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THE INFLUENCE OF GLOBAL ENGINEERING STANDARDS AND PATENTS ON LANGUAGE EDUCATION

Introduction. This study investigates how global engineering standards, predominantly written in English, influence language education for engineering students. It explores the impact of international standards such as ISO, IEEE, and IEC on the development of technical English vocabulary, reading and writing skills, and communication in intercultural engineering contexts.

Global engineering standards represent a critical intersection between technical accuracy and language proficiency. Organizations such as the International Organization for Standardization (ISO), the Institute of Electrical and Electronics Engineers (IEEE), and the International Electrotechnical Commission (IEC) establish universally adopted quality, safety, and performance criteria. These standards, predominantly authored in English, form the linguistic medium through which engineers worldwide communicate complex technical information.

Consequently, engineering language education must address the specialized linguistic demands posed by such documentation, which significantly shape educational practices and student competencies.

ISO, IEEE, and IEC standards extensively define technical vocabulary, syntactic structures, and communicative conventions unique to engineering discourse. The language of standards is highly formal, precise, and often characterized by dense syntactic constructions, including domain-specific terminology and complex conditional structures. Moreover, global standards impose technical documentation and safety regulations that engineers must both understand and accurately implement to ensure operational safety and product reliability.

Effect on Engineering Language Education. Engineering students must acquire a specialized lexicon to navigate global standards effectively and expand their reading.

Studies underscore considerable difficulties learners face when encountering unfamiliar terminology and complex syntactical forms typical of standard documents.

Franch et al. (2021) examine the essential role of English proficiency in interpreting and applying international standards, which serve as key sources of codified engineering knowledge but are often insufficiently understood by students. Engineering standards are typically written in highly specialised technical language, requiring advanced linguistic competence for accurate interpretation. This challenge is underscored by Kurr and Landmesser (2023), whose research identifies a significant gap in undergraduate curricula and emphasises the need for targeted training in how to read and interpret complex technical documentation.

Such linguistic complexity highlights the importance of developing students' ability to process complex syntactic structures and specialised terminology characteristic of standardised engineering texts. According to Lei and Liu (2018), mastering domain-specific vocabulary and formal structures is essential in engineering discourse.

In addition, engineers frequently engage with patents as a key source of technological information and innovation. Patent documents are characterised by complex legal and technical language, requiring both subject-specific expertise and advanced reading and interpretative skills in English. The ability to analyse patent claims, descriptions, and technical specifications is therefore an essential component of professional communication in engineering contexts.

Furthermore, Khalifa and Albadawy (2024) emphasise modern trends, including digital access to standards, AI-supported translation tools, and the demands of international collaboration, as well as the growing role of AI in supporting academic writing and language development.

Writing Skills and Documentation Proficiency. In the context of global engineering standards and patent documentation, technical writing instruction must prepare students to produce precise, standards-compliant reports, specifications, and analytical summaries. These genres require not only linguistic accuracy but also the ability to interpret highly structured and formalised technical and legal texts. While AI-supported tools can assist in drafting and editing by improving grammatical accuracy and

coherence, their role remains limited when applied to complex, domain-specific documentation. However, as demonstrated in the case study by Yaroslava Fedoriv (2024), AI-assisted academic writing presents significant challenges, particularly in ensuring contextual accuracy, managing specialised terminology, and fostering critical interpretation. Over-reliance on such tools may reduce learners' ability to independently construct arguments and accurately engage with engineering standards and patent texts, which demand a high level of analytical and linguistic competence. Therefore, AI should be viewed as a supplementary resource rather than a substitute for developing advanced writing skills within engineering language education.

Oral communication, in turn, frequently requires explaining complex standard requirements, negotiating technical solutions, and presenting patent-based innovations to diverse audiences. As shown by Wu et al. (2021), communication competence significantly affects employability; however, in engineering contexts, this competence is inseparable from the ability to accurately interpret and convey standardized and patent-based knowledge. Furthermore, research by Cheryl Bodnar and Renee Clark (2017) suggests that interactive approaches such as game-based learning can enhance communication skills when tasks are grounded in authentic engineering scenarios, including the interpretation of technical standards and innovation-related documentation.

Modern Trends in Language Education within Standards- and Patent-Oriented Engineering Contexts.

Digitalisation of Standards and Patent Databases. The transition from printed materials to digital platforms has fundamentally transformed how engineers access and interpret both international standards and patent documentation. Engineers increasingly rely on specialised databases, such as ISO and IEEE digital libraries, as well as patent repositories including the European Patent Office (EPO) and the World Intellectual Property Organization (WIPO). These platforms require not only advanced reading skills but also the ability to formulate precise keyword queries, interpret classification systems, and navigate highly structured technical and legal documents. Patent texts, in particular, demand careful analysis of claims, descriptions, and abstract sections, each of which follows strict linguistic and structural conventions. According to the World Intellectual

Property Organization, patent documents represent one of the most comprehensive sources of technical information, but their complexity poses significant challenges for non-native English-speaking engineers.

Integration of Standards and Patents into Language Instruction. A growing trend in engineering language education is the systematic integration of authentic materials, specifically international standards and patent documents, into the curriculum. This approach enables students to develop discipline-specific literacy skills, including the ability to interpret regulatory requirements and extract innovation-related information from patent texts. Unlike general technical texts, standards and patents require learners to understand not only terminology but also genre-specific structures, such as normative language in standards and legally binding phrasing in patent claims. Research by Katarina Polić and Ivana Krelja Kurelović (2021) demonstrates that exposure to authentic technical corpora improves students' ability to process complex multi-word units and specialised expressions. Additionally, studies by European Patent Office (2022) highlight that incorporating patent literacy into engineering education enhances students' innovation awareness and their ability to engage with real-world technological documentation.

Conclusion. The interplay between global engineering standards and language education necessitates a multidisciplinary, technology-enriched pedagogical approach that equips engineering students with critical linguistic and communicative skills. Empirical evidence supports integrating AI-enhanced tools, project-based learning, and soft skills development into curricula to address the complex demands of standardized technical English. This alignment prepares engineering students not only to comprehend and apply global standards accurately but also to thrive in the multicultural, interdisciplinary professional environments characterizing modern engineering practice. Further studies are needed to investigate how the integration of AI in language instruction affects the development of students' competence in reading, interpreting, and producing standardised engineering and patent-related texts.

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