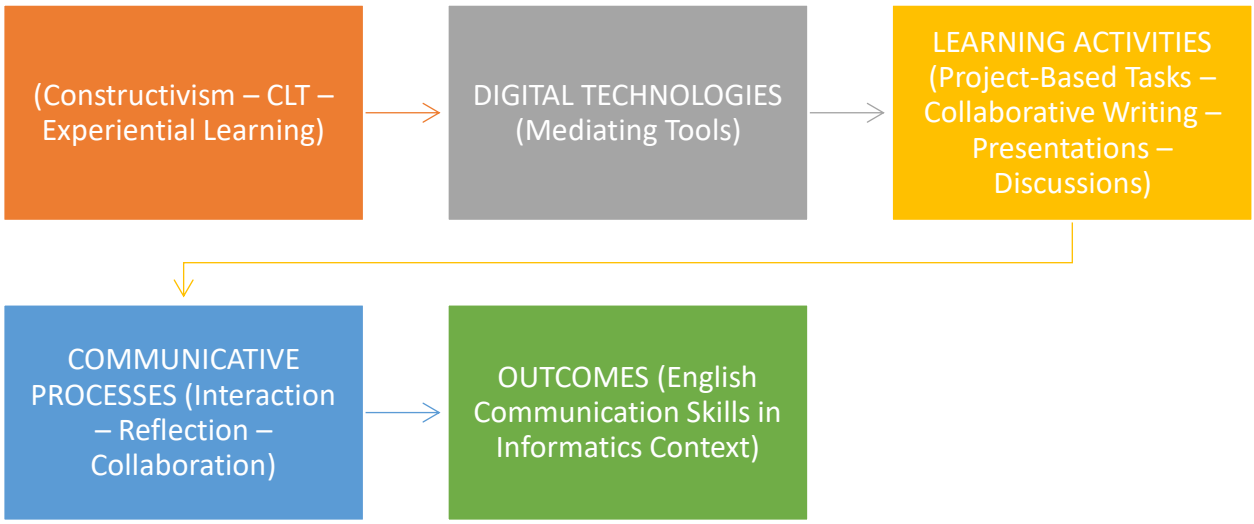

Figure 1 depicts a hierarchical relationship among pedagogical foundations, digital technologies, learning activities, and communication outcomes. At the base, **pedagogical**

principles—Constructivism, Communicative Language Teaching (CLT), and Experiential Learning—serve as the theoretical grounding. Above this, **digital technologies** function as **mediating tools** that translate theory into instructional design and meaningful practice. These technologies enable **learning activities** such as project-based tasks, collaborative writing, and presentations, which create authentic opportunities for students to use English in Informatics-related contexts. At the top level, the framework converges toward **English communication skills**, representing the ultimate learning outcome. The top-down flow highlights how pedagogical theories guide practice through technology-mediated learning processes, resulting in contextualized communication competence (Mahato et al., 2020).

Within this framework, instructors play a critical role as facilitators of learning. Rather than acting as sole knowledge providers, instructors design tasks, guide interactions, and provide scaffolding to support students' engagement with both content and language. Their pedagogical decisions shape how technologies are used and how communication skills are developed.

Figure 2. Interactive framework illustrating reciprocal relationships among instructors, students, and digital technologies in fostering English communication

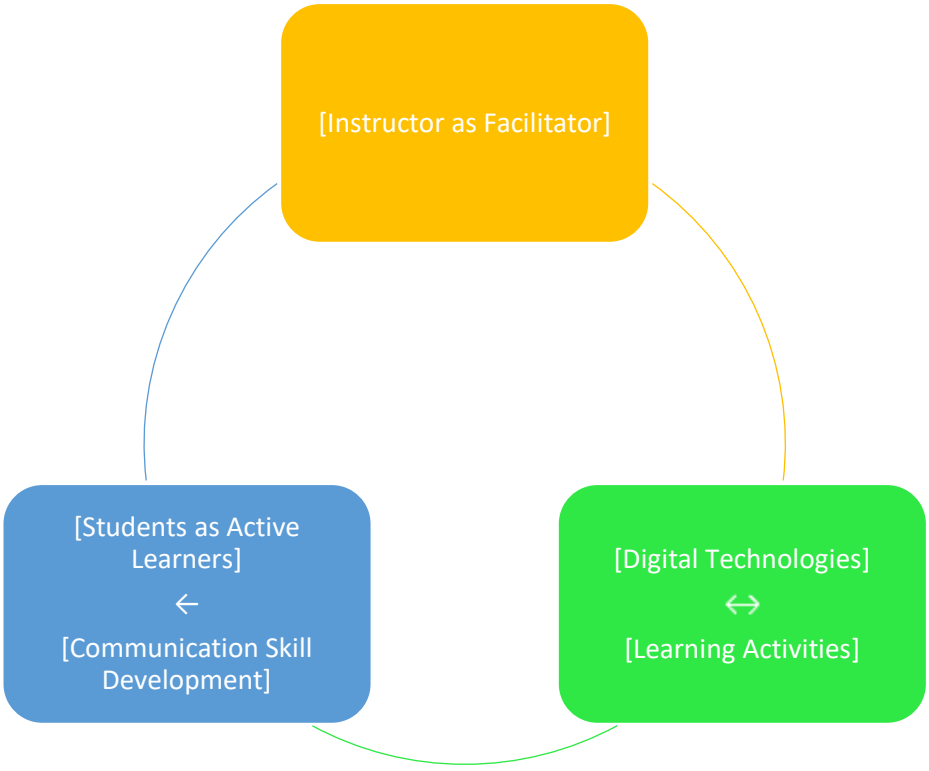

Figure 2 visualizes the dynamic, reciprocal interaction between **instructors, students, and digital technologies**. Instructors act as **facilitators**, designing learning tasks and providing scaffolding that fosters meaningful engagement. **Digital technologies** serve as the **mediational bridge** linking pedagogical design with communicative performance. Meanwhile, **students** are positioned as **active learners** who construct understanding through participation, collaboration, and reflection within digital environments. All three elements form a continuous cycle of interaction, representing a **participatory and reflective learning ecosystem** where technology

supports, rather than replaces, human communication and collaboration. This model emphasizes that communicative competence emerges through ongoing interaction among human agents and digital tools.

Students, in turn, are positioned as active learners who construct knowledge through participation, collaboration, and reflection. By engaging in technology-supported activities, students take responsibility for their learning, develop communicative confidence, and gradually build disciplinary English competence.

Figure 3. Layered conceptual model of pedagogical foundations, technology-supported learning processes, and communication outcomes

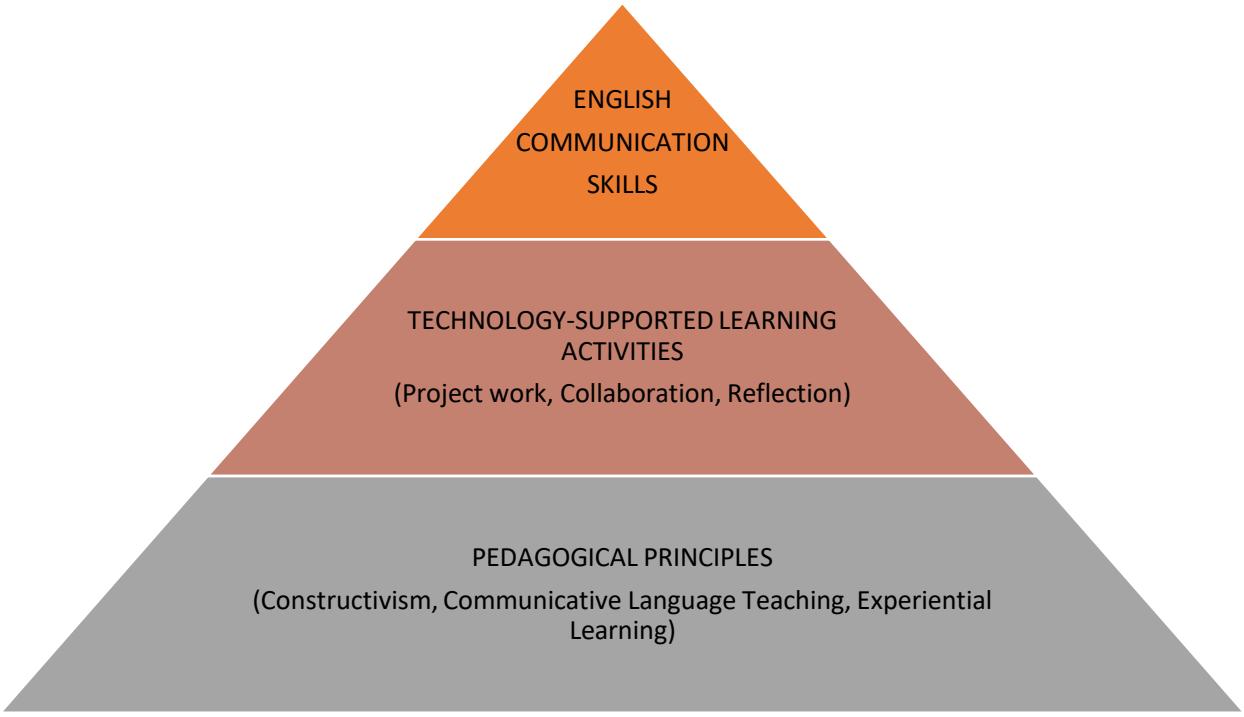

Figure 3 presents a **layered conceptual model** that demonstrates how theoretical principles, technology-mediated processes, and communication outcomes are interrelated. The **base layer** represents **pedagogical foundations**—Constructivism (learning through active meaning-making), Communicative Language Teaching (meaningful interaction), and Experiential Learning (learning through reflection and practice). The **middle layer** highlights **technology-supported learning processes**, including collaborative writing, project-based communication, and online discussions that integrate both language and technical content. The **top layer** culminates in **English communication skills**, encompassing writing, speaking, and collaborative competence within Informatics contexts. This layered model underscores that communicative skill development emerges from the integration of sound pedagogy, authentic practice, and purposeful use of digital technologies.

Together, Figures 1 to 3 represent a conceptual progression—from the hierarchical relationship between pedagogy and technology (Figure 1), through the interactive dynamics of participants (Figure 2), to the layered synthesis of theoretical foundations, processes, and

outcomes (Figure 3). This progression illustrates how digital technologies transform pedagogical principles into communicative practices within Informatics education.

The framework is grounded in several pedagogical principles. Constructivism emphasizes learning as an active process in which learners construct meaning through experience. Communicative Language Teaching highlights the importance of meaningful interaction and authentic communication. Experiential learning underscores the value of learning through practice and reflection, particularly in contexts that simulate real-world tasks. Together, these principles provide a theoretical foundation for understanding how digital technologies can support English communication skills in Informatics education (Saqjuddin et al., 2025).

PEDAGOGICAL IMPLICATIONS

The proposed conceptual framework offers several pedagogical implications for Informatics undergraduate education. First, instructors are encouraged to design technology-based tasks that require students to use English for genuine communication purposes, such as explaining technical concepts, collaborating on projects, or presenting solutions.

Second, the integration of digital technologies into the Informatics curriculum should be intentional and aligned with learning outcomes. English communication skills should be embedded within disciplinary courses rather than treated as separate or supplementary components.

Third, assessment strategies should reflect the communicative nature of learning activities. Evaluating written reports, presentations, and collaborative contributions can provide more meaningful insights into students' communication development than traditional language tests.

For instance, project-based assignments could require students to design bilingual system documentation, develop English-language video tutorials on coding concepts, or collaborate on international open-source projects. Such tasks combine authentic disciplinary practice with communicative competence. Institutions should also establish cross-departmental collaboration between language instructors and Informatics faculty to ensure consistent integration of communicative objectives across technical courses (Julius Fusic et al., 2022).

Finally, both instructors and students require adequate preparation to effectively engage with technology-enhanced learning environments. Professional development for instructors and digital literacy support for students are essential to ensure that technologies are used pedagogically rather than superficially.

CHALLENGES AND CONSIDERATIONS

While digital technologies offer significant potential, their integration into English communication learning also presents challenges. Access to technology may vary across institutions and students, potentially exacerbating inequalities in learning opportunities. Technical limitations and infrastructure constraints can affect the consistency and quality of learning experiences.

Pedagogical readiness is another critical consideration. Instructors may require support in designing effective technology-enhanced language activities and in balancing disciplinary

content with language development. Without appropriate guidance, technology use may remain limited to content delivery rather than active communication (Ofem et al., 2025).

There is also a risk of over-reliance on technology, particularly AI-based tools. While such tools can support learning, excessive dependence may reduce critical engagement with language and raise concerns related to academic integrity. Ethical considerations surrounding data privacy and responsible AI use must therefore be addressed within instructional design (Jiang et al., 2017).

Beyond infrastructural concerns, pedagogical dependence on AI tools may diminish instructors' role as facilitators of communicative learning. Therefore, professional development should not only focus on technical proficiency but also on cultivating teachers' pedagogical agency—ensuring that AI integration enhances rather than replaces human interaction and feedback

FUTURE DIRECTIONS

Future research should build upon this conceptual framework through empirical investigation. Studies employing mixed-method or design-based research approaches could examine how specific technologies and pedagogical strategies influence English communication development in Informatics contexts.

Emerging technologies, such as artificial intelligence and virtual reality, also warrant further exploration for their potential to create immersive and interactive communication environments. Additionally, interdisciplinary collaboration between language educators, Informatics faculty, and instructional designers can contribute to more holistic and sustainable approaches to English communication learning.

Future studies should also examine contextual differences in technology adoption across regions and institutions, identifying socio-cultural and linguistic factors that shape effective integration. Collaborative research between computer science and applied linguistics scholars could further refine frameworks that are both technologically robust and pedagogically grounded

CONCLUSION

This conceptual article has explored the role of digital technologies in supporting English communication skills among Informatics undergraduates. By integrating insights from ESP, language pedagogy, and educational technology, the paper has proposed a conceptual framework that highlights the relationships between technology use, learning activities, and communication outcomes.

The contribution of this article lies in its conceptual clarification of how digital technologies can be pedagogically aligned with the communication needs of Informatics students. Rather than emphasizing technological innovation alone, the framework underscores the importance of contextual relevance, active learning, and instructional design in supporting English communication development. In doing so, the paper offers a foundation for future research and pedagogical practice in technology-enhanced English education.

REFERENCES

Aleksius, M., Lake, F., Werang, E. A., & Seran, M. F. (2022). Exploring EFL Students' Perceptions of Google Classroom as Learning Management System. *VELES Voices of English Language Education Society*. https://doi.org/10.29408/veles.v6i1.5113

Astuti, S., & Kokom Nurjanah. (2023). Teachers'perception on English Curriculum and Material in Vocational High School. *JOLADU: Journal of Language Education*. https://doi.org/10.58738/joladu.v2i1.341

Choi-Lundberg, D. L., Butler-Henderson, K., Harman, K., & Crawford, J. (2023). A systematic review of digital innovations in technology-enhanced learning designs in higher education. *Australasian Journal of Educational Technology*. https://doi.org/10.14742/ajet.7615

Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. In *Stroke and Vascular Neurology*. https://doi.org/10.1136/svn-2017-000101

Julius Fusic, S., Anandh, N., Anitha, D., Sugumari, T., & Sri Vinodhini, H. (2022). Impact of implementing project-based assignment (PBA) in CDIO framework for computer numerical control application course. *Computer Applications in Engineering Education*. https://doi.org/10.1002/cae.22545

Karakus, M., Uludag, S., Guler, E., Turner, S. W., & Ugur, A. (2012). Teaching computing and programming fundamentals via App Inventor for Android. *2012 International Conference on Information Technology Based Higher Education and Training, ITHET 2012*. https://doi.org/10.1109/ITHET.2012.6246020

Kohut, U., & Shyshkina, M. (2020). Providing the fundamentalisation of operations research learning using MAXIMA system. *CEUR Workshop Proceedings*.

Lou, Y. (2025). The impact of virtual reality environments on English language acquisition: Innovative immersive learning technologies for communication skills development. *Journal of Computational Methods in Sciences and Engineering*. https://doi.org/10.1177/14727978251337950

Mahato, V., Obeidi, M. A., Brabazon, D., & Cunningham, P. (2020). An evaluation of classification methods for 3D printing time-series data. *IFAC-PapersOnLine*. https://doi.org/10.1016/j.ifacol.2020.12.1992

Mhlongo, S., Mbatha, K., Ramatsetse, B., & Dlamini, R. (2023). Challenges, opportunities, and prospects of adopting and using smart digital technologies in learning environments: An iterative review. *Heliyon*. https://doi.org/10.1016/j.heliyon.2023.e16348

Nguyen, L. A. T., & Habók, A. (2024). Tools for assessing teacher digital literacy: a review. *Journal of Computers in Education*. https://doi.org/10.1007/s40692-022-00257-5

Nguyen, T. N. (2023). The Implementation of Canvas to Enhance English Teaching and Learning. *Journal of English Language Teaching and Applied Linguistics*. https://doi.org/10.32996/jeltal.2023.5.2.22

Ofem, U. J., Orim, F. S., Edam-Agbor, I. B., Amanso, E. O. I., Eni, E., Ukatu, J. O., Ovat, S. V., Osang, A. W., Dien, C., & Abuo, C. B. (2025). Teachers' preparedness for the utilization of artificial intelligence in classroom assessment: the contributory effects of attitude toward technology, technological readiness, and pedagogical beliefs with perceived ease of use and perceived usefulness as mediators. *Frontiers in Education*.

https://doi.org/10.3389/feduc.2025.1568306

Saqjuddin, S., Parisu, C. Z. L., & Saputra, E. A. (2025). Exploring Deep Learning Practices in Social Studies within Inclusive Elementary Classrooms. *Jurnal Riseta Soshum*. https://doi.org/10.70392/jrs.v2i2.4754

Velic, A., & Orlovic, A. (2018). Human Resource Management - Perception of Police Officers concerning Education and Police Career Developement. *POLICIJA I SIGURNOST-POLICE AND SECURITY*.

Wang, D., & Dou, W. (2024). Investigation on how carbon markets and digital transformation affect green innovation: evidence from Chinese listed companies. *Environment, Development and Sustainability*. https://doi.org/10.1007/s10668-023-03575-5

Zhang, H. (2024). The Impact of English Language Development on Internationalization of Education. *Lecture Notes in Education Psychology and Public Media*. https://doi.org/10.54254/2753-7048/34/20231933