



Designing Classrooms with Information and Communication Technology for Language Instruction: A Paradigm Shift in Engineering Education

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ABSTRACT

The article addresses the revolutionary impact of information and communication technology (ICT) on language teaching to engineering students. Engineers require effective communication competence, and reading and comprehending technical literature, attending international academic conferences and cross-cultural communication cannot be done without civil language. The conventional language teaching practices have shortcomings that require the introduction of new practices that will encourage engineering students to use the language in real-life context and application. ICT presents interactive language learning support- system, including language learning software, multimedia clips and virtual simulation, which supports various learning styles and helps students to understand and retain language skills better. Adaptive language software enables personalized learning, as it modifies experiences according to individual levels of proficiency and promotes faster language acquisition. Language understanding can be enhanced by multimodal learning that involves the use of videos, audio recordings, and interactive quizzes. The implementation should be successful and it will involve training faculty on technology tools, provision of technology infrastructure needed, incorporation of language modules in the curriculum and working partnership between language professors and engineering faculty. Impact assessment is performed through the measurement of the change in language proficiency, the measurement of engagement and motivation, academic performance measurement, and feedback gathering. Conclusively, language teaching that is ICT-based will provide engineering students with critical language skills and international competencies.

Keywords: Communication; Engineering; ICT; Language teaching; Technology;

1 Introduction

The digital merging of information and communication technology (ICT) has acted as a driving force behind radical change in the education sector [1]. Specifically, the use of ICT in the teaching of language and, more specifically, in the teaching of engineering has proved to have great advantages. Integrating ICT in language pedagogy, teachers are able to develop practical communication skills in students and provide engineering students with the necessary skills to work in the environment of global interconnection. The current paper focuses on the importance of ICT-based language teaching in engineering education and its positive effect on academic and professional growth of students. Use of ICT in teaching languages has gained a lot of popularity in engineering programs [2]. The use of technology as a language teaching tool can increase the interest and motivation in the learner and, at the same time, improve language proficiency. The current research assesses the ICT contributions in the engineering classrooms, in particular, technology-enhanced language (TEL) interventions, and determines the ways to actualize these benefits effectively.

The significance of language skills among engineering graduates in the working environment cannot be underestimated. Engineers should work effectively with other engineers, clients, and other parties to the design, implementation, and maintenance of the engineering projects. You should have a high level of reading and understanding of complicated technical documents, i.e., plans, manuals, and reports. English as lingua franca of international business and engineering makes the ability to communicate in the language an essential skill. Since the majority of technical documentation is written in English and a great number of practitioners attend international conferences, engineers with good command in English language are better placed in the employment market worldwide. Communication is one competency of an engineer. They should be able to express ideas concisely and clearly, both verbally and in writing, and convey technical topics of complex interest to the stakeholders who might not be experts in the field [3]. Effective teamwork, which is a part of the engineering practice, requires strong communication and teamwork skills. Further, effective communication is essential to the safety of occupations; engineers need to communicate possible risks and dangers to the colleagues and clients, and follow the safety measures and rules.

Lappalainen (2010) [4] indicates that an interdisciplinary, project-oriented, problem-based, and real-world context language course is better suited to changing students into multidisciplinary communication participants with both cultural and ethical awareness, as well as superior self-leadership and managerial skills. A literature review carried out by Maldague et al. (2016) [5] made the authors conclude that ICT in education enhances motivation among learners, activates their thinking, engages in independent work, and facilitates information sharing and interactive communication between teachers and learners, having a positive impact on the learning process. A study conducted by Laloja et al. (2021) [6] revealed that a hybrid learning approach is an efficient didactic instrument in the process of switching between a traditional and integrative approach to teaching in the university. The authors discovered that the given approach can be used as an effective way of teaching the foreign language to engineering students.

As noted by Suleymanova (2021) [7], the introduction of ICT to language learning gives new opportunities to effective communication to both learners and instructors. Technology-supported courses seem to be the most appropriate and attractive to those who want to excel in language learning among other language-learning strategies. The argument by Rajarapolu and Bhadwatkar (2017) [8] was that ICT provides an avenue through which millennial learners who are more technologically oriented can interact and communicate. Brandt and Henning (2001) [9] responded to the changing role of engineers in the society and discussed the way ICT was transforming the technical and organizational architectures of human-machines relations.

The article by Sidhu and Kang (2010) [10] examined the use of new Information and Communication Technologies (ICT) in mechanical engineering to support and facilitate learning. Titova et al. (2021) [11] provided the means by which ICT tools can be used to promote the creativity and information literacy of the engineering students, as well as the ways to capitalize on the control of the learning outcomes to their maximum potential. Ford and Riley (2003) [12] recommended the integration of communication technologies into engineering curriculum with both Writing-Across-Disciplines (WAC) and multidisciplinary courses as examples. Paugh et al. (2018) [13] described how engineering design provided the possibilities of disciplinary and language learning in the environment of an urban elementary school.

Bergman et al. (2013) [14] referred to the project-based technical communication course that considers the team-based approaches, including instructors of various fields that results in better interdisciplinary learning. Kang et al. (2011) [15] promoted bilingualism in teaching foreign-language courses that were professional in engineering and they used the multimedia technology to enhance the quality of teaching and involvement of students. The author, Morgado (2018) [16], investigated the problems connected with intercultural and multilingual classrooms in engineering education and offered teaching methods, including content and language-integrated learning (CLIL) and communities of practice (CoPs) to improve the learning outcomes. Requena-Carrión et al. (2010) [17] suggested a student centered collaborative learning environment that combines project based learning, peer assessment and ICT with the aim of enhancing communication skills among the engineering students.

2 The Role of Language Skills in Engineering Education

The complex world of engineering requires an accurate communication, teamwork, and problem-solving skills. To communicate complex technical ideas, cooperate with co-workers, and express their thoughts to customers and stakeholders, engineers have to have strong written and oral communication skills [18]. According to McMahon and Escribano (2008) [19], future engineers should be equipped with communication as a core competence, and suggested that a group of language learning outcomes be developed to be part of the engineering curriculum. As noted by Živković (2015) [20], engineering students view language skills as the key to cognition, explanation, and performance of engineering tasks and were interested in taking career-related courses to improve the level of English proficiency. The paper by Gatinskaya (2013) [21] emphasized the advantages of the additional language education among future engineers and recommended that the novel programs are to be added to the existing language training. It was observed in the study conducted by Atman et al. (2008) [22] that students studying engineering design courses gain a standardized engineering-design

language, which influences the way that they conceptualise design, although such knowledge does not always apply to practice.

Also, with the growing globalisation of the engineering sector, language competency in terms of English and other languages is an added benefit to would-be engineers. Information and Communication Technology (ICT) has become significant in the field of language teaching and has altered traditional classroom experiences as well as provided new opportunities to language students at an affordable price. The following major ways demonstrate the way ICT is transforming the teaching of language:

2.1 Authentic Learning Experiences through ICT Integration

The adoption of Information and Communication Technologies (ICT) in the teaching of languages gives the students opportunities to access an authentic learning experience, including online materials, digital media, and interactive tools. Indicatively, students are able to access real texts, images, videos, podcasts, and to chat with native speakers using online sources. This way, the students will be able to build up their language proficiency in a more natural and meaningful way.

2.2 Interactive Learning Tools for Engineering Language Instruction

Interactive learning tools to teach engineering language can also be provided with the help of information and communication technologies. As an example, a student can use simulation software to develop technical communication skills, e.g. writing technical reports or making presentations. These mediated environments can support the development of oral proficiency in students in a more interactive and engaging way.

2.3 Facilitating Global Communication and Cross-Cultural Skills

Information and Communication Technology (ICT) is another dimension that can help to promote communication on a global level and intercultural competencies. Students can use online communication tools like social media and video conferencing to mingle with other students worldwide. This exposure helps them to acquire cross cultural skills and equips them to operate successfully in a professional world that is becoming more globalized.

2.4 Personalized Learning Opportunities and Adaptive Language Software

Personalized learning opportunities and adaptive language software can also be enabled with the help of ICT. The computer-aided instruction software can support the pace of learning and ability of a student, thus, it is able to afford one-on-one learning. The method can aid the learners towards greater levels of language competence.

2.5 Multimodal Learning and its Impact on Language Comprehension

Other multimodal learning opportunities that are provided by ICT include video, audio recordings, and interactive simulations. These affordances make language understanding skills of students easier to develop since they offer a variety of input and interaction modalities.

3 Challenges in Traditional Language Teaching Methods

Traditional language teaching methods often stress rote learning and grammar instruction in ways that can make it harder to learn a language well in engineering settings. Also, the fact that traditional language teaching doesn't use real-world examples can make it harder to learn a language. Morgado (2018) [23] examined the difficulties of intercultural and multilingual classrooms in engineering education and suggested instructional design strategies to address communication and cultural disparities. Bekteshi et al. (2020) [24] executed an experimental study on English instruction in engineering courses utilizing a bilingual CLIL methodology. They discovered that instructing engineering courses alongside an engineering practitioner and an ESP teacher can enhance particular engineering subdisciplines and professional English vocabulary. Mohamed et al. (2020) [25] identified a gap in the advancement of English language proficiency among engineering students in English language classrooms, contrasting with the maintenance of Engineering Classrooms in Malaysia. They proposed the necessity for a framework that supports Engineering Internationalization in English for Specific Academic Purposes (ESAP) for engineering students in engineering education. A student in an academic context consistently encounters the following challenges when learning a new language: i) Insufficient vocabulary—unfamiliarity with the meanings of words in comparison to their mother tongue.

3.1 Rote Learning and its Limitations in Language Acquisition

Rote learning is a method of memorizing information by repeating it over and over again, even if you don't really understand what it means. This method may not be very helpful for students who want to learn a language because it doesn't always help them improve their speaking, listening, or understanding of language in real-life situations. Rote learning often emphasizes discrete linguistic components, such as vocabulary and grammatical rules, rather than the broader context of language usage.

3.2 Grammar-Focused Approaches and Their Drawbacks in Engineering Contexts

Teaching language with a focus on grammar can also be limiting in engineering settings. Engineers need to know grammar and syntax well, but focusing too much on these things can sometimes get in the way of learning how to communicate. In engineering, good communication sometimes requires more than just perfect grammar. It often also requires a working knowledge of technical jargon and the ability to clearly and concisely explain complex ideas.

3.3 Lack of Real-World Context and its Impact on Language Proficiency

Traditional ways of teaching languages often don't give enough real-world context, which makes it harder to learn a language. It's not enough to learn a language by memorizing words and grammar; you also need to learn how to use it in the real world. By using real language, students may learn how to communicate well in engineering.

4 Benefits of Integrating ICT in Language Teaching

Mai (2020) [26] and Dedja (2015) [27] demonstrated that ICT integration can enhance collaboration, interaction, motivation, and utilization to web-based materials. Azmi (2017) and Mullamaa (2010) [28] additionally noted that ICT can promote self-regulated learning, improve specific contexts, and enhance the performance of the language classroom. Both papers also talk about problems with integrating ICT, such as the rise of "multiliteracies," students not being as good at ICT as their teachers might be, and teachers not wanting to change their professional role. There are a number of benefits to using ICT in language instruction in engineering, as shown in the table below:

1. **Real Learning Experiences:** ICT lets language teachers use real-world materials like engineering journals, research papers, technical documents, and texts related to the industry. This exposure gives students relevant and current information, which makes learning more interesting and useful.
2. **Interactive Learning Tools:** With ICT, language instructors can utilize interactive learning tools like language learning apps, multimedia presentations, virtual simulations, and online language exercises. These tools cater to diverse learning styles and enhance students' comprehension and retention of language skills.
3. **Global Communication:** ICT enables engineering graduates to communicate with peers and experts worldwide. Through online discussion groups, video conferencing, and virtual collaboration, students can work on international projects, share ideas, and improve their ability to communicate with people from other cultures.
4. **Personalized Learning:** ICT-integrated language teaching facilitates personalized learning experiences. Language learning software can change based on how well a person knows the language, giving them exercises that are just right for them and instant feedback. This makes the learning process more effective.
5. **Multimodal Learning:** ICT allows the integration of various multimedia elements like videos, audio recordings, infographics, and interactive quizzes. This multimodal method uses both sight and sound to help students understand language concepts better.
6. **Distance Learning Opportunities:** ICT makes it possible for engineering students in remote areas to learn a language. Online language courses and resources enable self-paced learning, allowing students to balance their language development and engineering studies.
7. **Improved Language Proficiency:** Language proficiency can be enhanced by means of ICT-integrated language teaching, through the students' access to real-world language practice environments. For instance, students may read and write about engineering online, engage in online discussions, and collaborate on projects with students around the world. This way, students can see their vocabulary, grammar, and communication skills grow in a more natural and substantial way.
8. **Increased Engagement:** ICT-supported language learning may facilitate the promotion of student engagement by rendering the learning process more dynamic and attractive. For instance, students might investigate engineering ideas more interestingly using multimedia resources like movies, animations, and interactive simulations [29]. This can help students stay motivated and interested in the subject matter.

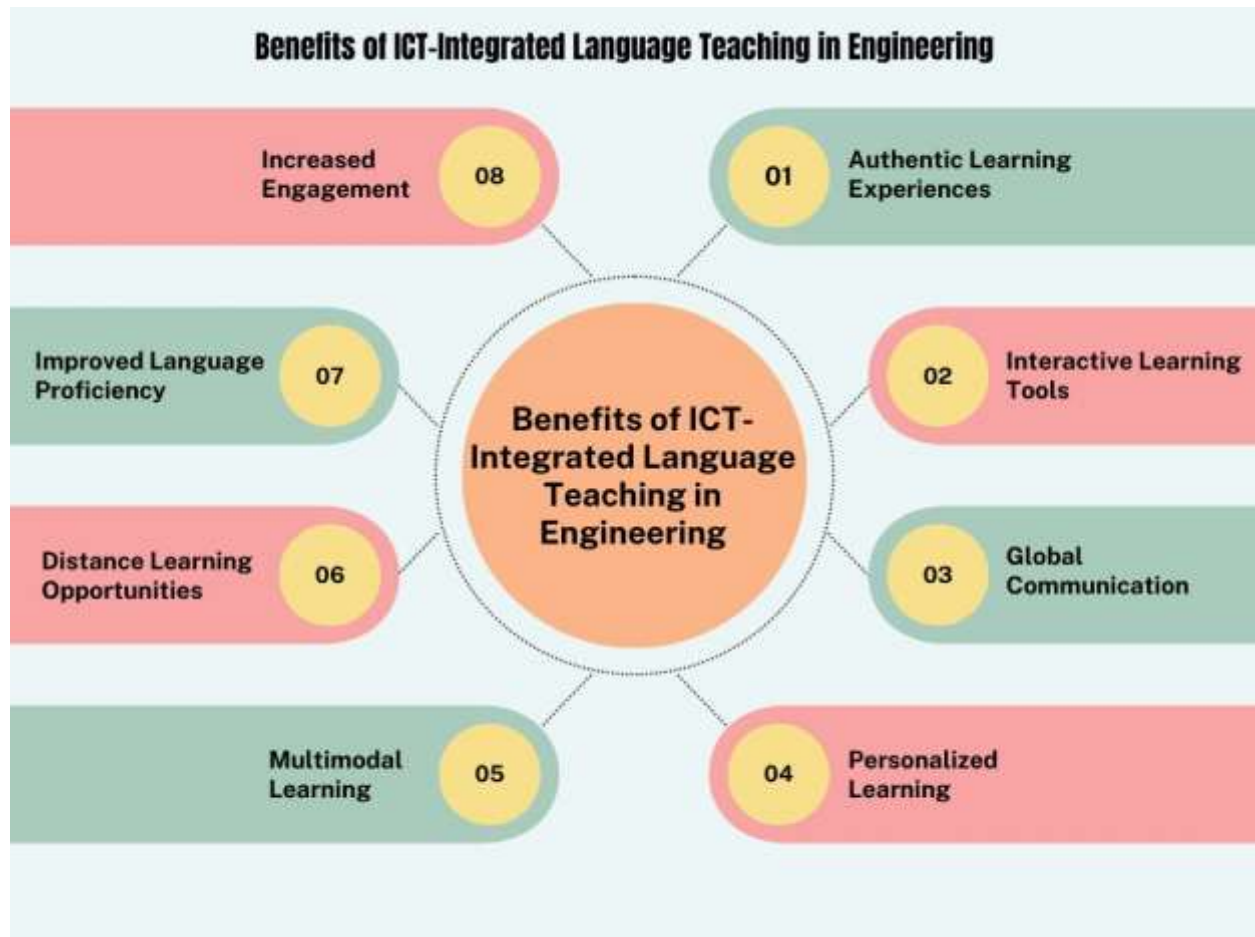


Figure 1: Benefits of ICT-integrated language teaching in engineering fields

These benefits, which are depicted in Fig. 1, can help students acquire this language feature, which could help them become more successful in both their engineering careers and personal lives. By using ICT in language instruction, teachers can provide students with a useful and successful course that can help them succeed in their careers.

5 Implementing ICT-Integrated Language Teaching

Schrooten (2006) [30] listed the potential benefits of using ICT for language learning, including enriched materials, motivation, differentiated instruction, and increased teaching effectiveness. According to Emzir et al. (2019) [31], it has been demonstrated that the use of ICT in language instruction improves both teacher and student proficiency. Views of educators regarding the application of information and communication technology (ICT) to language instruction and learning. The degree to which teachers' subject-matter expertise influences their opinions regarding ICT integration was also investigated by Avisteva (2020) [32], who found certain obstacles to effective ICT integration in the classroom. Paz (2017) [33] made the case for the benefits of ICT in terms of teaching practices, including greater group activation, learning motivation, and a range of activities. They also provided resources that could help teachers in the digital age. Engineering colleges must use some of the following tactics (see Fig. 2) in order to successfully integrate ICT into language instruction:

1. **Faculty Training:** Language instructors should receive adequate training in ICT tools and skills to improve the efficient use of technology in language instruction. Successful integration of ICT into language instruction requires faculty development and exercise. To successfully integrate technology and language teaching methodologies into their teaching practices, faculty members need to receive training in these areas. Workshops, seminars, self-paced online training courses, and peer-to-peer mentoring are examples of professional development resources.
2. **Technology Access:** Students should have access to the computers, internet, and language-learning software that engineering schools require. Another essential element of successful ICT integration in language instruction is granting access to technology and internet resources. To improve the language learning experience, educational institutions can give students access to online dictionaries, multimedia materials, language learning software, and other online resources.
3. **Integration of the Curriculum:** Include language modules in the engineering curriculum to link language acquisition to technical topics like presentation and communication techniques for engineers. Another

essential element of successful ICT integration in language instruction is curriculum integration. In order to give students an integrated learning experience, language modules need to be in line with engineering subjects. Engineering courses can be enhanced by language modules that give students the chance to practice technical communication skills like presenting or writing technical reports.

4. **Collaboration:** To create interdisciplinary language projects and assignments, encourage cooperation between engineering faculty and language instructors. Collaborative projects between the engineering and language faculties can also be used to integrate ICT into language instruction. Through collaborative projects and initiatives, students can gain practical engineering experience and enhance their language skills in a real-world context [34].

5. **Provide feedback:** Let students know how well they speak the language and encourage them to assess their own progress. This could help students identify their areas of weakness and effectively improve their language skills. Giving students feedback on their language skills is a crucial part of teaching language in engineering. Students can improve their language skills by using feedback to identify their areas of strength and weakness. It is crucial to give detailed, helpful criticism that identifies both strengths and shortcomings. Students can take charge of their education and cultivate a growth mindset by being encouraged to reflect on their progress. Students can maintain their motivation and interest in the language learning process with regular opportunities for self-reflection and feedback.

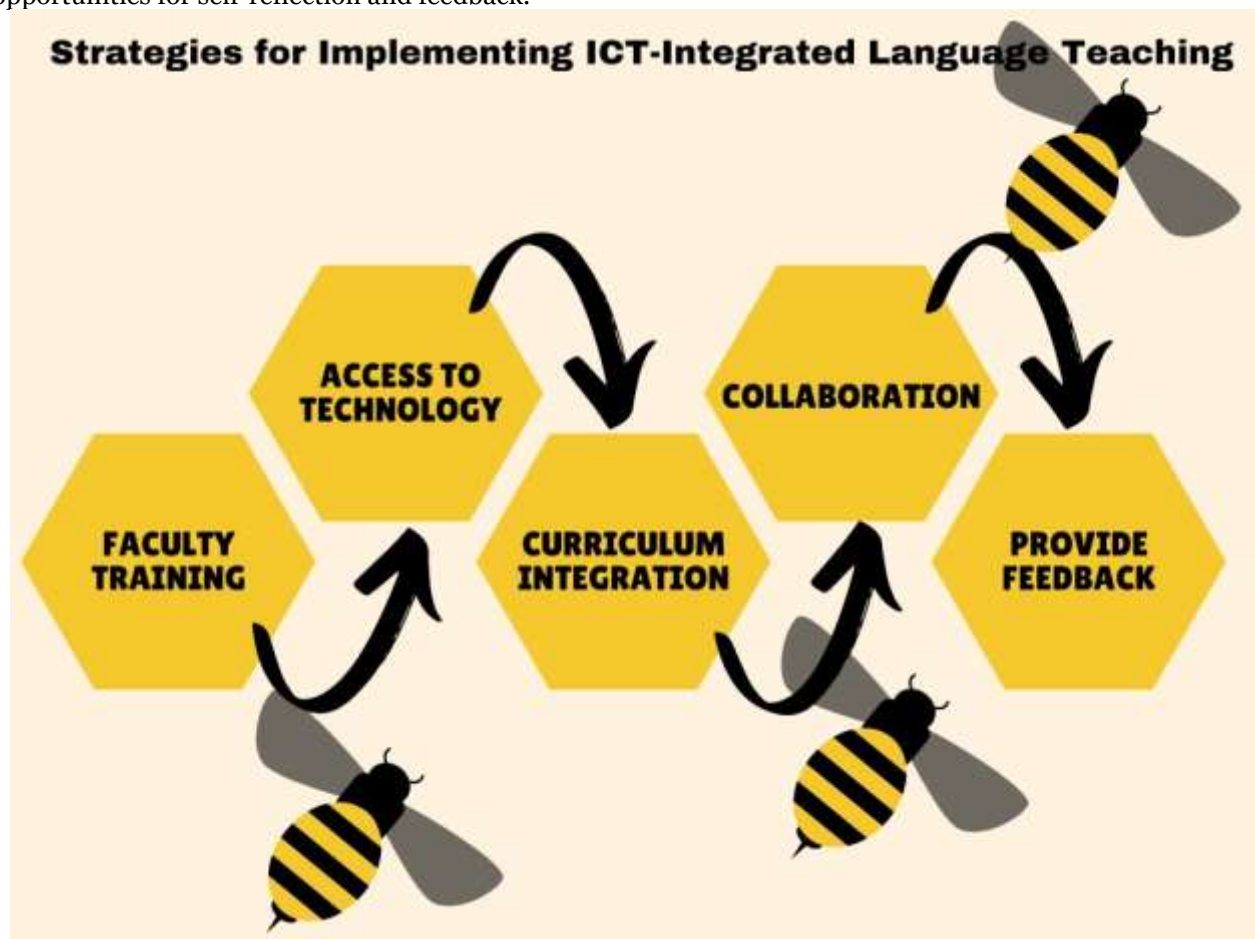


Figure 2: Strategies for applying ICT-integrated language teaching

6 Assessing the Impact of ICT-Integrated Language Teaching

Despite their frustration with the ICT facilities and training instructions, teachers in Vietnam had positive attitudes regarding the use of ICT to teach English, according to Hu et al. (2011) [36]. According to Dwiono et al. (2018) [37], teachers' enthusiasm for using ICT decreased due to a lack of support and training, and inadequate ICT skills and pedagogical knowledge were barriers to ICT use for language teaching in China. The authors discovered that Indonesian teachers only used ICT at the substitution and augmentation levels and had only rudimentary proficiency with it. The following techniques can be applied to assess the effectiveness of ICT-integrated language instruction:

6.1 Measuring Language Proficiency Improvements

Measuring gains in language proficiency is one way to evaluate the effects of ICT-integrated language instruction. Standardized language proficiency tests or a comparison of language skills evaluations conducted

before and after the course can be used for this. This can assist in assessing whether language learning goals are being fulfilled and whether technology has improved language proficiency.

6.2 Evaluating Students' Engagement and Motivation

Motivation and engagement are crucial elements of successful language instruction. Surveys or in-class observations can be used to gauge how motivated and engaged students are. This can assist in determining whether technology has improved language learning outcomes by raising student motivation and engagement levels.

6.3 Analyzing the Impact on Engineering Students' Academic Performance

By comparing the grades and academic outcomes with those of language courses, it is possible to evaluate the degree to which language instruction in ICT affects students' credit. This can assist in determining the impact of language proficiency on engineering coursework as well as whether the use of technology has improved academic performance.

6.4 Surveys and Feedback from Students and Instructors

Information on the effects of ICT-integrated language instruction may be gleaned from survey results and comments from teachers and students [38]. Surveys can be used to find out how students feel about the effectiveness of language teaching methods and how technology influences their education. Teacher feedback may be used to assess how well technology supports language learning and identify areas that require improvement [39].

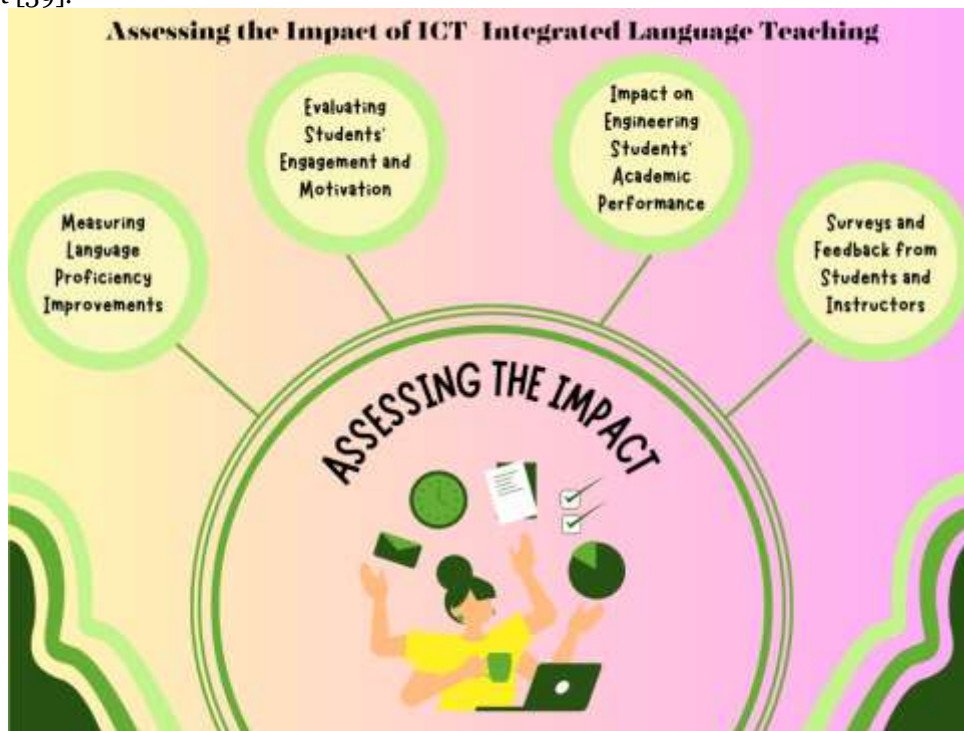


Figure 3: Assessing the impact of ICT-integrated language teaching

It is essential to evaluate the effects of ICT-integrated language instruction (as illustrated in Fig. 3) to make sure that it successfully raises language proficiency and enriches the educational experience of engineering students. In order to evaluate the impact of ICT-integrated language teaching, it is crucial to measure improvements in language proficiency, assess students' motivation and engagement, examine the impact on academic performance, and collect feedback from both students and teachers. By learning how technology affects language learning, language teachers can make well-informed decisions about its use in the classroom and enhance their methods [40].

The emergence of artificial intelligence (AI) has fundamentally altered educational paradigms, necessitating the urgent need to teach students AI literacy, rapid engineering, and critical thinking in order to improve classroom experiences. To maximize AI's potential, integrating it into the curriculum necessitates specialized teaching methods and a careful assessment of the social repercussions [41]. In online learning environments, sophisticated data-driven techniques like the Louvain algorithm have shown promise in fostering better group dynamics and collaboration. Teachers can improve student engagement and problem-solving skills by using network analysis to create more cohesive and captivating virtual learning environments [42].

As highlighted by a SWOT (Strengths, Flaws, Potential, and Threats) analytical technique that evaluates its strengths, flaws, opportunities, and threats, generative AI offers both opportunities and challenges in computer education. Teachers can take advantage of generative AI's transformative potential while reducing risks like over-reliance and skill erosion by creating a strict risk management plan [43]. Although there have been notable advancements in the integration of AIED (Artificial Intelligence in Education), the author felt that regional disparities and the attention given to administrative and special education stakeholders remained unbalanced and inadequate. A roadmap for setting research priorities in this field is provided by a meta-synthesis of 143 AIED literature studies, which also identifies broader trends [44].

Artificial intelligence (AI) and information and communication technology (ICT) have the potential to revolutionize the learning process when incorporated into second language acquisition. Several studies have shown that factors like teacher proficiency, resource accessibility, and appropriate training affect how effective ICT is in language instruction. Techniques like measuring gains in language proficiency, tracking student participation, and researching the impact on academic performance provide valuable information about how well ICT-integrated language training works. Furthermore, new options for improving group dynamics, increasing student cooperation, and optimizing online learning environments are made possible by AI technologies like generative AI and the Louvain algorithm.

Notwithstanding these technologies' potential, challenges still exist, such as disparities in the resources available, inadequate teacher preparation, and the need for more research on the social effects of these technologies. Both the transformative potential of generative AI and the risks of over-reliance and loss of critical skills are highlighted by a SWOT analysis methodology and risk management strategies. Thus, it is essential to approach the integration of AI and ICT in education from a well-rounded, knowledgeable perspective, making sure that teachers have the resources and support they need to fully utilize these technologies while avoiding associated risks. The future of education will be largely determined by the ongoing research and modification of teaching strategies as the field of artificial intelligence in education develops.

7 Implications and Future Directions

To fully utilize ICT in engineering language instruction, ongoing research and development are required. Engineering schools can take full advantage of the ICT revolution that is currently transforming the way engineers of tomorrow are taught by identifying the areas that require improvement, resolving barriers, and staying up to date with technological advancements. In order to prepare future engineering students to become competent engineers who can meet societal expectations, teaching methods must be adjusted as the world changes.

7.1 The potential of ICT in advancing engineering education:

ICT integration into language instruction has the potential to revolutionize engineering education. Students can learn the language as they would in real life by using technology to enhance the learning process and make it more effective. Additionally, engineering students can work together with peers and experts from a variety of backgrounds thanks to ICT, which promotes global connectivity and helps them develop cross-cultural communication skills. The potential advantages of ICT in engineering education will only increase with technological advancements, offering chances for creative and revolutionary teaching strategies.

7.2 Identifying areas for further research and improvement:

Even though ICT-integrated language instruction has potential, more study is necessary to maximize its impact and efficacy in engineering classrooms. Finding the most effective interactive learning tools, balancing virtual and in-person language instruction, and examining artificial intelligence's role in personalized language learning are some possible research directions. Additionally, research on how ICT can help develop the domain-specific language skills needed in various engineering domains could be taken into consideration. Continuous evaluation and feedback will enhance the use of ICT in teaching engineering students' languages.

7.3 Addressing challenges and adapting to changing technological trends:

There are obstacles to overcome when implementing ICT in language instruction, including making sure all students have fair access to technology, handling privacy and security issues that may arise from online communication, and getting past reluctance to depart from conventional teaching methods. For the seamless integration of ICT in language instruction, engineering schools must make training and infrastructure investments. Maintaining relevance and effectiveness in meeting the needs of engineering students also requires keeping up with evolving technological trends. Regular software updates, access to cutting-edge communication tools, and a proactive approach to problems are all necessary for the successful integration of ICT in language instruction in engineering classes.

8 Conclusion

In engineering classrooms, ICT-integrated language instruction is a useful strategy with enormous potential for improving language proficiency and general education. This cutting-edge approach gives engineering students the opportunity to improve their language skills while also giving them the teamwork and communication abilities they need to succeed in a world that is becoming more interconnected by the day. Teachers can successfully implement ICT-integrated language teaching for the benefit of their students by utilizing a variety of multimedia resources, encouraging collaborative learning, giving prompt feedback, and incorporating authentic materials. A more dynamic and captivating educational experience is possible when ICT-integrated language instruction is embraced as a transformative approach. Language teachers can design interactive, customized learning environments that meet the needs and learning preferences of each individual student by incorporating information and communication technology. When teaching engineering practices, this approach encourages students to take initiative in their studies and to acquire language skills in-depth. It is becoming more and more important to prepare students for success in a multicultural and interconnected world as engineering develops into a globalized profession. International collaboration opportunities and the development of cross-cultural communication skills are made possible by ICT-integrated language instruction. This approach will give engineering students who become proficient in the language a competitive advantage in the job market and better equip them to work in diverse teams on demanding international projects. There is no denying that technology has the potential to influence engineering education in the future. New tools, applications, and learning platforms will appear as ICT develops further, enhancing language instruction in engineering classrooms. Teachers can continuously enhance the efficacy of language instruction and improve the results for engineering students by adopting and keeping up with these technological trends. To sum up, ICT-integrated language instruction is a revolutionary strategy that caters to the particular language requirements of engineering students. Through the development of language skills, teamwork, and global competencies, this approach equips future engineers to succeed in a fast-paced, connected world. A more promising and brighter future for engineering education is being paved by engineering institutions as they embrace the potential of technology. Teachers can make sure their students are ready for the opportunities and challenges in the rapidly changing engineering field by conducting ongoing research, adjusting to shifting trends, and committing to providing high-quality language instruction.

Competing interests

The authors affirm that they have no conflicting financial or non-financial interests that might affect the study's findings or interpretation.

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References

1. Vo, P. T. N. (2019). Investigating ICT policy implementation in an EFL teacher education program in Vietnam.
2. Saud, D. S. (2023). Teachers and students' perceptions towards using ICT in ELT in model schools. *Journal of Tikapur Multiple Campus*, 6(01), 78–93. <https://doi.org/10.3126/jotmc.v6i01.56347>
3. ECCU. (n.d.). How to effectively communicate cybersecurity best practices. Retrieved from <https://www.eccu.edu/blog/technology/how-to-effectively-communicate-cybersecurity-best-practices/>
4. Lappalainen, P. (2010). Integrated language education – a means of enhancing engineers' social competences. Informa UK Limited. <https://doi.org/10.1080/03043797.2010.488290>
5. Maldague, X., Kuimova, M., Burleigh, D., & Skvortsova, S. (2016). Information and communication technologies in engineering education (A. V. Yurchenko & V. I. Syryamkin, Eds.). EDP Sciences. <https://doi.org/10.1051/mateconf/20167901044>
6. Lalova, T. I., & Tolstykh, O. M. (2021). Application of information and communication technologies in hybrid learning of engineering students. Presented at the 2021 International Conference on Quality Management, Transport and Information Security, Information Technologies (IT&QM&IS). <https://doi.org/10.1109/itqmis53292.2021.9642726>
7. Suleymanova, G. N. (2021). Information and communications technology integration in language education. Presented at the 2021 International Conference on Information Science and Communications Technologies (ICISCT). <https://doi.org/10.1109/icisct52966.2021.9670297>
8. Rajarapolu, P. R., & Bhagwatkar, S. A. (2017). ICT - An effective way for active and collaborative learning teaching process in engineering education - A review. Presented at the 2017 International Conference on Transforming Engineering Education (ICTEE). <https://doi.org/10.1109/ictted.2017.8585697>
9. Brandt, D., & Henning, K. (2001). Perspectives of information and communication technologies for engineering education. Informa UK Limited. <https://doi.org/10.1080/03043790124177>
10. Sidhu, M. S., & Kang, L. C. (2010). New trends and futuristic information communication technologies for engineering education. IGI Global. <https://doi.org/10.4018/jictthd.2010100106>

11. Titova, O., Luzan, P., Sosnytska, N., Kulieshov, S., & Suprun, O. (2021). Information and communication technology tools for enhancing engineering students' creativity. Springer International Publishing. https://doi.org/10.1007/978-3-030-77719-7_33
12. Ford, J. D., & Riley, L. A. (2003). Integrating communication and engineering education: A look at curricula, courses, and support systems. Wiley. <https://doi.org/10.1002/j.2168-9830.2003.tb00776.x>
13. Paugh, P., Wendell, K., & Wright, C. (2018). Elementary engineering as a synergistic site for disciplinary and linguistic learning in an urban classroom. SAGE Publications. <https://doi.org/10.1177/2381336918786937>
14. Bergman, B., Eriksson, A.-M., Blennow, J., Groot, J., ... Hammarström, T. (2013). Reflections on an integrated content and language project-based design of a technical communication course for electrical engineering students. Coventry University, Lanchester Library. <https://doi.org/10.18552/joaw.v3i1.98>
15. Kang, Z., Wang, R., & Wang, Y. (2011). Bilingual teaching reform and practice of engineering student's "professional foreign language" based on multimedia technology. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-23357-9_102
16. Morgado, M. (2017). Content, language and intercultural challenges in engineering education: (E-)strategies to improve instructional design. Birlesik Dunya Yenilik Arastirma ve Yayincilik Merkezi. <https://doi.org/10.18844/prosoc.v4i8.3026>
17. Requena-Carrion, J., Alonso-Atienza, F., Guerrero-Curienes, A., & Rodriguez-Gonzalez, A. B. (2010). A student-centered collaborative learning environment for developing communication skills in engineering education. Presented at the 2010 IEEE Education Engineering 2010 - The Future of Global Learning Engineering Education (EDUCON 2010). <https://doi.org/10.1109/educn.2010.5492499>
18. Job Posting. (n.d.). Retrieved from <https://jobs.heraldnet.com/job/17163909/1-Toronto,%20ON>
19. Pierce McMahon, J., & Durán Escibano, P. (2008). Language communication competencies in engineering education revisited. Universitat Politecnica de Valencia. <https://doi.org/10.4995/rlyla.2008.690>
20. Živković, S. (2015). Language skills among students in the field of engineering. Walter de Gruyter GmbH. <https://doi.org/10.26417/ejls.v3i1.p83-90>
21. Gatinskaya, V. P. (2013). The importance of additional language training in engineering education. Presented at the 2013 International Conference on Interactive Collaborative Learning (ICL). <https://doi.org/10.1109/icl.2013.6644681>
22. Atman, C. J., Kilgore, D., & McKenna, A. (2008). Characterizing design learning: A mixed-methods study of engineering designers' use of language. Wiley. <https://doi.org/10.1002/j.2168-9830.2008.tb00981.x>
23. Morgado, M. (2017). Content, language and intercultural challenges in engineering education: (E-)strategies to improve instructional design. Birlesik Dunya Yenilik Arastirma ve Yayincilik Merkezi. <https://doi.org/10.18844/prosoc.v4i8.3026>
24. Bektashi, E., Shala, M., & Xhaferi, B. (2020). Challenges of English teaching in engineering courses. *Journal of Modern Research in English Language Studies*, (Online First). <https://doi.org/10.30479/jmrels.2020.13275.1640>
25. Mohamed, M. N. A., Othman, Z., Jamari, S., Powzi, N. F. A., Samad, N. A., & Othman, N. 'Ain. (2020). Scaffolding the development of English language and communication skills of engineering students. Horizon Research Publishing Co., Ltd. <https://doi.org/10.13189/ujer.2020.081915>
26. Mai, N. T. (2020). Integrating information and communication technologies into second and foreign language teaching: Pedagogical benefits and considerations. *Vietnam National University Journal of Science*. <https://doi.org/10.25073/2588-1159/vnuer.4401>
27. Dedja, M. (2015). ICT in foreign language teaching and learning: Benefits and challenges. Walter de Gruyter GmbH. <https://doi.org/10.26417/ejls.v2i1.p42-47>
28. Mullamaa, K. (2010). ICT in language learning - Benefits and methodological implications. *Canadian Center of Science and Education*. <https://doi.org/10.5539/ies.v3n1p38>
29. Saud, D. S. (2023). Teachers and students' perceptions towards using ICT in ELT in model schools. *Journal of Tikapur Multiple Campus*, 6(01), 78–93. <https://doi.org/10.3126/jotmc.v6i01.56347>
30. Schrooten, W. (2006). Task-based language teaching and ICT: Developing and assessing interactive multimedia for task-based language teaching. Cambridge University Press. <https://doi.org/10.1017/cbo9780511667282.007>
31. Emzir, A., Ismail, A., Ismail, H., & Permata Sari, N. W. A. (2019). Implementation of information and communication technology in language teaching. Presented at the Proceedings of the 1st International Conference on Innovation in Education (ICOIE 2018). <https://doi.org/10.2991/icoie-18.2019.54>
32. Avisteva, R. T. (2020). Teachers' perspectives on the implementation of information and communication technology in language teaching. Presented at the 3rd International Conference on Language, Literature, Culture, and Education (ICOLLITE 2019). <https://doi.org/10.2991/assehr.k.200325.046>
33. Paz, D. P., Franco, M. H. I., & de Castro Bertagnolli, S. (2017). Use of information and communications technology in language teaching: Connecting knowledges. Presented at the 2017 International Symposium on Computers in Education (SIIE). <https://doi.org/10.1109/siie.2017.8259646>
34. Bacsich, P., & Bristow, S. (2004). The e-university compendium. Higher Education Academy. UK.

35. Academic Publishing House Researcher. (2021). Teachers' perception of ICT integration in English language teaching at Vietnamese tertiary level. <https://doi.org/10.13187/ejced.2021.3.697>
36. Hu, Z., & McGrath, I. (2011). Innovation in higher education in China: Are teachers ready to integrate ICT in English language teaching? Informa UK Limited. <https://doi.org/10.1080/1475939x.2011.554014>
37. Dwiono, R., Rochsantiningsih, D., & Suparno, S. (2018). Investigating the integration level of information and communication technology (ICT) in the English language teaching. Faculty of Education and Teacher Training, Jambi University. <https://doi.org/10.22437/ijolte.v2i3.5752>
38. Chen, A. C.-Y., & Lin, Y.-C. (2017). Girls in robot class: Smart textiles interactive tool-kits to enhance the participatory of women in technology. Springer International Publishing. https://doi.org/10.1007/978-3-319-58515-4_11
39. Saud, D. S. (2023). Teachers and students' perceptions towards using ICT in ELT in model schools. *Journal of Tikapur Multiple Campus*, 6(01), 78–93. <https://doi.org/10.3126/jotmc.v6i01.56347>
40. Hampel, R., & Stickler, U. (Eds.). (2015). Developing online language teaching. Palgrave Macmillan UK. <https://doi.org/10.1057/9781137412263>
41. Walter, Y. (2024). Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education. *International Journal of Educational Technology in Higher Education*, 21(15). <https://doi.org/10.1186/s41239-024-00421-0>
42. Lee, M., & Sharma, P. (2024). Leveraging the Louvain algorithm for enhanced group formation and collaboration in online learning environments. *International Journal of Educational Technology in Higher Education*, 21(65). <https://doi.org/10.1186/s41239-024-00490-z>
43. Humble, N. (2024). Risk management strategy for generative AI in computing education: How to handle the strengths, weaknesses, opportunities, and threats? *International Journal of Educational Technology in Higher Education*, 21(61). <https://doi.org/10.1186/s41239-024-00486-9>
44. Mustafa, M. Y., Tlili, A., Lampropoulos, G., Huang, R., Jandrić, P., Zhao, J., Salha, S., Xu, L., Panda, S., Kinshuk, L.-P., & Saqr, M. (2024). A systematic review of literature reviews on artificial intelligence in education (AIED): A roadmap to a future research agenda. *Smart Learning Environments*, 11(59). <https://doi.org/10.1186/s40561-024-00257-5>