

# The Importance of English in Technical and Scientific Education

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## Abstract

In today's globalised world, English is considered the primary language of science, technology, and international communication. Proficiency in English is no longer optional but essential for students enrolled in technical and scientific programmes. This paper aims to examine the role of English mainly in scientific and technical education, emphasising both the support provided by automated translation tools and the indispensable guidance from qualified instructors. While artificial intelligence can facilitate comprehension and access to information, it cannot replace structured instruction or the pedagogical support that enables students to develop genuine linguistic competence. By analysing the dominance of English in research publications, technological development, and global networking, this article highlights how effective English education enhances academic performance, expands professional opportunities, and fosters meaningful international collaboration.

## Keywords

English Language, ESP, Higher Education, Artificial Intelligence, Machine Translation

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## 1. Introduction

The rapid advancement of science and technology has intensified global interaction among researchers, engineers, and technical professionals. The search for a common language as a tool for international cooperation resulted in the prevalence and dominance of English. English has become the lingua franca of academic and professional communication in several fields, including technical and scientific. Most scientific journals, international conferences, and technical manuals are published in English, making English proficiency a fundamental skill for students pursuing careers in these areas. (Ammon, 2001).

However, rather than adopting a narrow perspective, this paper proposes a broader analytical approach, although maintaining a clear focus on the main scope: technical and scientific areas. It embraces the examination of the role of English not only as a professional requirement but as a tool for academic development, access to scientific knowledge, and international collaboration. Ultimately, it aims to argue that mastering English significantly enhances educational outcomes, professional development, and access to innovation, particularly for students enrolled in technical and scientific education, which refers to higher-education programmes in fields such as engineering, information technology, natural sciences, biotechnology, and other STEM-related disciplines.

According to [Crystal \(2003\)](#), and following the broader approach suggested beyond technical and scientific areas, there are several reasons for choosing a particular language as a favoured foreign language, including historical tradition, political expediency, and the desire for commercial, cultural, or technological contact.

English is heard on television and spoken by politicians worldwide. Signs and advertisements written in English are found everywhere, and English is understood in hotels and restaurants in most foreign cities. It seems, therefore, understandable that people in general may be strongly motivated to learn it, as this will enable them to be in touch with more people than other languages would allow.

By the beginning of the nineteenth century, Britain had become the world's leading industrial and trading power, which brought linguistic consequences and the adoption of new scientific and technological terminology. This had an immediate impact on the language. Thousands of words were added to the English lexicon. But, more importantly, these innovations poured out of the English-speaking countries. People from abroad felt the need to learn the language.

Soon, similar developments took place in America that overtook Britain as the world's fastest-growing economy, ultimately resulting in the worldwide consolidation of English as the primary language.

From a different approach, [Rao et al. \(2025\)](#) explain that most prestigious scientific journals are published in English, and researchers must use English to achieve international recognition. Inadequate proficiency, lack of proper vocabulary, terms, and sentence patterns can result in research rejection.

Significantly, this paper argues that English proficiency is a strategic and indispensable component of technical and scientific education, as it enables access to global research, reinforces academic performance, expands job opportunities, and facilitates international collaboration. While AI tools can support comprehension, they cannot replace structured instruction or the guidance of qualified educators.

A narrative review and position-paper approach was adopted. The discussion draws on selected academic literature addressing the global role of English in science, technology, and higher education, as well as studies on English for Specific Purposes (ESP), scientific communication, and the use of artificial intelligence in language learning. The sources cited in this review were selected for their relevance

to the theme. Priority was given to peer-reviewed research, authoritative surveys, and examples from internationally recognised institutions, ensuring that the review reflects current evidence-based practice.

In this paper, genuine linguistic competence—defined as the ability to communicate complex ideas effectively in English, both in writing and orally—is presented as essential for success in technical and scientific education, supporting academic achievement, professional development, and international collaboration.

## 2. English as the Dominant Language of Scientific Publication

Major academic databases, research journals, and conference proceedings use English as their primary language. As a result, students who lack English proficiency may have difficulty accessing up-to-date research findings. In fields such as engineering, information technology, biotechnology, and environmental sciences, without mastery of English, students risk relying on translated or outdated materials, which may limit their academic growth and technical data and expertise.

Ammon (2001) explains that native speakers are more capable of producing articles following the existing norms. Hence, higher investment in language learning and the costs of producing linguistically adequate texts are additional problems that non-native speakers address. These challenges are not limited to individual researchers or academics; they also affect publishing houses and companies whose economic activities depend on science and scientific communication, particularly in countries where English is neither the native language nor the official language.

But the advantages enjoyed by English-speaking scientists go far beyond the aspects previously discussed. One significant benefit is the prestige associated with the English language, which leads research written in English to be perceived as more valuable or authoritative. Furthermore, English-speaking academic communities are sometimes credited with discoveries and innovations that were originally developed elsewhere but failed to gain international recognition due to language barriers.

By contrast, while the global expansion of English in science and other domains is evident, it has reduced the use of national languages, even within their own countries. In many non-English-speaking nations, writing theses, dissertations, and papers in English has become widely accepted, in some cases a standard practice. Additionally, numerous countries have adopted English-language educational policies to attract international students, many of whom are reluctant or unable to study in the local language. Also, in most cases, modernisation of terminology occurs in English rather than through indigenous linguistic resources. The preponderance of English in science, technology and other domains seems, therefore, to be affecting and limiting the use of other languages, even internally, for national publications, that is, within their home countries (Ammon, 2001).

In line with this view, Ferguson (2007) reinforces that the implications of this

dominance should indeed be subject to debate. Two major concerns stand out. First, there is the previously mentioned potential negative impact on other languages, mainly national languages, which may be gradually confined to secondary status and may consequently lose important functional domains. Second, the predominance of English may generate communicative inequalities, as non-native researchers are often at a relative disadvantage when attempting to publish their work in high-prestige international journals.

Despite any associated disadvantages, in practice, the use of English continues to expand as a dominant trend, and this trajectory is unlikely to reverse. For this reason, many countries worldwide (as further discussed in the text) have introduced English-language learning to their educational programmes, which has been playing an increasingly vital role in academic institutions, as a way to attract more students, besides those enrolled in language courses.

### **3. Academic Performance and Research Development**

As discussed earlier, English proficiency is widely considered an important factor supporting academic success in higher education. Students enrolled in technical and scientific programmes are more likely to engage in international conferences, collaborative projects, and online scientific communities, thereby strengthening their research experience. They are often required to write papers, reports, and project presentations in English, frequently relying on academic literature published in English as sources of state-of-the-art research. The ability to understand specialised terminology and communicate effectively in English, therefore, plays an important role in supporting academic performance.

The predominance of English in academic publishing has been widely documented in the literature on scientific communication (Ammon, 2001). As a result, mastery in the English language plays a crucial role in shaping academic performance and fostering research development, particularly in technical and scientific disciplines. Students who develop strong English skills are better positioned to access primary research articles, technical manuals, and scientific databases, which are predominantly published in English. This access enables them to remain informed about global developments in their fields and to integrate updated knowledge into their academic work.

Students with higher levels of English proficiency are therefore better positioned to produce high-quality academic work and to engage with the global scientific community (Misikhin, 2016; Si, Zhang, & Zhang, 2025).

Furthermore, students who aim to publish their research or participate individually in international conferences must be able to present and disseminate their work in English. Competence in English increases the visibility of research outputs and supports academic exchange within the international scientific community. The capacity to understand complex terminology, construct coherent arguments, and communicate research findings effectively may therefore contribute to academic performance, defined here as the ability to understand specialised

literature, produce research-based assignments, participate in academic discussions, and complete research or technical projects.

Ultimately, the study of English extends beyond the development of linguistic competence. In technical and scientific education, it functions as a strategic academic tool that enables students to access scientific knowledge, participate in international scholarly communication, and engage in global research initiatives, while also preparing them for future professional opportunities.

#### 4. Professional Opportunities in a Globalised Market

Governments increasingly introduce English as a mandatory subject at younger ages, and workers are expected to have high proficiency in English (Nunan, 2003). Igor Misikhin (2016) emphasises that engineers and scientists must enhance their oral and written English skills to communicate with colleagues internationally, which raises the question: how should teachers approach improving these skills, that is, focusing on communication competencies?

One may therefore presume that the need for well-qualified teachers is closely linked to the growing importance of English proficiency in the labour market. Effective and focused instruction directly influences learning outcomes and plays a crucial role in preparing students to meet global professional demands.

The labour market in technical and scientific fields is highly international. Multinational corporations, research institutions, and technology companies require English for professional communication. Many technical tools, programming languages, and software platforms are documented in English, further reinforcing its necessity.

Ahamed (2025) highlights that the IT and technology sectors depend heavily on international communication and cooperation. Proficiency in English is therefore essential for activities such as software development, coding, project management, technical writing, and other roles that require global teamwork and collaboration. This reinforces the importance of English for individuals pursuing careers in technology, research, academia, and scientific fields.

Taken together, and considering both academic and professional contexts, these observations suggest that in today's globalised economy, effective communication in English has become one of the most critical skills for technical and scientific professionals. Organisations and research institutions increasingly operate across national borders, requiring students and future employees to interact with colleagues, collaborators, and partners from diverse linguistic and cultural backgrounds. In this context, proficiency in English—built through structured education and practice—often functions as the common language that enables both academic collaboration and professional cooperation, facilitating knowledge exchange, participation in international projects, and integration into global research networks.

Strong communication skills, therefore, contribute directly to professional development. Individuals who can present ideas persuasively, write technical reports,

and communicate successfully in global contexts are better positioned to access leadership roles, international assignments, and collaborative research opportunities.

In this sense, communication is no longer merely a supplementary skill but a strategic competence that supports professional success in a globalised labour market.

## 5. International Collaboration and Innovation

Another significant factor for scientific progress is collaboration. Proficiency in English enables productive participation in global networks, collaborative platforms, and online scientific communities (Ahamed, 2025; Si, Zhang, & Zhang, 2025).

Innovation often emerges from the exchange of diverse perspectives, which must be adequately disseminated and perceived. By mastering English, technical students can contribute to and benefit from global innovation ecosystems.

Many multinational companies in innovation areas use English as the official language and consider it essential for professional success. English facilitates communication in conferences, negotiations, and multinational projects, making it not just an advantage but often a requirement.

### Illustrative examples:

- **CERN** demonstrates English as the working language for multinational research teams (CERN, n.d.).
- **The Human Genome Project** brings together institutions from multiple countries, the United States, the United Kingdom, Japan, Germany, France, and China, with shared genomic databases, protocols, and publications being standardised in English (Collins et al., 2003).
- **mRNA vaccine development during COVID-19** relied on English for global scientific collaboration, coordination and knowledge dissemination. Clinical trial protocols, regulatory documentation, and scientific publications were prepared in English to facilitate international review and scientific exchange (Polack et al., 2020; Karikó & Weissman, 2020; World Health Organization, 2021).
- **International Space Station.** As documented in NASA's 2023 reports, operations use English as the primary language for documentation and coordination, and astronauts undergo language training to ensure operational safety and experimental coordination.

These examples show that English proficiency is fundamental in equipping researchers and professionals to operate effectively within international innovation and collaborative scientific networks.

## 6. The Role of Artificial Intelligence

In science and technology programmes, Artificial Intelligence (AI) is frequently used as a support resource. Machine Translation (MT) tools such as Google Trans-

late, DeepL, and ChatGPT have become increasingly popular among language learners in both academic and everyday contexts (Lee, 2022). While these digital tools can facilitate text comprehension, they do not replace structured language instruction or the pedagogical role of teachers, and excessive reliance on them may compromise the development of critical reasoning and communicative skills.

Klimova (2025) emphasises that human interaction and instructor guidance remain essential in language education. Although MT and AI offer efficiency and accessibility, they may hinder independent language development, reduce motivation to deepen language study, and limit understanding of cultural context.

Institutional guidance is therefore crucial, including training students to identify and correct translation errors, as these tools can sometimes generate inaccuracies, particularly in rigorous scientific and technological fields. Errors in technical translations may lead to misunderstandings, misapplications, oversimplifications of complex concepts, or flawed communication. Reliance solely on automated tools, without solid language competence or instructor support, may undermine academic rigour and accuracy. Furthermore, MT tools can create an illusion of mastery, as students may feel confident when reading or producing translated texts, but lack the oral skills necessary for effective communication in conferences, seminars, briefings, or international meetings.

Conversely, when combined with formal English training, MT and AI tools can enhance learning without replacing teacher-led instruction. Face-to-face collaborative learning remains vital for language acquisition. Human instructors provide essential cultural understanding, adaptive teaching, and ethical guidance, which technology alone cannot replicate (Rafique et al., 2025).

Far from reducing the need for English in science and technology programmes, the presence of MT and AI reinforces the importance of developing genuine linguistic competence. Despite advances in language processing and educational support, machines cannot substitute for human interaction in the classroom. Language learning is a social process that extends beyond grammar and vocabulary; it involves emotional connection, cultural understanding, adaptive instruction, and ethical guidance, all grounded in human experience. Technology can assist and enhance English education, but the presence of a knowledgeable, empathetic, reflective, and AI-literate teacher remains essential, as the social and communicative aspects of language learning cannot be replaced (Rafique et al., 2025).

## 7. Conclusion

For students in technical and scientific education, English is no longer merely an additional academic skill but a fundamental component of participation in the global scientific community. As globalisation continues to reshape the labour market, the importance of linguistic and intercultural communication cannot be understated.

The existence of digital technologies reinforces the need for systematic training under human guidance and instruction. While digital tools can enhance access to

information and comprehension, they cannot replace structured language instruction or the pedagogical expertise of qualified teachers. Overreliance on such tools may create a false sense of proficiency, particularly when students are required to communicate orally at conferences or participate in international collaborative research projects. Developing genuine linguistic competence ensures that students can critically engage with scientific literature, express their ideas effectively, and actively participate in international scientific and professional environments.

Overall, proficiency in English remains essential in today's globalised world, serving as a vital tool for academic success, professional advancement, and participation in international academic and professional environments. Effective English education, therefore, relies not only on technological support but also on competent, dedicated and well-prepared instructors capable of providing rich and meaningful learning experiences.

True academic integration requires more than AI-assisted translation tools. It demands critical thinking, confident communication, and the ability to engage in scientific dialogue across cultures and disciplines. For this reason, fostering highly qualified language educators within technical and scientific programmes is essential to ensure that students fully benefit from the opportunities associated with English proficiency.

Ultimately, embedding English within science and technology education is not merely advantageous or an additional skill; it is a strategic necessity that supports students' global readiness, academic development, and long-term professional success.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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