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ENGLISH FOR SPECIFIC PURPOSES (ESP) FOR ENGINEERING STUDENTS IN SAUDI HIGHER EDUCATION

INGLÊS PARA FINS ESPECÍFICOS (ESP) PARA ESTUDANTES DE ENGENHARIA NO ENSINO SUPERIOR DA ARÁBIA SAUDITA

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Abstract

Introduction: The Vision 2030 of Saudi Arabia highlights the necessity to provide certain language skills to engineering graduates. Though the application of Preparatory Year Programs (PYP) in Saudi Higher Education Institutions (HEIs) had been implemented for several decades, one hardly can find a lack of evidence proving that there is no gap between the language competencies necessary for engineers and those developed by means of preparation programs for fulfilling them. English for Specific Purposes (ESP) learning proves to be the most widespread approach towards overcoming that gap; however, ESP learning theory, practice, and assessment continue developing rapidly because of a fast growth of discipline and technology background. Aims: This paper presents the findings of a thematic review related to the ESP training of undergraduate engineers in Saudi HEIs within the period of 2020-2025. The aims of the present study include the analysis of (1) the types of tasks presented for Saudi engineering undergraduates; (2) the current ESP curricula in terms of students' needs; (3) the role of technologies and artificial intelligence (AI) as instruments for ESP instruction; and (4) the ESP program reform proposals based on the ABET standards and Vision 2030. Methods: The study is aimed at performing a systematic thematic review on the ESP training of engineering undergraduates through the use of Scopus, Web of Science, ERIC, Google Scholar, and Saudi Digital Library with the PRISMA methodology. Thirty articles published in the range from 2020 to 2025 have been selected and thematically analyzed. Results: There have been found the discrepancies between ESP learning needs and curricula of preparatory courses in all analyzed studies. Technical writing, oral presentation, academic reading, and specialized vocabulary are identified as the most popular ESP skills for

Resumo

Introdução: A Visão 2030 da Arábia Saudita destaca a necessidade de proporcionar determinadas competências linguísticas aos graduados em engenharia. Embora a aplicação de Programas de Ano Preparatório (PYP) nas instituições de ensino superior (IES) sauditas já tenha sido implementada há várias décadas, dificilmente se encontram evidências que comprovem a inexistência de uma lacuna entre as competências linguísticas necessárias aos engenheiros e aquelas desenvolvidas por meio dos programas preparatórios para atendê-las. A aprendizagem do Inglês para Fins Específicos (ESP) revela-se a abordagem mais difundida para superar essa lacuna; no entanto, a teoria, a prática e a avaliação da aprendizagem do ESP continuam a evoluir rapidamente devido ao rápido crescimento da disciplina e do contexto tecnológico. Objetivos: Este artigo apresenta os resultados de uma revisão temática relacionada à formação em ESP de engenheiros de graduação nas IES sauditas no período de 2020 a 2025. Os objetivos do presente estudo incluem a análise de (1) os tipos de tarefas apresentadas aos estudantes de graduação em engenharia da Arábia Saudita; (2) os atuais currículos de ESP em termos das necessidades dos alunos; (3) o papel das tecnologias e da inteligência artificial (IA) como instrumentos para o ensino de ESP; e (4) as propostas de reforma do programa de ESP com base nos padrões da ABET e na Visão 2030. Métodos: O estudo visa realizar uma revisão temática sistemática sobre a formação em ESP de estudantes de graduação em engenharia por meio do uso do Scopus, Web of Science, ERIC, Google Scholar e da Biblioteca Digital Saudita, utilizando a metodologia PRISMA. Trinta artigos publicados entre 2020 e 2025 foram selecionados e analisados tematicamente. Resultados: Foram encontradas discrepâncias entre as necessidades de

engineering students in Saudi Arabia. ESP learning in STEM areas is significantly facilitated by the use of technologies and AI. The inconsistency between the views of students and subject teachers on task performance depends on educational and specialization levels. Conclusion: Evidence-based ESP curriculum reform recommendations are made.

Keywords: English for Specific Purposes. Engineering Education. Needs Analysis. Saudi Arabia. Task-Based Learning. AI-Enhanced Instruction. Curriculum Reform.

aprendizagem de ESP e os currículos dos cursos preparatórios em todos os estudos analisados. Redação técnica, apresentação oral, leitura acadêmica e vocabulário especializado são identificados como as habilidades de ESP mais populares entre os estudantes de engenharia na Arábia Saudita. A aprendizagem de ESP nas áreas STEM é significativamente facilitada pelo uso de tecnologias e IA. A inconsistência entre as visões dos estudantes e dos professores da disciplina sobre o desempenho nas tarefas depende dos níveis educacionais e de especialização. Conclusão: São feitas recomendações para a reforma do currículo de ESP baseadas em evidências.

Palavras-chave: *Inglês para Fins Específicos. Educação em Engenharia. Análise de Necessidades. Arábia Saudita. Aprendizagem Baseada em Tarefas. Instrução Aprimorada por IA. Reforma Curricular.*

1 INTRODUCTION

The problem statement. In Saudi Arabian public universities where the medium of instruction in engineering faculties is English, students often encounter problems with understanding lectures because of the gap between their level of second language proficiency, which is acquired during their stay in secondary schools learning the Arabic language, and the level they need to be able to understand and analyze educational material taught in English. It is claimed that many undergraduate engineering students who studied English for 9 years cannot work effectively with this language after entering university because of the gap between these two levels (Alfehaid, 2018; Alrashidi & Phan, 2015). This problem is especially severe for students of Saudi public universities, in particular because of the low pass rate in engineering disciplines and the elimination of entire cohorts of students from programs, poor academic achievements of learners, and high rates of dropouts (Asmari, 2016; Muhammad & Abdul Raof, 2019). Consequently, to provide assistance to these students, almost all Saudi public universities create Preparatory Year Program designed to prepare undergraduate students to study in the future and teach them some basic language skills and prerequisites related to other disciplines (Omar & Alrubayea, 2012). Accordingly, in the framework of these PYPs, the

students gain their level B1 according to CEFR and obtain some general language proficiency and the basics of ESP. However, despite the positive role PYPs play in this context, it has been pointed out that such programs involve the usage of commercial textbooks that cannot provide satisfactory results (Howard & Major, 2004; Muhammad & Abdul Raof, 2019; Alsamadani, 2020). In light of the appearance of several important tendencies, including the implementation of the reforms of Vision 2030 in a short period, the rise in labor market standards, increased pressure on ESP training, and the appearance of various AI language tools, such as language models, intelligent writing assistants, and dynamic vocabulary building applications, a comprehensive review of ESP courses of Saudi engineering undergraduates remains necessary.

1.1 Objectives and research questions

This systematic review aims to be carried out according to the following four objectives and research questions:

• RQ1: What communicative tasks do Saudi engineering undergraduates perform most often with the help of their English language skills at different academic year levels and disciplines specialization?

• RQ2: How is current ESP training in Saudi higher education institutions related to the results of needs analysis?

• RQ3: What impact do AI tools have on ESP training for engineering undergraduates in Saudi higher education institutions?

• RQ4: What evidence-based principles for curricula reform are needed to bridge learner needs and ABET requirements and Vision 2030 goals?

2 LITERATURE REVIEW: BACKGROUND AND THEORETICAL FRAMEWORK

2.1 ESP instruction in Saudi Engineering Faculties

ESP instruction in Saudi HEIs occupies quite a unique place in relation to the overall structure of ESP instruction in any other country. If ESP courses in many overseas higher educational institutions remain elective, in Saudi universities and colleges, such courses become obligatory and represent a kind of mandatory passage for engineering students to actively engage in studying disciplines such as civil, electrical, mechanical, and computer engineering. At the same time, the uniqueness of the ESP instruction in Saudi HEIs brings certain constraints into ESP curriculum development inasmuch as ESP instruction should not only develop the transferable language skills of the students but also prepare them for particular communication-related challenges they may face in engineering disciplines (Muhammad & Abdul Raof, 2019; Alshabeb *et al*., 2021). The second peculiar feature is the difference in curricular frameworks, which are developed in the scope of the Accreditation Board for Engineering and Technology with a view to outlining the skills of graduates in the areas of engineering communication, technical writing, and professional presentations in English. By contrast, ESP programmes developed in English departments have different organizational structure, aims, and assessment procedures (Alsamadani, 2020; Habbash & Albakrawi, 2022).

2.2 Needs analysis and ESP curriculum design

Needs analysis (NA), which represents evidence-based methodology for identifying the language competences needed by learners to perform certain communicative tasks, becomes the major framework for designing and delivering ESP courses (Brown, 2016; Long, 2005). Within the context of NA research, there are three main types of analyses: TSA aims at defining the linguistic demands of certain academic or professional settings; LSA identifies learners' preferences and motivation; PSA serves for assessing learners' current language competences in relation to the standards defined in TSA (Brown, 2016; Long, 2005). According to task-based NA proposed by Long

(2005), the focus of the needs analysis will be put on communicative tasks, which are considered to be concrete examples of language use. For instance, those include such activities as writing scientific articles or laboratory reports, giving technical presentations, and reading books on a certain topic. Task-based needs analysis becomes particularly important in ESP, where the language learning takes place against the background of definite communicative tasks. The task-based approach has become one of the mainstream approaches to ESP instruction used in Saudi Arabia (Alsamadani, 2020; Alshabeb *et al*., 2021; Habbash & Albakrawi, 2022).

2.3 Integrating AI into ESP instruction

One of the most recent trends in the development of ESP instruction includes intelligent applications using AI techniques. Recent research suggests that advanced applications such as ChatGPT can serve as useful aides in completing engineering writing tasks in English as a foreign language. In this way, such technologies enable the learners to receive prompt feedback on their work, adjust their style and register, and understand certain conventions typical of the genre (Jmaiel *et al*., 2025; Mohamed *et al*., 2024; Warschauer & Xu, 2024). Additionally, AI-assisted technologies such as Grammarly provide rule-based assistance in cases when the learners make regular mistakes typical of Arabic speakers (Al-khresheh *et al*., 2023). The basis for the implementation of AI into ESP instruction is explained through Vygotsky's (1978) concept of the Zone of Proximal Development, in which AI can become a mediating tool helping learners to complete actions that would be impossible to them without external influence. The capacity of modern AI-based applications to produce texts and give immediate feedback on the performance solves one of the core issues related to traditional ESP instruction – namely, the limitations of teachers' resourcefulness in dealing with many students

3 METHODOLOGY

3.1 Review design and rationale

In this paper, systematic thematic review will be employed (Grant & Booth, 2009; Snyder, 2019). As mentioned above, systematic thematic review combines quantitative and qualitative data and allows developing themes that extend beyond the findings reported in primary studies (Thomas & Harden, 2008). This type of review is preferable compared to meta-analysis owing to variability of research methods utilized in existing scholarly literature in this domain of interest.

3.2 Literature search protocol and databases

Systematic search of articles was performed in March 2025 from five electronic databases, such as Scopus, Web of Science (Core Collection), ERIC, Google Scholar, and Saudi Digital Library (SDL). Relevant studies will be identified in the time frame ranging from January 2020 until February 2025. A literature search protocol includes Boolean operators and three conceptual categories that will be considered as follows:

ESP/EFL context: "English for Specific Purposes" OR "ESP curriculum" OR "EFL writing" OR "academic English"

Learner population and context: "engineering students" OR "STEM undergraduates" OR "Saudi Arabia" OR "Saudi HEI" OR "Preparatory Year Programme"

Intervention/approach: "needs analysis" OR "task-based" OR "AI-based" OR "digital tools" OR "curriculum design"

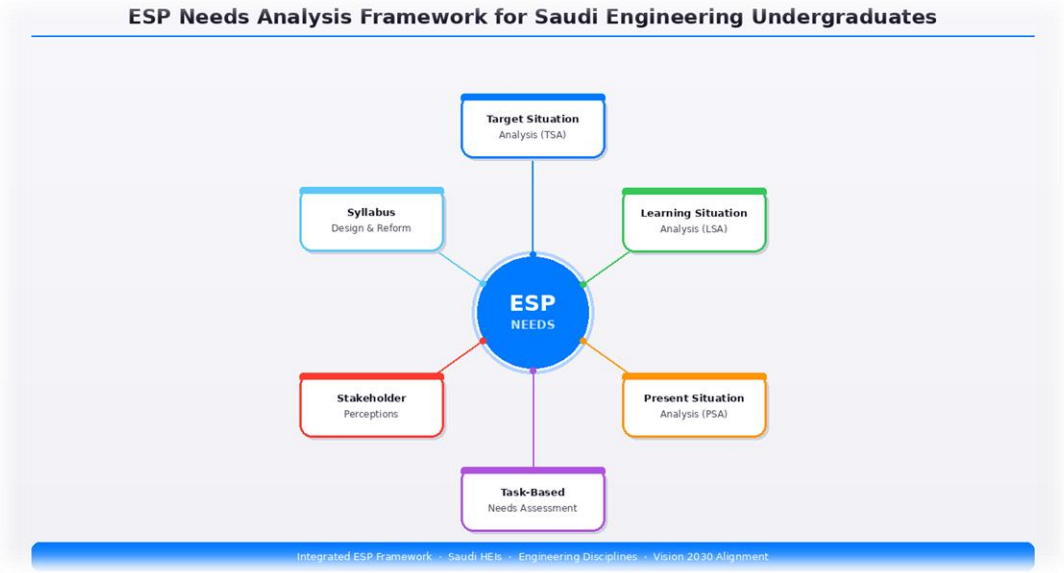
3.3 Selection criteria and process

To select articles for further analysis, the following criteria have to be met: (a) the article concerned ESP or academic English learning among engineering or STEM undergraduates in Saudi Arabia or other GCC countries; (b) the publication was released in a peer-reviewed journal during 2020-2025; (c) there existed an intervention method; (d) there were relevant findings to answer research questions posed. The papers that

examined ESP acquisition among secondary school students, involved non-engineering students, and focused on ESP learning in a different country than Saudi Arabia and other GCC states will not be considered. After conducting a literature search, 2,340 total papers will be obtained. Out of these papers, 894 papers will be removed from analysis due to their being duplicate. Thus, 1,446 articles will be left to proceed to title and abstract examination. Out of these papers, 312 papers will go through full-text screening. Only thirty papers were found to satisfy all selection criteria outlined above. Mixed methods appraisal tool (MMAT) (Hong *et al*., 2018) will be utilized to critically evaluate these articles. All of the thirty papers met four out of five criteria. To conduct a thematic analysis, a three-step process was followed, namely: line-by-line coding of findings, grouping them in sub-themes, and formulating analytical themes.

Figure 1

Integrated ESP Needs Analysis Framework for Saudi Engineering Undergraduates: Six inter-connected analytical domains guiding curriculum development and pedagogical design



4 FINDINGS AND THEMATIC SYNTHESIS

4.1 Communicative tasks demands in saudi engineering programmes (RQ1)

One consistent finding found throughout the reviewed literature is the wide variety of communicative tasks Saudi engineering undergraduates are asked to perform in English. Based on the findings from needs analyses of Saudi engineering students reviewed for this paper, the high-priority communicative tasks demanded of them by both teachers and students can be divided into six distinct functional categories including: teacher-student communication, document writing, classroom and laboratory activities, examinations and assessments, presentation, and digital information tasks (Muhammad & Abdul Raof, 2019; Alsamadani, 2020; Habbash & Albakrawi, 2022). In relation to writing tasks, laboratory report writing, graduation project reports, and term papers represent the most frequently performed tasks across the four different branches of engineering programmes – Civil, Electrical, Mechanical and Computer Engineering. Such communicative tasks impose on engineering students the need to employ not one but several genre-specific discourse styles simultaneously, i.e. they have to organize the technical content in a discipline-specific way, use specialized vocabulary correctly, keep their texts in an appropriate register while incorporating non-linguistic resources like figures, equations and tables (Alshabeb *et al*., 2021). The complexity of these writing tasks cannot be covered by basic-level PYP classes. Classroom and laboratory activities are among the most numerous types of communicative tasks engineering students perform. Based on data gathered in comparable surveys, listening to lectures and laboratory instructions (a frequent task by around 89% of the respondents), asking and answering teacher questions, and taking notes in lectures are the top three tasks within this category. Importantly, many such interactions take place within a hybrid-language classroom context, whereby Arab instructors tend to switch back and forth between Arabic and English languages in the middle of discourse, thereby complicating learners' acquisition of academic listening skills in English (Alsamadani, 2020; Alrashidi *et al*., 2021). Oral presentation was consistently indicated as both high-frequency and high-difficulty communicative tasks in this review of the literature. Students are required to give oral presentations throughout various stages of the engineering programme: mini-

projects during second and third years, technical laboratory demonstrations starting third year, and graduation project presentations in the final year. It was shown that presentation tasks received insufficient instruction within current PYP programs creating an apparent gap between the frequency of the demand and the level of preparation (Habbash & Albakrawi, 2022; Alshabeb *et al*., 2021).

Table 1

High-Priority ESP Task Categories for Saudi Engineering Undergraduates: Evidence from Reviewed Studies (2020–2025)

Task Category	Specific Task	Frequency Level	Reported Challenges	Source
Document Writing	Laboratory Report	Very High	Genre conventions; technical register	Alsamadani (2020)
Document Writing	Graduation Project Report	Very High	Extended discourse; citation practices	Habbash & Albakrawi (2022)
Document Writing	Term Paper / Assignment	High	Argumentation; source integration	Alshabeb *et al.* (2021)
Classroom Activities	Listening to Lectures	Very High	Code-switching; technical vocabulary	Alrashidi *et al.* (2021)
Classroom Activities	Note-Taking	High	Speed; abbreviation; accuracy	Muhammad & Abdul Raof (2019)
Presentations	Graduation Project Presentation	Very High	Fluency; visual aids; Q&A handling	Habbash & Albakrawi (2022)
Assessment	Solving Numerical Problems	Very High	Formulaic language; symbols	Alsamadani (2020)
Digital Tasks	Internet-Based Research	Very High	Academic source evaluation	Alshabeb *et al.* (2021)
Communication	Professional Email Writing	High	Formal register; structure	Muhammad & Abdul Raof (2019)
Reading	Subject-Specific Textbooks	High	Specialised vocabulary load	Alrashidi *et al.* (2021)

Note. Frequency levels based on synthesis of quantitative findings across reviewed needs analysis studies. Very High = >80% respondents; High = 60–79%.

4.2 Misalignment between tasks and PYP curricula: evidence and consequences (RQ2)

The main insight emerging from the thematic synthesis analysis is the continued misalignment between the type of tasks which Saudi engineering undergraduates need to perform in English and the content of PYP English language courses which prepare them

for doing these tasks. The nature of misalignment may manifest itself in different ways such as diversity of task types, genre specificity, depth of disciplinary vocabulary, and sequencing in terms of increasing communicative complexity. To begin with, diversity of task types indicates that practically all the studies discussed in the review highlight how current Saudi PYP curricula emphasize general skills of writing essays and reading passages in English as well as conducting general vocabulary activities. At the same time, specialized genres which include laboratory reports, technical descriptions, documentation required for the graduation projects, and writing engineering proposals, are not addressed in the curricula or only briefly touched upon (Muhammad & Abdul Raof, 2019; Alsamadani, 2020; Alshabeb *et al*., 2021). Another dimension of misalignment between the types of tasks students are expected to perform in PYP programs and the content of these courses is the type of commercially published educational resources which continue to play a central role in ESP programs. According to Howard and Major (2004), any commercially produced textbook aimed at preparing engineering students for performing communicative tasks will be geared towards the largest potential audience. Therefore, any commercial English for Academic Purposes (EAP) materials cannot meet discipline-specific needs of engineering ESP learners. All the studies discussed in the review confirm this earlier conclusion. The year of study proves to be an important factor in the relation between task demands and curricula content. For instance, while second-year engineering students take classes such as foundational mathematics, general physics and university requirements, fourth-year students engage in capstone design projects, summer industrial training, and work on completing their graduation projects. Nevertheless, there is no progression in building up ESP competencies related to year of study, thus, the first year of study implies high communicative task demands and insufficient linguistic preparation for these tasks (Muhammad & Abdul Raof, 2019; Habbash & Albakrawi, 2022).

4.3 AI-based tools and digital technologies in saudi engineering ESP (RQ3)

The current period (2020-2025) stands for breakthrough in making advanced digital technology available to assist in ESP instruction. More and more studies on the use of AI-enabled technologies in Saudi engineering ESP programs are being conducted

on the basis of surveys or student self-reports on tool usage experience. In particular, large language models (LLMs) such as ChatGPT, become especially well-known AI solution in the realm of ESP instruction as demonstrated by several studies carried out between 2023 and 2025. These studies reveal that Saudi engineering students who employ ChatGPT in the course of writing assignments show a studies report statistically significant improvements in such aspects as development of content, structuring of the text, and ability to express themselves in English (Jmaiel *et al*., 2025; Mohamed *et al*., 2024). The results are consistent with previous international evidence on the positive effects of using LLM on improving EFL writing skills given proper instructional scaffolding. Other popular AI-enabled tool is the intelligent grammar correction software like Grammarly which is even more widespread than LLMs in Saudi higher education institutions. In particular, using such tool places fewer cognitive loads on learners, allowing for deterministic feedback concerning rule applications which are essential for surface grammatical errors made by EFL learners of Arabic origin. This assumption is confirmed by a number of studies, particularly the recent work done by Al-khresheh *et al*. (2023), which shows statistically significant decrease in frequencies of errors related to articles, prepositions, and subject-verb agreement. Adaptive vocabulary training tools like Duolingo and Quizlet AI prove effective in acquiring discipline-specific vocabulary acquisition which is mentioned among priorities of some studies discussed in the review. Indeed, spaced repetition algorithms implemented in adaptive vocabulary training software is in line with international findings on vocabulary retention. However, in ESP settings, this kind of tool can be especially effective if it provides learners with specific disciplines-related vocabulary sets (Shadiev *et al*., 2022; Alrashidi *et al*., 2021).

Figure 2

Preferred ESP Skill Areas by Student and Subject Teacher Groups: Comparative Analysis Based on Reviewed Studies (2020–2025)

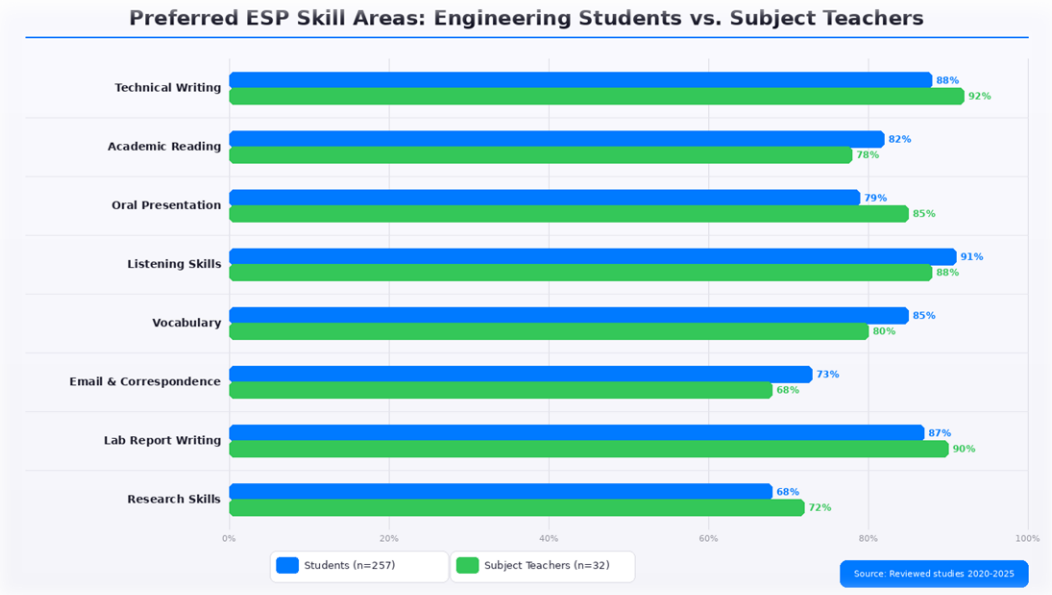


Table 2

Comparative Analysis of ESP Curriculum Alignment in Saudi Engineering HEIs: Current Provision vs. Identified Needs

Identified Need	Curriculum Coverage	Alignment Level	Recommended Action	Priority
Lab Report Writing	Minimal: generic essay writing	Low	Genre-specific writing modules	Urgent
Technical Presentation	Occasional: general speaking	Low	Structured presentation training	Urgent
Domain Vocabulary	Partial: academic word lists	Moderate	Discipline-specific lexical sets	High
Academic Listening	Limited: general comprehension	Low	Discipline-embedded listening tasks	High
Professional Email	Absent in most PYPs	Very Low	Business communication unit	High
Reading Textbooks	Present but generic	Moderate	Technical text analysis strategies	Moderate
Research Skills	Minimal digital literacy	Low	AI-supported research instruction	High
Note-Taking	Rarely addressed	Very Low	Integrated listening-note tasks	Moderate
AI Tool Literacy	Absent in most PYPs	Very Low	AI-assisted writing workshops	Urgent

Graduation Project Docs	Absent pre-Year 4	Very Low	Progressive genre instruction	High

Note. Alignment levels based on thematic synthesis of curriculum audit studies and needs analysis reports (2020–2025). Priority ratings derived from frequency and difficulty indices in reviewed studies.

5 DISCUSSION

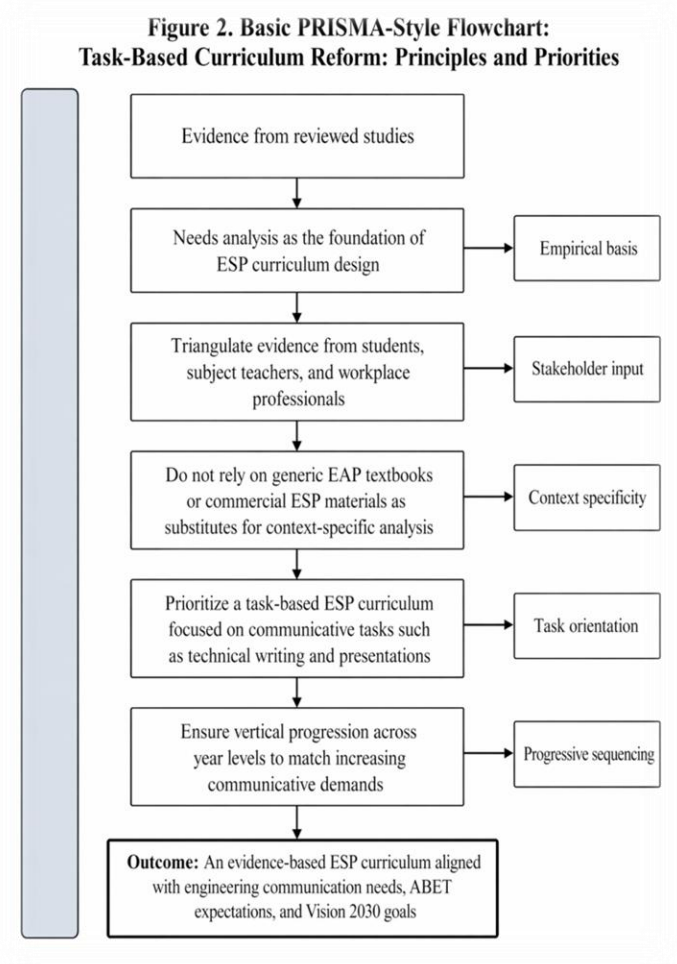
5.1 The curriculum alignment crisis: causes and consequences

The body of evidence compiled in this review points to the conclusion that a significant curriculum alignment problem exists in Saudi engineering ESP programs: to a considerable extent, the former prepares engineering students for a set of communicative tasks which does not properly capture the nature of the latter. This problem is neither the result of any single institutional failure nor a coincidence but rather reflects a structural mismatch in which the ESP curriculum development process takes place at the level of English language departments, while task definition and assessment remain a responsibility of engineering faculties working according to an entirely different organisational logic. The consequences of the curriculum mismatch described above are twofold: academic and professional. On the one hand, as a recent study suggests, engineering students who have failed to develop necessary writing genres (formal laboratory reports, technical project documents, etc.) often underperform in content courses, regardless of their overall proficiency in the relevant discipline (Alshabeb *et al*., 2021; Habbash & Albakrawi, 2022). On the other hand, persistent communication competency gaps throughout an engineer's university education mean that the Saudisation of the national labour market envisaged by Saudi Vision 2030 is unlikely to succeed: engineers unable to draft professional reports, give presentations to expert audiences, and communicate effectively across cultures will remain professionally uncompetitive in the post-Saudisation economy.

5.2 Task-based curriculum reform: principles and priorities

Figure 3

Basic PRISMA-Style Flowchart



Based on the convergent evidence provided by the literature review conducted above, it can be stated that a number of key principles need to be articulated for an effective ESP curriculum reform. Firstly, needs analysis must serve as a foundation for any ESP curriculum for Saudi engineering students, with empirical evidence triangulated between students' own experiences, the views of subject teachers, and workplace professionals – the three stakeholders whose insights are likely to provide the most accurate account of communicative task demands. Secondly, generic EAP textbooks and commercial ESP materials should never be considered a suitable replacement for contextually specific needs analysis.

Thirdly, it seems reasonable to argue that a task-based approach to ESP should take priority in Saudi engineering programmes given that the task-oriented epistemological orientation of engineering education implies the primacy of discrete communicative tasks (technical writing, presentations, etc.). Task-based language teaching (TBLT) has a well-established theoretical foundation, along with numerous empirical successes; indeed, TBLT is recommended as a framework for ESP curricula in a number of reviewed articles (Long, 2005; Brown, 2016; Alsamadani, 2020). Finally, however, task-based ESP curricula require appropriate vertical progress in line with changes in communicative task demands among second-, fourth- and fifth-year engineering students.

5.3 Incorporation of AI-assisted learning materials into saudi engineering ESP courses: a proposal supported by scientific research

First, based on the data gathered during the literature review process, the introduction of AI-assisted learning materials in the process of teaching Saudi engineering ESP classes could prove to be a beneficial approach, provided that three scientific premises will be met in relation to three different types of instruction provided to students with the help of the former. First of all, the benefits of using AI technologies, such as large language models, for writing instruction were clearly proven in the context of Saudi engineering ESP classes (Jmaiel *et al*., 2025; Mohamed *et al*., 2024). Such results were obtained owing to the potential of feedback compression and opportunities to revise student works constantly, provided by AI technologies in the course of their work. However, the successful application of the proposed approach requires several specific preconditions to be addressed. It is necessary that, in order to enhance their writing skills in an efficient manner, students have opportunities for receiving and assessing feedback generated by the technology used for this purpose. Failure to provide the former due to insufficient training in evaluating the suggestions of AI software, lack of knowledge about AI's weaknesses, and the absence of critical thinking skills in relation to the latter would lead to the inability to actively engage in the learning process. For these reasons, not only should the Saudi engineering ESP teachers have access to such software but also learn to use it effectively.

5.4 Possible consequences for ABET and relevance to the vision 2030 initiative

Speaking generally, there are two organizations that influence the structure of Saudi engineering programs. These organizations are ABET, which determines the expected learning outcomes of engineering programs, and Vision 2030. The former is responsible for oral and written communication skills and the quality of students' technical documentation. Considering the data gathered during the literature review, failure to develop the required language competencies in Saudi engineering ESP students can be considered a risk factor influencing ABET-curriculum alignment in the future. In turn, Vision 2030 creates additional challenges that should be considered when developing Saudi engineering ESP curricula. More specifically, in order to meet the criteria established by the vision and become globally competent professionals able to participate in international projects, interact with foreign companies/partners, and study abroad, Saudi engineers should develop language competencies higher than B1 (Alsamadani, 2020; Alrashidi *et al*., 2021).

6 CONCLUSION

The present review has systematically analyzed and summarized the results of thirty scientific articles published between 2020 and 2025 in order to develop an evidence-based account of ESP teaching practices for engineering undergraduates taught at Saudi higher education institutions. As a result, three major insights have emerged from the thematic analysis performed. First of all, there is an enormous gap between communicative tasks assigned to engineering majors at Saudi universities and the preparatory linguistic skills they acquire during their participation in PYP and ESP courses. Indeed, it is precisely in these aspects of ESP practice (technical writing, presentations, listening in academic discourse) that this discrepancy reaches its peak because engineering students and their teachers agree that mastering these competencies is essential for successful communication in academia and beyond.

Secondly, AI-assisted language learning technology is very helpful in Saudi engineering ESP, provided that it is employed within a well-designed instructional design which emphasizes the development of AI literacy among students. Although this type of

educational application should not replace any curricular content developed by instructors, it can greatly facilitate personalization of learning experiences offered to engineering undergraduates.

Thirdly, for any reform in the domain discussed in the article to take place, it is necessary to achieve structural unity between ESP and engineering departments at Saudi universities. As long as the ESP curriculum is not aligned with ABET frameworks and expectations of faculty members who assign particular communicative tasks, any attempt to improve it, regardless of its quality, will prove to be futile. For such reforms to occur, ESP teachers, faculty members, and engineers should collaborate institutionally.

In the future, researchers will need to carry out longitudinal studies tracking the development of communicative competence of engineering majors throughout four years of university education; perform randomized controlled experiments testing comparative effectiveness of task-based and form-oriented ESP curricula; and conduct qualitative inquiries into the challenges facing ESP programs in Saudi universities.#

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