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Teaching in the Digital Era. Enhancing Technical Vocabulary and Grammar in Engineering

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Abstract: The paper explores the use of digital tools, specifically Kahoot and PowerPoint, in teaching English for Specific Purposes (ESP) to engineering students. The study examines how these platforms enhance student engagement, support the acquisition of technical vocabulary, and improve grammar mastery. By integrating these tools into lectures and assessments, this study evaluates their impact on student motivation, participation, and comprehension. The paper emphasizes the potential of digital tools in promoting a dynamic and collaborative learning environment, while helping students communicate complex engineering concepts in English and bridging the gap between theory and practice in technical language education.

Keywords: digital, teaching, English, students, engineering.

1. Introduction

Technology will not replace great teachers, but technology in the hands of great teachers can be transformational. – George Couros

This study analyses the effectiveness of PowerPoint and Kahoot in enhancing student engagement and comprehension in university-level engineering courses. It examines their impact on students' attention spans, participation rates, and overall academic performance. By analysing their structured implementation in the classroom, this research provides insights into best practices for technology integration in engineering education. Additionally, it contributes to the broader discourse on digital communication in academia, emphasizing innovation, engagement, and effective knowledge transmission

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In engineering education, mastering technical language is crucial for the effective transmission of knowledge. English has emerged as the dominant language for communication in technical sciences, ensuring consistency and accessibility in global academic discourse. The ability to convey complex engineering concepts in a standardized language promotes collaboration, research, and innovation across international academic and professional communities. Given this linguistic standardization, it is essential for educators to adopt effective teaching strategies that not only facilitate understanding of theoretical concepts but also actively engage students in the learning process.

Student engagement plays an essential role in academic success, directly influencing comprehension, acquisition, and overall performance. Traditional lecture-based approaches often fail to capture and sustain student attention, particularly in fields as intricate as engineering. This challenge has led educators to explore and integrate more interactive teaching methods that encourage active participation and enhance motivation. Among these, technology-driven learning tools stand out as particularly effective, providing dynamic, interactive learning experiences that significantly improve student engagement and knowledge acquisition.

2. Theoretical Framework: The Role of Digital Technology in Language Learning

In recent years, digital technology has become an integral part of higher education, transforming traditional teaching methodologies and reshaping student engagement with course content. In the field of language acquisition, technological tools have been widely recognized for their potential to enhance motivation, participation, and learning outcomes (Chapelle 2010 19-25; Levy & Hubbard 2005, 143-149). Platforms such as PowerPoint and game-based applications like Kahoot, Quizzizz, Mentimeter, and Gimkit promote a more interactive and student-centered approach, addressing limitations of conventional lecture-based instruction. In specialized fields such as engineering, the combination of structured theoretical content delivery with interactive engagement is essential for reinforcing language acquisition and technical terminology mastery.

Within English for Specific Purposes (ESP), particularly in technical disciplines, the challenge is not only to teach general linguistic structures but also to facilitate the acquisition of specialized vocabulary. Research on technology-enhanced language learning suggests that digital tools not only support linguistic development but also sustain student motivation and engagement (Blake 2013, 45-60). For instance, PowerPoint allows for clear and structured content presentation, while Kahoot introduces gamification elements that transform assessments into interactive and competitive learning experiences (Zarzycka-Piskorz 2016, 17-36). Additionally, Mayer's (2021) Cognitive Theory of Multimedia Learning highlights that combining text, visuals, and interactivity optimizes information retention by accommodating diverse learning preferences, making complex concepts more accessible.

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Beyond individual engagement, digital technology also fosters collaboration, a key element in contemporary didactic strategies. Socio-constructivist theories emphasize peer interaction as a fundamental driver of knowledge acquisition, arguing that students learn more effectively when engaging in shared tasks (Vygotsky 1978, 69-86). According to Vygotsky's Zone of Proximal Development (ZPD), learning is most effective when students perform tasks that slightly exceed their independent capabilities, supported by peers or instructors. This aligns with Computer-Supported Collaborative Learning (CSCL), which highlights the role of digital platforms in facilitating meaningful peer-to-peer collaboration (Stahl, Koschmann, & Suthers 2006, 409-426). By implementing team-based quizzes, learners not only reinforce their technical vocabulary but also develop cooperative problem-solving skills, mirroring real-world professional interactions.

However, the mere presence of technology in the classroom does not automatically translate into better learning outcomes. Effective pedagogical integration is essential (Hubbard 2013, 163-178). The Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler 2006, 1017-1054) provides a structured approach for integrating digital tools by balancing technological, pedagogical, and content knowledge. In this study, PowerPoint and Kahoot were not used in isolation but strategically integrated to complement traditional teaching methods, ensuring that students not only assimilated theoretical knowledge but also actively applied it through interactive assessments.

The implementation of these tools follows the principles of blended learning, which combines face-to-face instruction with online and interactive components to enhance student engagement and comprehension (Garrison & Vaughan 2008, 134-140.). Research on game-based learning suggests that platforms such as Kahoot increase motivation and improve information retention by incorporating competition and immediate feedback mechanisms (Wang 2015, 217-227). Additionally, the Cognitive Load Theory (Sweller 2011, 37-76) argues that well-structured multimedia learning environments reduce extraneous cognitive load, making complex technical language more digestible for ESP students.

To maximize the impact of digital tools, their use must be carefully aligned with instructional goals and student needs. As Dörnyei and Ushioda (2021) emphasize, motivation in second language acquisition depends significantly on the learning environment, which should offer both cognitive challenges and emotional engagement. By integrating PowerPoint for structured content delivery and Kahoot for interactive reinforcement, this approach not only enhances technical vocabulary and grammar acquisition but also encourages active participation, fostering a more engaging and effective learning experience.

2.1. Methodology

In previous academic years, quizzes were occasionally conducted using PowerPoint as a means of assessing students' progress throughout the semester. This approach was generally well received, as students found it more engaging and less stressful

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compared to traditional examination methods. Building on this positive response, the present study analyses the class records of the two academic years with five groups of engineering students from the following specializations: Industrial Informatics, Engineering and Management, Waste Valorization Engineering, Road Vehicles Engineering, and Electrical and Computer Engineering. The data contains records from 2022-2023 and 2023-2024.

The primary objective of this study was to evaluate the impact of integrating technology-driven tools—specifically PowerPoint and Kahoot—on student engagement, comprehension, and knowledge acquisition in the context of English language learning for engineering students. In the first semester, PowerPoint was used for the delivery of theoretical content, as well as for interactive quizzes. These quizzes, designed to test students' grasp of technical vocabulary and grammar rules, were incorporated into the lessons to foster active participation. To make the quizzes more engaging and avoid monotony, an additional question from various fields such as music, history, geography, or general culture was included in each session. This element not only sparked curiosity but also encouraged students to think beyond their technical domain. Furthermore, each quiz revisited concepts from previous lessons, reinforcing knowledge and allowing for continuous review throughout the semester. Students earned points based on their quiz responses, which encouraged engagement and motivated them to stay involved throughout the course.

In the second semester, PowerPoint continued to serve as the tool for presenting theoretical content, while Kahoot was introduced for conducting quizzes in a gamified format. Kahoot provided a dynamic and competitive platform for students to assess their comprehension of the material, which not only reinforced learning but also promoted collaboration. As with PowerPoint quizzes, Kahoot also incorporated review questions from previous lessons, ensuring ongoing reinforcement of key concepts. The inclusion of interdisciplinary bonus questions further enhanced engagement by making the quizzes feel less predictable and more stimulating. Students worked in teams to answer Kahoot quiz questions, thus enhancing peer learning and fostering a sense of community within each group.

Each specialization consisted of approximately 30 students. However, due to the fact that many of the students are employed full-time, actual attendance during sessions typically ranged from 15 to 17 students per class. Having students attend the English seminar was an ongoing challenge, especially in previous years.

Data regarding student engagement, comprehension, and attendance were gathered through informal observations and student feedback, alongside the performance results from the quizzes. These data were analyzed to assess the effectiveness of the technological tools in fostering student motivation, enhancing participation, and improving the acquisition of both technical vocabulary and grammatical structures. Student reflections highlighted the positive impact of the interdisciplinary questions and the review-based approach, noting that these elements made the quizzes more interactive and cognitively engaging. Additional reflections from students were also collected to gain a deeper understanding of their experiences

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with the tools, offering valuable insights into how these interactive methods influenced their learning process. The overall aim was to evaluate not only the immediate educational outcomes but also the longer-term impact on students' ability to engage actively with complex technical content in English.

3.1. Data collection

Data for this paper were collected through both quantitative and qualitative methods. The quantitative data were obtained from several sources, including attendance records, which provided insight into student participation rates across both semesters, and quiz scores from assessments conducted via PowerPoint in the first semester and Kahoot in the second semester. These scores were instrumental in tracking student performance and evaluating the effectiveness of the digital tools in reinforcing technical vocabulary and grammar. Attendance was recorded at every seminar, either through a sign-in sheet or by calling students by name, and a notable increase in participation was observed. In addition, students were assessed based on their team performance, working in teams of up to four members from the very first lesson. This structure encouraged collaborative learning, where if one team member was uncertain about an answer, others could offer their support, allowing for brief discussions during the few seconds that the question was presented.

Each quiz allowed teams to earn a maximum of one point per session, but the scoring system introduced an element of challenge and competition. With 24 questions in total, teams had to answer at least 22 correctly to secure the full point. A score between 22 and 20 earned 0.75 points, while any score below 20 resulted in 0.5 points. This structured approach to scoring heightened the competitive spirit among teams, motivating students to pay closer attention to both the material covered in class and the quizzes themselves. Knowing that even a small mistake could affect their standing, students became more engaged in discussions, worked more effectively in teams, and displayed an increased commitment to accuracy and participation.

However, students who accumulated too few points throughout the semester were required to take the final exam to reach the necessary grade threshold. In such cases, their final grade was calculated based on both the points earned during the quizzes and their performance on the exam. This system encouraged consistent engagement, as students recognized the advantage of actively participating in quizzes to secure a passing grade without the added pressure of an end-of-semester exam.

To ensure focus and minimize distractions, the use of mobile phones was not permitted during these collaborative sessions. Alongside the quantitative data, qualitative data were gathered through student feedback, collected via anonymous surveys at the end of each semester. The responses were analyzed thematically, grouping key insights into categories such as engagement levels, perceived effectiveness of the quizzes in reinforcing learning, and overall student satisfaction. Many students reported that the quizzes helped them recall previously learned material more effectively, while others emphasized the motivational boost provided by the competitive elements of Kahoot. Additionally, common themes that emerged

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included the appreciation for team-based activities and the balance between structured review and new learning opportunities. By identifying these recurring patterns, the study gained a deeper understanding of how students interacted with the tools and how they perceived their impact on the learning process.

3.2. Data analysis

The collected data were analyzed using both quantitative and qualitative approaches to assess the impact of integrating digital tools into ESP instruction for engineering students. Quantitative data, including attendance records and quiz scores, were compared across the two semesters to identify trends in student participation and performance. Before implementing PowerPoint and Kahoot for each seminar quizzes, occasionally (1/semester) structured quiz-based assessments were used, and student engagement during lessons was lower. Many students, especially those lacked motivation to actively participate in class activities. The introduction of interactive, technology-enhanced weekly assessments contributed to an increase in attendance and engagement, as students became more involved in the learning process.

To quantify the impact of quiz-based activities on student engagement and learning outcomes, attendance rates from the academic year 2022/2023—when no quiz-based activities were used—were compared with those from 2023/2024, during which PowerPoint quizzes were introduced in the first semester, followed by Kahoot in the second. Additionally, quiz performance data were analyzed to assess whether the transition from PowerPoint-based quizzes to Kahoot had a measurable effect on conceptual understanding and knowledge application. This approach aligns with the principles of formative assessment (Black & Wiliam, 1998), which emphasize the role of continuous feedback in enhancing learning. Furthermore, Cognitive Load Theory (Sweller, 2011) suggests that interactive and gamified learning environments, such as Kahoot, may reduce extraneous cognitive load and improve information retention compared to more static quiz formats.

For the qualitative component, student feedback from anonymous surveys was analyzed using thematic analysis (Braun & Clarke, 2006). Responses were categorized based on key themes, including the perceived usefulness of the tools, motivation levels, teamwork dynamics, and overall learning experience. Thematic analysis allowed for the identification of recurring patterns in student perceptions, providing deeper insights into both the benefits and challenges of integrating digital technology into language instruction.

This approach aligns with the constructivist paradigm (Lincoln & Guba, 1985), which views knowledge as actively constructed rather than passively received. In this perspective, learning is a dynamic process influenced by personal experiences, social interactions, and contextual factors. By analyzing student feedback qualitatively, this study acknowledges the subjectivity of learning experiences, recognizing that the impact of digital tools varies based on individual learner needs and perceptions. Additionally, social constructivism (Vygotsky, 1978) suggests that knowledge is co-constructed through interaction with peers and instructors, reinforcing the importance

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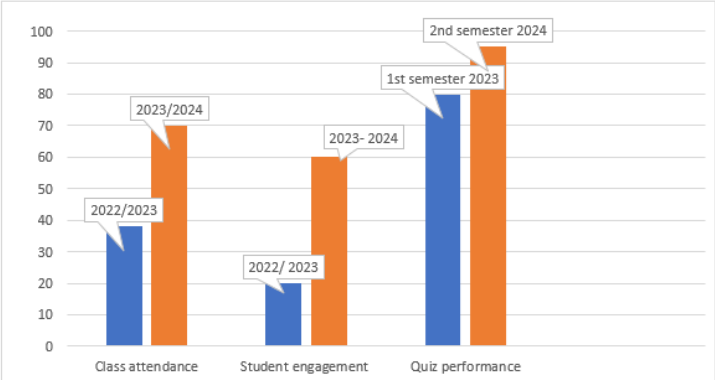
of collaborative and interactive learning environments. Understanding students' perspectives within this paradigm enables educators to refine pedagogical strategies, ensuring that technology is integrated in a way that enhances engagement, motivation, and deep learning.

By combining these analytical methods, the study aimed to provide a comprehensive evaluation of how digital tools influence student engagement, knowledge acquisition, and collaborative learning in an ESP context.

The following graph is based on attendance records maintained throughout the academic year and illustrates the changes in student participation before and after the implementation of quiz-based activities.

3.3. Results and discussions

The integration of PowerPoint and Kahoot quizzes into ESP instruction has had a measurable impact on class attendance, student engagement, and quiz performance. Comparative data from the 2022/2023 and 2023/2024 academic years highlight the



effectiveness of structured, interactive assessments in fostering a more dynamic and participatory learning environment. lass attendance increased significantly in 2023/2024 following the introduction of structured quizzes, as students recognized the benefits of accumulating points toward their final grade. This aligns with Self-Determination Theory (Deci & Ryan, 1985), which posits that motivation is enhanced when learners experience a sense of competence and autonomy. The findings suggest that gamified assessments not only encourage more consistent class participation but also foster intrinsic motivation by making learning more engaging and goal-oriented.

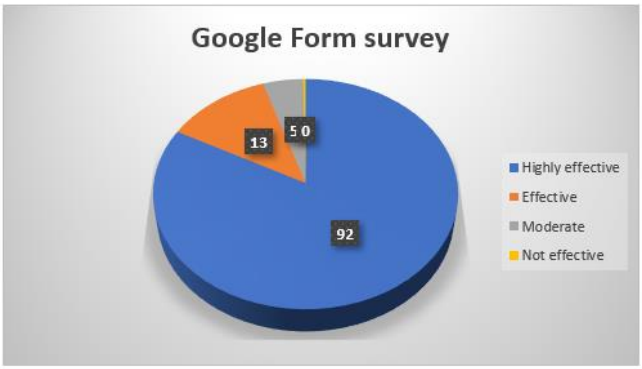
Beyond attendance, students exhibited higher levels of engagement during lessons, demonstrating increased willingness to participate in discussions and interact with course material. The use of digital tools transformed traditional lectures into more dynamic sessions, where students actively contributed rather than passively absorbing information. This shift not only made learning more enjoyable but also reinforced key linguistic concepts by allowing students to immediately apply their knowledge in quiz-based activities.

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Quiz performance showed a notable improvement over the course of the academic year. A comparison between the two semesters of 2023/2024 indicates that while PowerPoint quizzes in the first semester contributed to knowledge reinforcement, the introduction of Kahoot in the second semester led to even greater engagement and acquisition. The real-time feedback and competitive nature of Kahoot appeared to enhance students' motivation, making the learning process more enjoyable and effective. Additionally, the continuous assessment system reduced the number of students required to take the final exam, as many had already accumulated sufficient points throughout the semester.

Student feedback reflected a highly positive perception of quiz-based assessments, highlighting their interactive and engaging nature. Many students reported that the quizzes not only made learning more enjoyable but also reinforced key concepts in a structured manner. The competitive element further enhanced motivation, as students were encouraged to actively participate and strive for improved performance. Additionally, the incorporation of team-based quizzes fostered collaborative learning, enabling students to discuss and refine their understanding of technical vocabulary and grammar in a supportive environment. Overall, students expressed enthusiasm for this approach, emphasizing that it contributed to a more dynamic, engaging, and rewarding learning experience

Anonymous surveys were conducted at the end of the first semester using a traditional format and at the end of the second semester via Google Forms to evaluate students' perceptions of quiz-based learning, engagement levels, and overall satisfaction with the use of PowerPoint and Kahoot. The survey responses indicated a predominantly positive experience, with students emphasizing the interactive nature of the quizzes and their effectiveness in reinforcing technical vocabulary and grammar. These findings align with research on technology-enhanced language learning (Chapelle, 2010), which highlights the role of digital tools in promoting engagement and facilitating knowledge retention.



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While the majority of students appreciated the quiz-based format for its engaging and interactive nature, some suggested minor adjustments to further enhance their learning experience. Specifically, they recommended incorporating a mix of quiz types to introduce greater variety and accommodate different learning preferences. Additionally, a few students noted that adjusting time constraints could help alleviate the pressure associated with answering questions quickly, allowing for a more thoughtful and balanced approach to assessments.

4.3 Limitations and future research

This study primarily examined the impact of quiz-based learning on student engagement and knowledge acquisition. The focus was on helping students solidify grammar rules and develop technical language proficiency in an interactive and engaging way. Tools like Kahoot and PowerPoint quizzes provided structured reinforcement, making complex linguistic concepts more accessible. Future research could explore whether integrating additional digital platforms, such as Mentimeter, Quizizz, or Gimkit, can enhance students' ability to apply technical vocabulary and grammatical structures effectively in written reports, presentations, or workplace communication.

Although the integration of digital tools significantly enhanced student engagement and participation, certain technological and logistical challenges emerged throughout the study, highlighting areas for refinement in future applications. These limitations varied depending on the tool used in each semester, influencing both the accuracy of assessments and the overall learning experience. For instance, in the first semester, PowerPoint quizzes required students to manually write and exchange answers for peer correction. While this method promoted collaboration and active engagement, it also presented certain limitations, sometimes leading to unclear handwriting or misinterpretation of responses or even to unintentional errors during evaluation. These challenges highlight the need for more automated and structured assessment tools to ensure greater reliability and consistency in feedback.

Furthermore, the grading process proved to be time-consuming, reducing the time available for other instructional activities. To improve this aspect of assessment, future implementations could explore the use of digital response systems that automate answer collection and grading, offering instant feedback and minimizing discrepancies. Platforms such as Google Forms or Socrative could provide real-time analytics, enhancing both student and instructor engagement in the learning process.

The second semester introduced Kahoot as an interactive alternative, shifting from paper-based quizzes to real-time digital assessments. While students responded positively to the gamified format, some technical challenges affected the overall experience. It provided instant feedback but its time-restricted format sometimes pressured students to prioritize speed over accuracy, potentially impacting their comprehension of technical vocabulary and grammar rules. To address these concerns, future research could explore alternative digital platforms that offer greater flexibility, such as Quizizz, which allows students to complete quizzes at their own

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pace, or Mentimeter, which provides interactive polling and assessments without imposing strict time constraints.

Since each team accessed Kahoot using a single mobile device, occasional connectivity issues disrupted participation, causing delays and limiting students' ability to respond within the allocated time. Future actions should ensure access to a stable Wi-Fi network or providing backup devices could help minimize technical disruptions and enhance the overall learning experience.

Future research should explore strategies to further optimize technical language acquisition in ESP instruction for engineering students. While digital tools such as Kahoot and PowerPoint have proven effective in enhancing engagement and reinforcing vocabulary and grammar, additional technological innovations could further support students in mastering discipline-specific terminology and language structures. For example, virtual labs and simulation software could provide immersive experiences where students engage with technical vocabulary in real-world engineering scenarios. Augmented reality (AR) and virtual reality (VR) applications could enhance comprehension by allowing students to interact with 3D models of complex engineering systems while learning the corresponding terminology. Additionally, AI-powered language learning apps and speech recognition tools could offer personalized feedback on pronunciation and technical writing, ensuring a more adaptive and effective learning process. These advancements would not only reinforce theoretical knowledge but also enhance students' ability to apply technical language in professional contexts.

Future research could also investigate the integration of interdisciplinary approaches in ESP instruction for engineering students. Collaborating with subject-matter experts from engineering fields to co-develop language learning materials could bridge the gap between linguistic competence and technical expertise. This approach would ensure that students not only acquire technical vocabulary but also understand how to apply it in authentic industry contexts, such as technical documentation, workplace communication, and project presentations. Additionally, analysing how industry-relevant communication skills—such as writing professional emails, drafting reports, or engaging in technical discussions—can be effectively incorporated into ESP curricula would provide valuable insights for improving language instruction tailored to engineering professionals.

4. Conclusion

The integration of digital tools in English for Specific Purposes (ESP) instruction for engineering students has demonstrated significant potential in enhancing student engagement, motivation, and technical language acquisition. By combining structured theoretical instruction through PowerPoint with interactive, gamified assessment using Kahoot, this study highlights a dynamic approach to language learning that moves beyond traditional passive methods. While PowerPoint serves as an effective medium for organizing and delivering complex linguistic and technical content in a clear and systematic manner, it may not always be sufficient to maintain student

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attention or stimulate active participation. The incorporation of Kahoot bridges this gap by transforming assessments into collaborative, interactive experiences, fostering both engagement and knowledge acquisition.

A key advantage of this blended approach is the promotion of active learning. Engineering students, who often perceive language courses as secondary to their technical training, are more likely to engage with the material when learning becomes interactive and competitive. The gamified nature of Kahoot encourages students to participate more actively, reinforcing vocabulary acquisition and grammar mastery through real-time feedback and peer collaboration. Furthermore, by working in teams, students develop essential communication skills and problem-solving strategies that are vital in professional engineering environments.

Another crucial outcome of this study is the role of technology in facilitating continuous assessment. Unlike traditional examination-based evaluation, which provides only a summative measure of student learning, digital tools enable educators to track student progress throughout the semester. The quiz-based point system allowed students to accumulate scores gradually, reducing exam-related pressure and fostering a more consistent learning experience. As a result, many students secured their final grades through ongoing assessments, leading to a significant decrease in the number of students that failed the English exam. This not only encouraged regular participation but also promoted a deeper and more sustained engagement with the course content.

Beyond addressing technological considerations, future studies should also explore additional strategies to support technical language acquisition, particularly for students with diverse academic backgrounds. While some engineering students may have a foundational understanding of technical English, others, particularly those transitioning from non-technical high school programs, may face greater challenges in adapting to the specialized terminology and complex grammatical structures required in their field. Personalized learning approaches, such as AI-driven language learning platforms or context-based interactive exercises, could offer tailored support by adjusting content difficulty based on individual proficiency levels. Additionally, expanding the research to include students from different years of study would provide valuable insights into how digital tools contribute to long-term language acquisition and application in professional contexts.

In conclusion, the findings of this study reinforce the value of integrating digital tools into ESP instruction for engineering students. When strategically employed, technology can transform traditional language learning into a more engaging, participatory, and effective experience. By fostering collaboration, reinforcing technical vocabulary, and enabling continuous assessment, digital tools not only enhance academic performance but also equip students with essential communication skills for their future careers. As digital learning environments continue to evolve, ongoing research and pedagogical innovation will be essential in refining instructional strategies and ensuring that engineering students are well-prepared for the linguistic demands of their professional fields.

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References

1. Black, P., Wiliam. 1998. “Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice”. 5(1) DOI:10.1080/0969595980050102.
2. Blake, R. J. 2013. “Brave new digital classroom: Technology and foreign language learning” (2nd ed.), Washington, DC, Georgetown University Press.
3. Chapelle, C. A. 2010. “Computer applications in second language acquisition: Foundations for teaching, testing, and research”. Cambridge University Press.
4. Deci, E. L., & Ryan, R. M. 1985. “Intrinsic motivation and self-determination in human behavior”, Plenum Press, New York and London, Intrinsic motivation and self-determination in human behavior : Deci, Edward L : Free Download, Borrow, and Streaming : Internet Archive
5. Garrison, D. R., & Vaughan, N. D. 2008. “Blended learning in higher education: Framework, principles, and guidelines”, Jossey-Bass, Brave new digital classroom : technology and foreign language learning : Blake, Robert J., 1951- : Free Download, Borrow, and Streaming : Internet Archive
6. González-Lloret, M., & Ortega, L. 2014. “Technology-mediated TBLT: Researching Technology and Tasks”, Amsterdam, John Benjamins Publishing Company.
7. Hubbard, P. 2013. “Computer-Assisted Language Learning: Critical Concepts in Linguistics”, London, New York, Routledge.
8. Hubbard, P. 2013. “Making a case for learner training in technology-enhanced language learning environments”, Stanford, Calico Journal, 30(2).
9. Levy, M., & Hubbard, P. 2005. "Why call CALL 'CALL'?" Computer Assisted Language Learning, 18(3), (PDF) Why call CALL “CALL”?, DOI:10.1080/09588220500208884
10. Mayer, R. E. 2021. “Multimedia learning (3rd ed.)”, Cambridge University Press.
11. Mishra, P., & Koehler, M. J. 2006. “Technological Pedagogical Content Knowledge: A framework for teacher knowledge”, Teachers College Record, 108(6), https://doi.org/10.1111/j.1467-9620.2006.00684.x
12. Stahl, G., Koschmann, T., & Suthers, D. 2006. “Computer-supported collaborative learning: An historical perspective”, Cambridge handbook of the learning sciences, CSCL English
13. Sweller, J. 2011. “Cognitive load theory. In Psychology of Learning and Motivation”, Vol. 55, New York, Springer, Cognitive load theory : Sweller, John : Free Download, Borrow, and Streaming : Internet Archive
14. Vygotsky, L. S. 1978. “Mind in society: The development of higher psychological processes”, Harvard University Press.
15. Wang, A. I. 2015. “The wear-out effect of a game-based student response system. Computers & Education”, https://doi.org/10.1016/j.compedu.2014.11.004
16. Zarzycka-Piskorz, E. 2016. “Kahoot it or not? Can games be motivating in learning grammar? Teaching English with Technology”, 16(3), EJ1135685.pdf.

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