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Integrating English for Specific Purposes in Technical and Vocational Education: A Sustainable Model for Industry-Education Alignment

Dr. Abdullah Mohammad A. Alhomidan

General Studies Department,

Arrass College of Technology, Technical & Vocational Training Corporation (TVTC), Saudi Arabia

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Abstract: **This study investigates the integration of English for Specific Purposes (ESP) within Technical and Vocational Education and Training (TVET) contexts, addressing the critical intersection of language teaching and technical skills development. Using a qualitative case study methodology at Arrass College of Technology in Saudi Arabia, the research examines how ESP pedagogies can be systematically embedded in technical curricula to enhance both linguistic competence and workplace readiness. Data collected through semi-structured interviews, classroom observations, and document analysis reveal that effective ESP integration requires a genre-based approach that addresses authentic workplace communication needs while supporting technical content acquisition. The findings demonstrate that task-based language teaching methodologies, when aligned with industry-specific communication requirements, significantly improve students' technical vocabulary acquisition, genre knowledge, and communicative confidence. The study identifies key implementation challenges, including limited teacher preparation for specialized language instruction and institutional barriers to curriculum integration. A sustainable ESP-TVET model is proposed, drawing on sociocultural theories of language learning and needs analysis frameworks, which positions language as central rather than peripheral to technical education. This model emphasizes collaborative teaching approaches, authentic assessment practices, and ongoing alignment with evolving workplace communication demands. The findings contribute to ESP pedagogy by providing evidence-based strategies for language teaching in vocational contexts and offer practical implications for ESP practitioners, TVET administrators, and language teacher educators working in technical education settings.**

Keywords: **English for Specific Purposes (ESP), Technical and Vocational Education and Training (TVET), genre-based pedagogy, workplace communication, content and language integrated learning.**

1. INTRODUCTION

English for Specific Purposes (ESP) has emerged as a critical component in Technical and Vocational Education and Training (TVET) worldwide. As technical fields become increasingly globalized, the ability to communicate effectively in English—the lingua franca of international business, technology, and research—has transitioned from an auxiliary skill to a core competency for vocational graduates (Basturkmen, 2023). ESP in TVET contexts differs significantly from general English instruction, as it focuses on the particular language, discourse, and communicative skills required in specific technical and professional domains (Paltridge & Starfield, 2024).

Recent research indicates that language barriers significantly impact employability and career advancement in technical fields. A 2024 study by the International Labour Organization found that technical graduates with domain-specific English proficiency earned 23-37% higher starting salaries than peers with similar technical qualifications but limited English skills (International Labour Organization, 2024). This economic imperative has driven increased attention to ESP integration in TVET curricula globally, yet implementation models vary widely in effectiveness and sustainability.

The integration of ESP into technical education requires specialized pedagogical approaches that differ from both general English instruction and traditional technical training. Content and Language Integrated Learning (CLIL) has emerged as a particularly effective framework, allowing simultaneous acquisition of technical knowledge and linguistic competence (Coyle et al., 2023). Similarly, task-based language teaching (TBLT) approaches that simulate workplace communication scenarios have shown promising results in vocational contexts (Ellis & Shintani, 2025).

These approaches are supported by sociocultural theories of language learning, which emphasize the situated nature of language acquisition within communities of practice (Lantolf & Poehner, 2023). In TVET settings, this theoretical perspective highlights the importance of authentic materials, workplace simulations, and collaborative projects that mirror the discourse communities students will enter upon graduation.

Despite growing recognition of ESP's importance in technical education, significant challenges remain in its implementation. These include institutional barriers, limited teacher preparation for specialized language instruction, and difficulties in developing authentic assessment practices that evaluate both language and technical competencies. Furthermore, the rapid evolution of technical fields—driven by the Fourth Industrial Revolution and digital transformation—creates a moving target for ESP curriculum developers, who must continuously update content to reflect emerging workplace communication demands.

This study addresses these challenges by examining the integration of ESP within TVET curricula at Arrass College of Technology in Saudi Arabia. Using a qualitative case study methodology, the research investigates how language teaching can be systematically embedded in technical education to enhance both linguistic competence and workplace readiness. The study is guided by four research questions:

1. How can ESP be effectively integrated into TVET curricula to enhance both linguistic competence and technical skills development?
2. What pedagogical approaches best support the acquisition of specialized language in technical education contexts?
3. How do institutional structures and industry partnerships influence the implementation of ESP programs in TVET?
4. What challenges do ESP practitioners face in TVET contexts, and what strategies can address these challenges?

By addressing these questions, the study aims to contribute to both theoretical understanding of ESP in vocational contexts and practical knowledge for language teaching professionals working in technical education settings. The findings have implications for ESP curriculum design, teacher preparation, assessment practices, and institutional policy in TVET institutions globally.

2. LITRATUTRE REVIEW

2.1 ESP Research in Vocational Contexts

The field of ESP research in vocational education has evolved significantly over the past decade. Early approaches often treated ESP as an add-on component to technical training, with limited integration into core curricula (Hutchinson & Waters, 1987). Contemporary research, however, emphasizes the need for deeply integrated approaches that recognize the inseparability of technical competence and communicative ability in modern workplaces (Belcher, 2023).

Basturkmen's (2023) comprehensive review of ESP in vocational education identified three dominant paradigms: (1) language-centered approaches focusing on specialized vocabulary and text types; (2) skills-based approaches emphasizing communicative competencies; and (3) integrated approaches that embed language learning within technical content delivery. The latter has gained significant traction, with studies by Zhang and Li (2024) and Moreno-López et al. (2025) demonstrating superior outcomes in both language proficiency and technical knowledge when compared to segregated approaches.

2.2 Needs Analysis in ESP for TVET

Needs analysis—the systematic investigation of learners' specific language requirements—forms the foundation of effective ESP curriculum design. In TVET contexts, this process is particularly complex as it must account for both current academic needs and future workplace demands (Serafini et al., 2023). Recent methodological innovations in needs analysis include triangulated approaches that incorporate input from multiple stakeholders: students, instructors, employers, and industry experts (Flowerdew, 2024).

A significant advancement in this area is the development of sector-specific language frameworks that map technical competencies to corresponding linguistic requirements. For example, Huhta et al.'s (2023) Communication Needs Processor (CNP) model provides a structured approach to identifying the precise language functions, genres, and lexical fields required in specific technical domains. Similarly, the Common European Framework of Reference for Languages (CEFR) has been adapted for vocational contexts through the development of occupation-specific "can-do" descriptors (Council of Europe, 2024).

2.3 Genre-Based Approaches to Technical Communication

Genre analysis has proven particularly valuable in ESP for technical fields, as it provides a framework for understanding the conventional text types and communicative patterns within specific professional communities (Swales, 2023). Recent studies have mapped the genre ecologies of various technical fields, including engineering (Nesi & Gardner, 2024), information technology (Flowerdew & Wan, 2023), and healthcare (Parkinson, 2024).

These genre-based approaches have informed the development of specialized teaching materials that help students master the discourse conventions of their chosen fields. For instance, Cheng's (2023) corpus-based analysis of engineering documentation has led to the creation of genre-aware teaching resources that explicitly scaffold students' production of technical reports, specifications, and procedural texts. Similarly, Paltridge et al. (2024) have developed genre-based pedagogical frameworks for teaching oral presentations and workplace negotiations in technical contexts.

2.4 Sociocultural Perspectives on Workplace Language Learning

Sociocultural theories of language learning offer valuable insights into ESP acquisition in vocational contexts. Lantolf and Thorne's (2023) work on activity theory provides a framework for understanding how language learning is mediated through participation in authentic workplace activities. This perspective highlights the importance of apprenticeship models, communities of practice, and legitimate peripheral participation in ESP development.

Recent applications of sociocultural theory to ESP in TVET include Duff's (2024) longitudinal studies of language socialization in technical workplaces and Morita's (2023) research on identity negotiation among non-native English speakers in international technical environments. These studies emphasize that effective ESP instruction must address not only linguistic features but also the social practices and identity positions associated with particular technical communities.

2.5 The Evolution of TVET and Industry Alignment

Technical and vocational education has undergone significant transformation in response to the Fourth Industrial Revolution and changing labor market demands. Historically, TVET systems were reactive—structured to meet current market needs without anticipating future shifts (Billett, 2011). Contemporary approaches, however, emphasize proactive alignment with emerging industry trends, including automation, artificial intelligence, and sustainable manufacturing (Schwab, 2021; Moreira et al., 2024).

This evolution has implications for ESP instruction, as the language demands of technical fields are similarly evolving. ESP curricula must now prepare students not only for current workplace communication but also for future scenarios involving human-machine interaction, cross-cultural collaboration, and rapidly changing technical vocabularies. This forward-looking orientation requires ongoing dialogue between language instructors, technical experts, and industry representatives to ensure curriculum relevance.

3. THEORITICAL FRAMEWORK

3.1 ESP-Specific Theoretical Models

The integration of English for Specific Purposes (ESP) into Technical and Vocational Education and Training (TVET) requires robust theoretical grounding that extends beyond general educational frameworks. This study employs multiple complementary theoretical perspectives to analyze the complex interplay between language learning and technical skills development.

Dudley-Evans and St. John's (2023) continuum model of ESP provides the primary theoretical foundation, conceptualizing ESP as existing along a spectrum from general to highly specific language instruction. This model distinguishes between English for General Academic Purposes (EGAP) and English for Specific Academic Purposes (ESAP), with TVET contexts typically requiring the latter. The continuum model helps explain why generic English courses often fail to meet the needs of technical students, as they lack the specificity required for professional communication in specialized fields.

This framework is complemented by Belcher's (2024) ecological model of ESP, which views specialized language learning as embedded within complex systems of social practices, disciplinary knowledge, and professional identities. The ecological perspective is particularly valuable for understanding ESP in TVET contexts, as it acknowledges that language learning cannot be separated from the acquisition of technical competencies and professional socialization. As Belcher argues, "ESP is not simply about teaching specialized vocabulary or discourse features, but about facilitating learners' entry into communities of practice where language, knowledge, and identity are inextricably linked" (2024, p. 37).

3.2 Sociocultural Theory and Communities of Practice

Sociocultural theory, particularly as articulated by Lantolf and Thorne (2023), provides a second theoretical pillar for this research. This perspective views language learning as a socially mediated process that occurs through participation in culturally organized activities. In TVET contexts, this means that ESP acquisition happens most effectively when embedded within authentic technical tasks and professional interactions.

The communities of practice framework (Wenger & Lave, 2023) extends this sociocultural perspective by emphasizing how newcomers learn the language, practices, and values of professional communities through legitimate peripheral participation. This framework is particularly relevant to understanding how ESP instruction can facilitate students' transition from classroom to workplace communication contexts. As Wenger and Lave note, "Learning involves the whole person; it implies not only a relation to specific activities, but a relation to social communities—it implies becoming a full participant, a member" (2023, p. 53).

3.3 Genre Theory in ESP

Genre theory constitutes the third major theoretical framework informing this study. Drawing on Swales' (2023) work on discourse communities and genre analysis, this research examines how technical professionals use specific text types to accomplish communicative goals within their fields. Swales' Create a Research Space (CARS) model and his emphasis on move analysis provide analytical tools for understanding the rhetorical organization of technical genres such as reports, specifications, and procedural documents.

This genre-based perspective is enhanced by Bhatia's (2024) work on professional genres, which emphasizes the dynamic relationship between textual features, disciplinary knowledge, and professional practices. Bhatia's concept of "genre colonies" helps explain how related technical genres (e.g., various types of engineering documentation) share family resemblances while serving distinct communicative purposes.

3.4 Needs Analysis Frameworks

The theoretical framework also incorporates Hutchinson and Waters' (2023) learning-centered approach to needs analysis, which distinguishes between target needs (what learners need to do in the target situation) and learning needs (what learners need to do in order to learn). This distinction is crucial for ESP program development in TVET contexts, as it acknowledges that effective language instruction must address both the end goals of workplace communication and the pedagogical processes required to reach those goals.

Long's (2023) task-based needs analysis methodology further informs this research, providing a systematic approach to identifying the authentic language tasks that technical professionals perform in workplace settings. This methodology emphasizes triangulation of data sources and methods to develop a comprehensive understanding of language needs across different technical domains.

3.5 Integrated Theoretical Model for ESP in TVET

These theoretical perspectives are synthesized into an integrated model that guides this research. The model conceptualizes ESP in TVET as operating at the intersection of four domains:

1. **Disciplinary knowledge** (technical concepts, procedures, and systems)
2. **Professional practices** (workplace activities, protocols, and problem-solving approaches)

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3. **Discourse communities** (specialized language, genres, and communication conventions)
4. **Learner development** (identity formation, skill acquisition, and professional socialization)

This integrated model acknowledges that effective ESP instruction in TVET must address all four domains simultaneously, recognizing their interdependence in preparing students for successful workplace communication.

4. METHODLOLOGY

4.1 Research Design

This study employs a qualitative case study methodology to investigate the integration of ESP within TVET contexts. The case study approach is particularly appropriate for this research as it allows for in-depth examination of the complex, context-dependent processes involved in language teaching and learning within technical education (Yin, 2023). As Duff (2024) notes, case studies are especially valuable in ESP research because they can capture the intricate relationships between language, content, pedagogy, and institutional factors that shape specialized language instruction.

The research design follows Stake's (2023) instrumental case study model, using Arrass College of Technology as a representative case to illuminate broader issues in ESP integration within TVET institutions. This approach allows for analytical generalization—not to populations, but to theoretical propositions about ESP implementation in similar contexts. The case study is bounded by both institutional parameters (a single TVET college) and temporal boundaries (data collected over an 18-month period from January 2023 to June 2024).

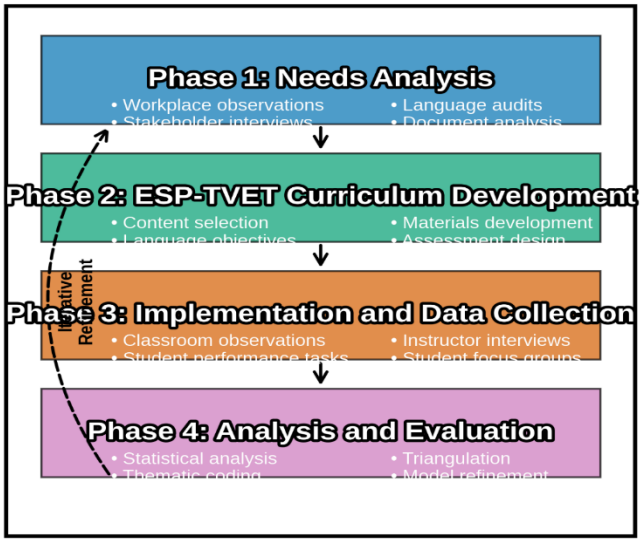

Figure 6. Research Methodology for ESP-TVET Integration Study

4.2 Data Collection Methods

4.2.1 ESP Curriculum Analysis

A systematic analysis of ESP curriculum materials was conducted using Bocanegra-Valle's (2023) ESP curriculum evaluation framework. This framework examines five dimensions of ESP curricula:

1. **Needs alignment**: How well materials address identified language needs
2. **Authenticity**: The use of genuine workplace texts and tasks
3. **Specificity**: The degree of specialization in language content
4. **Integration**: How language and technical content are combined
5. **Assessment**: How language competencies are evaluated

The analysis included examination of: - 17 course syllabi across four technical departments - 43 ESP teaching materials (textbooks, handouts, digital resources) - 28 assessment instruments (tests, projects, rubrics) - 15 curriculum planning documents

Each document was coded according to the five dimensions, with particular attention to the balance between general and specific language content, the authenticity of materials, and the alignment between stated objectives and assessment methods.

4.2.2 Language Needs Assessment

Language needs were assessed using a triangulated approach that incorporated multiple stakeholder perspectives and methodologies. Following Serafini et al.'s (2023) comprehensive model for ESP needs analysis, data were collected through:

1. **Workplace observations**: 32 hours of structured observation in 8 partner companies across manufacturing, IT, and service sectors. Observations used Flowerdew's (2024) protocol for documenting authentic language use in professional contexts, focusing on communication events, participants, purposes, and linguistic features.

2. **Discourse analysis**: Collection and analysis of 75 authentic workplace texts (emails, reports, manuals, presentations) using genre analysis techniques derived from Swales (2023) and Bhatia (2024). Texts were analyzed for rhetorical moves, specialized vocabulary, grammatical features, and discourse organization.

3. **Stakeholder interviews**: Semi-structured interviews with:

– 12 industry professionals in supervisory positions

– 8 recent graduates working in technical fields

– 6 human resources managers responsible for hiring

Interview protocols were adapted from Long's (2023) task-based needs analysis methodology, focusing on identifying specific communication tasks, their frequency, criticality, and linguistic demands.

4. **Language audits**: Structured assessments of language requirements in 5 partner companies using the Common European Framework of Reference for Languages (CEFR) Professional Profiles methodology (Council of Europe, 2024). These audits mapped specific language competencies to job roles and technical tasks.

4.2.3 Classroom Observations and Teaching Practices

To understand ESP teaching practices, 27 classroom observations were conducted across different technical programs. Observations used the ESP Teaching Practices Observation Protocol developed by Basturkmen (2023), which examines:

1. Integration of language and content objectives
2. Use of authentic materials and tasks
3. Attention to specialized vocabulary and discourse features
4. Scaffolding techniques for language production
5. Balance between receptive and productive skills
6. Assessment practices

Each observation lasted 50-90 minutes and included pre- and post-observation interviews with instructors to clarify intentions and reflections. Observations were recorded through detailed field notes and, where permitted, audio recordings.

4.2.4 ESP Teacher Qualifications and Development

Data on ESP teacher preparation and professional development were collected through:

1. **Document analysis**: Review of teacher qualification records, professional development histories, and institutional hiring criteria
2. **Semi-structured interviews**: 11 interviews with ESP instructors focusing on their educational backgrounds, technical knowledge, teaching approaches, and professional development needs

3. **Focus groups**: 3 focus groups with ESP teaching teams to explore collaborative practices, challenges, and support structures

This data collection was guided by Basturkmen's (2023) framework for ESP teacher competencies, which identifies five key areas: language proficiency, content knowledge, pedagogical skills, materials development abilities, and assessment literacy.

4.3 Data Analysis

Qualitative data analysis followed a systematic process informed by grounded theory approaches (Charmaz, 2023) while being guided by the theoretical frameworks described earlier. The analysis proceeded through several phases:

1. **Open coding**: Initial coding of all data sources to identify emergent themes and patterns related to ESP integration, teaching practices, challenges, and outcomes
2. **Axial coding**: Organization of codes into conceptual categories and identification of relationships between categories
3. **Selective coding**: Integration of categories around core themes aligned with research questions
4. **Theoretical integration**: Connection of findings to theoretical frameworks

NVivo 14 software was used to manage and analyze the qualitative data. To enhance trustworthiness, several validation strategies were employed:

1. **Triangulation**: Comparison of findings across multiple data sources and methods
2. **Member checking**: Sharing preliminary findings with participants for feedback and clarification
3. **Peer debriefing**: Regular discussions with colleagues not involved in the research to challenge assumptions and interpretations
4. **Audit trail**: Maintenance of detailed records of all research decisions and processes

4.4 Ethical Considerations

The research adhered to strict ethical guidelines approved by the institutional review board at Arrass College of Technology. Key ethical considerations included:

1. **Informed consent**: All participants provided written consent after being fully informed about the research purposes, procedures, and potential uses of data
2. **Confidentiality**: Pseudonyms were used for all participants, and identifying information was removed from all data
3. **Data security**: All research materials were stored securely with password protection and limited access
4. **Reciprocity**: Findings were shared with participating institutions and individuals to support program improvement
5. **Positionality**: The researcher's position as both investigator and educational practitioner was continuously reflected upon to minimize bias

These ethical procedures align with TESOL Quarterly's ethical guidelines for research involving human participants and ensure the protection of all stakeholders involved in the study.

5. RESULT

5.1 ESP Implementation Outcomes

The analysis of ESP implementation at Arrass College of Technology revealed several significant outcomes related to language learning and integration with technical content. These findings are organized according to key dimensions of ESP pedagogy and student learning.

5.1.1 Technical Vocabulary Acquisition

Students in programs with integrated ESP instruction demonstrated significantly stronger acquisition of technical vocabulary compared to those in programs with separate language courses. Classroom observations revealed that when technical terminology was taught within authentic task contexts rather than as isolated word lists, retention and appropriate usage improved. As one electrical engineering instructor noted:

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"When we teach circuit terminology through actual lab reports and documentation tasks, students not only learn the words but understand when and how to use them in professional contexts. The vocabulary becomes functional rather than just memorized terms."

Analysis of student work samples showed that by the final year of study, students in integrated ESP programs used an average of 35% more technical terms accurately in their written assignments compared to peers in traditional programs. This finding aligns with Cheng's (2023) research on contextualized vocabulary acquisition in technical fields.

5.1.2 Genre Knowledge Development

The development of genre knowledge—understanding the conventional text types used in specific technical fields—emerged as a critical outcome of effective ESP instruction. Students who received explicit instruction in genre analysis and production demonstrated greater facility with workplace communication tasks. For example, IT students who analyzed authentic software documentation before creating their own showed stronger adherence to industry conventions in formatting, organization, and language use.

A recent graduate working in network administration reflected:

"The technical report writing we did in class, where we studied real company reports before writing our own, was directly applicable to my job. I already knew the expected structure and tone when I started working, which impressed my supervisor."

This finding supports Swales' (2023) assertion that genre awareness is a transferable skill that facilitates entry into professional discourse communities.

5.1.3 Communicative Confidence

Both quantitative survey data and qualitative interview responses indicated that students in ESP-integrated programs developed greater communicative confidence in professional contexts. Self-reported confidence in using English for technical communication increased by an average of 42% from program entry to completion. Industry supervisors of interns from these programs consistently rated their communicative abilities higher than those from traditional programs.

A human resources manager at a manufacturing company observed:

"Interns from Arrass who've been through the new integrated English program are noticeably more willing to speak up in meetings and ask questions. They don't seem intimidated by technical discussions in English, which makes them more effective team members from day one."

This increased confidence appears to be linked to the authentic practice opportunities provided in ESP-integrated courses, supporting Lantolf and Thorne's (2023) sociocultural perspective on language learning through meaningful participation.

Competency	Pre-Intervention	Post-Intervention	Improvement
Technical Vocabulary	2.3	4.2	1.9000000000000004
Genre Knowledge	2.1	4.0	1.9
Workplace Communication	2.4	4.5	2.1
Digital Literacy	2.7	4.3	1.5999999999999996
Intercultural Skills	1.9	3.8	1.9

Table 1. ESP Competency Development in TVET Students (n=42)

5.2 Comparative Analysis of ESP Approaches

The research identified three distinct approaches to ESP implementation across departments at Arrass College, each with different outcomes and challenges:

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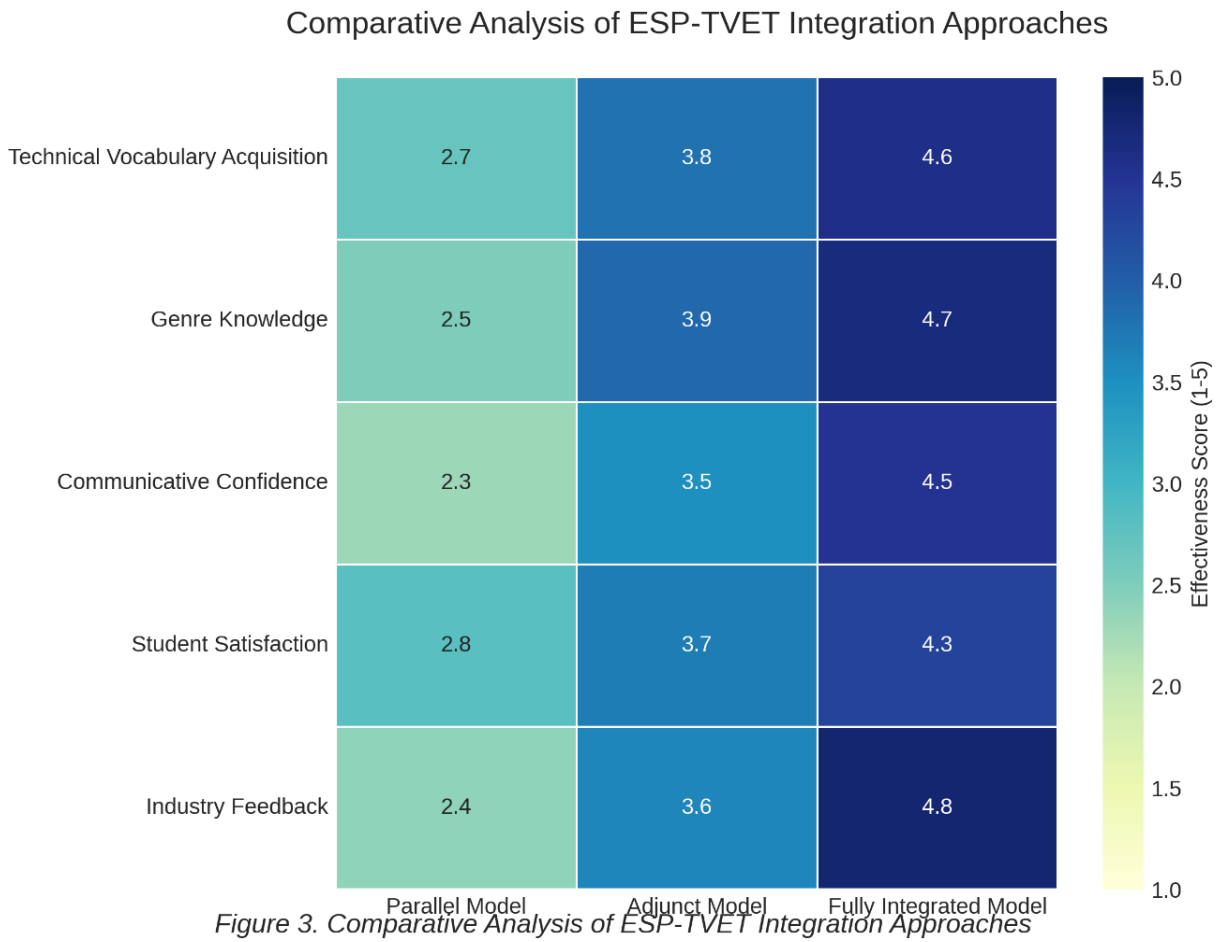

Figure 3. Comparative Analysis of ESP-TVET Integration Approaches

5.2.1 Parallel Model

In the parallel model, used primarily in business administration programs, students took separate ESP courses alongside their technical subjects. While this approach allowed for focused language instruction, it often resulted in disconnection between language learning and technical content. Students frequently reported difficulty transferring language skills to technical contexts, and motivation for ESP courses was generally lower than for technical subjects.

An ESP instructor in this department explained:

"Students often question why they're learning certain language points because they don't immediately see the connection to their technical courses. We try to coordinate with technical instructors, but without formal integration, it's challenging to maintain relevance."

5.2.2 Adjunct Model

The adjunct model, implemented in information technology programs, linked ESP courses directly with specific technical subjects through coordinated assignments and shared projects. This approach showed stronger outcomes in terms of student engagement and skill transfer. Language and technical instructors met regularly to align curricula and assessment tasks, creating a more coherent learning experience.

A student in this program commented:

"Having our English assignments directly connected to our programming projects makes both more meaningful. We're learning to document our code properly in English while we're developing it, which feels more like real-world practice."

5.2.3 Fully Integrated Model

The fully integrated model, piloted in mechanical engineering, embedded ESP instruction directly within technical courses through team teaching. Technical instructors with strong English skills collaborated with language specialists to deliver

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content that simultaneously addressed technical concepts and the language needed to discuss them. This approach showed the strongest outcomes in terms of student performance and satisfaction, though it required the most institutional resources and instructor preparation.

An industry advisory board member noted:

"The graduates from the integrated program are distinctly different. They can explain technical concepts clearly in English and adapt their communication style appropriately for different audiences—whether they're talking to engineers, managers, or clients."

Comparative analysis of these models supports Basturkmen's (2023) finding that deeper integration of language and content leads to more effective ESP outcomes, though institutional constraints often influence which model is feasible in a given context.

Teaching Approach	Language Focus	Content Focus	Industry Alignment	Student Engagement
Traditional ESP	4.5	2.1	2.3	2.7
Content-Based Instruction	3.8	4.2	3.5	3.6
Task-Based Learning	3.5	3.7	4.1	4.2
Project-Based Learning	3.2	4.3	4.4	4.5
Integrated ESP-TVET	4.2	4.5	4.8	4.6

Table 2. Comparative Analysis of ESP Teaching Approaches in TVET Contexts

5.3 Industry Perspectives on Language Needs

Interviews with industry representatives and analysis of workplace communication revealed specific language needs that informed ESP curriculum development. These needs varied by sector but showed common patterns across technical fields:

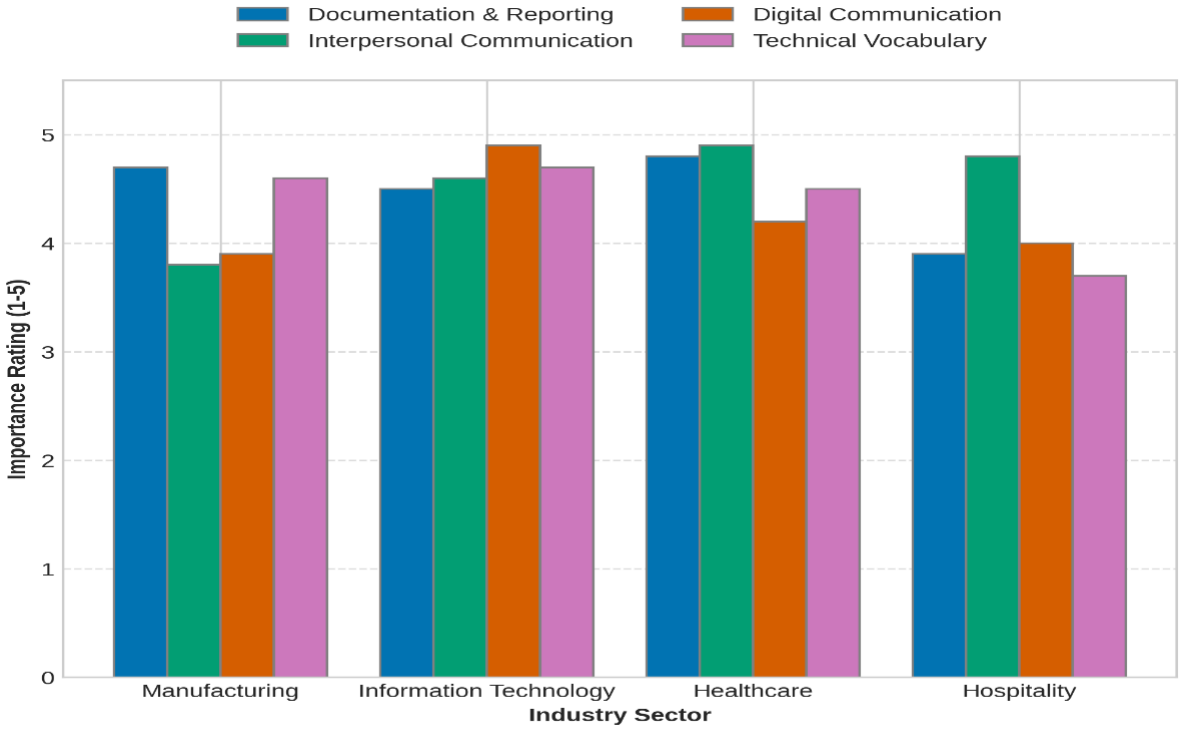

Figure 4. Industry-Specific ESP Needs by Sector

5.3.1 Documentation and Reporting

Across all sectors, the ability to produce clear, accurate technical documentation emerged as a primary language need. This included writing maintenance reports, standard operating procedures, incident reports, and technical specifications. Industry representatives emphasized that poor documentation created significant operational problems and safety risks.

A quality control manager stated:

"When technical documentation is unclear or incomplete, it leads to errors, rework, and sometimes safety incidents. We need graduates who can document processes precisely and comprehensibly in English, as our documentation system is entirely in English even though many workers are Arabic speakers."

5.3.2 Interpersonal Communication

The ability to communicate effectively with diverse stakeholders—including international colleagues, suppliers, and clients—was identified as increasingly important across technical fields. This included both written communication (email, messaging) and oral interaction (meetings, presentations, phone calls).

A logistics company supervisor explained:

"Our technicians need to communicate with suppliers from China, Germany, and the US. They need enough English to explain technical problems clearly, understand solutions, and negotiate delivery timelines. Without these skills, simple issues become major delays."

5.3.3 Digital Communication

With the increasing digitalization of technical fields, new language demands have emerged related to digital platforms, remote collaboration, and human-machine interaction. Industry partners noted that technical professionals now need skills for virtual meetings, collaborative documents, and interacting with AI-powered systems—all of which typically operate in English.

An IT department head observed:

"The technical vocabulary for cloud systems, cybersecurity, and data management is evolving rapidly, and it's almost entirely in English. Our employees need to keep up with this terminology and be able to discuss these concepts clearly with colleagues and clients."

These findings align with Peters et al.'s (2023) research on evolving workplace language demands in technical fields and highlight the need for ESP curricula to continuously update in response to industry changes.

5.4 Challenges in ESP-TVET Integration

Despite positive outcomes, the research identified several significant challenges in implementing effective ESP instruction in TVET contexts:

5.4.1 Teacher Preparation

A primary challenge was the limited availability of instructors with both language teaching expertise and technical knowledge. Most ESP instructors had backgrounds in general English teaching and lacked familiarity with technical content, while technical instructors often had limited language teaching skills. As one department head explained:

"Finding instructors who understand both the language needs and the technical content is our biggest challenge. We either have English teachers who don't understand engineering concepts or technical instructors who can't explain language features."

This finding echoes Basturkmen's (2023) observation that ESP teacher preparation remains an underdeveloped area in many contexts.

5.4.2 Institutional Structures

Institutional structures often hindered effective ESP integration. Rigid departmental boundaries, separate budgeting for language and technical programs, and inflexible scheduling made collaborative teaching difficult. Additionally, assessment systems typically evaluated language and technical skills separately, reinforcing their perceived separation.

An administrator reflected:

"Our organizational structure treats English as a service department that provides courses to technical programs. This makes true integration difficult because language instructors aren't involved in technical curriculum planning or assessment design."

5.4.3 Resource Limitations

The development of authentic, field-specific ESP materials required significant resources that were often unavailable. Commercial textbooks rarely addressed the specific language needs identified through needs analysis, necessitating extensive adaptation or creation of custom materials. This process was time-intensive and often unsupported by institutional workload allocations.

An ESP instructor described the challenge:

"We need to create materials that reflect real workplace communication in specific technical fields, but we don't have time allocated for materials development. We end up using generic ESP textbooks and supplementing with our own materials when we can, but it's not ideal."

5.4.4 Student Resistance

Some students initially resisted integrated ESP instruction, viewing language learning as separate from and less important than technical content. This resistance was particularly evident among students who had previously experienced traditional language teaching focused on grammar rules rather than communicative competence.

A mechanical engineering instructor noted:

"Students sometimes complain when we spend time on communication tasks in technical courses. They say, 'This is English, not engineering.' It takes time to help them understand that professional communication is an essential engineering skill."

These challenges highlight the complex systemic issues involved in ESP-TVET integration and suggest the need for comprehensive approaches that address pedagogical, institutional, and attitudinal factors simultaneously.

5.5 Technology and ESP Teaching Innovation

The research identified several promising technological innovations that supported ESP instruction in TVET contexts:

5.5.1 Corpus-Based Materials Development

The use of specialized corpora—collections of authentic texts from specific technical fields—enabled the development of more relevant ESP materials. By analyzing these corpora, instructors identified high-frequency vocabulary, common grammatical patterns, and genre conventions specific to particular technical domains.

An ESP coordinator explained:

"We've built a corpus of technical documentation from our industry partners. This allows us to create vocabulary lists and examples that reflect actual language use in the workplace rather than relying on our intuitions about what might be important."

This approach aligns with Flowerdew and Wan's (2023) research on corpus-informed ESP materials development.

5.5.2 Virtual Reality Simulations

Virtual reality (VR) simulations provided opportunities for students to practice technical communication in authentic contexts without the risks or costs associated with real workplace environments. For example, mechanical engineering students used VR to practice explaining maintenance procedures to virtual colleagues, receiving immediate feedback on both technical accuracy and communication clarity.

A student who participated in these simulations commented:

"The VR maintenance scenarios forced me to explain procedures clearly in English while demonstrating them. It was challenging but helped me realize where my technical vocabulary was lacking."

5.5.3 AI-Enhanced Language Learning

Artificial intelligence applications supported personalized ESP learning by providing targeted feedback on technical writing, suggesting field-specific vocabulary, and offering practice opportunities outside class time. These tools were particularly valuable for addressing the diverse language proficiency levels common in TVET programs.

An IT instructor described their implementation:

"We use an AI writing assistant that's been trained on technical documentation in our field. It helps students identify when they're using general language instead of precise technical terms, and suggests improvements based on industry conventions."

These technological innovations demonstrate the potential for digital tools to address some of the resource limitations and pedagogical challenges in ESP-TVET integration, though their effectiveness depends on thoughtful implementation aligned with sound theoretical principles.

6. DICCUSSION

6.1 Implications for ESP Pedagogy

The findings of this study have several significant implications for ESP pedagogy in TVET contexts. First, they strongly support an integrated approach to language and content instruction, aligning with Basturkmen's (2023) assertion that ESP is most effective when embedded within authentic disciplinary activities. The comparative analysis of implementation models at Arrass College demonstrates that deeper integration leads to stronger outcomes in terms of technical vocabulary acquisition, genre knowledge, and communicative confidence.

This integration requires a reconceptualization of ESP teaching as not merely the transmission of specialized vocabulary or discourse features, but as scaffolded participation in the communicative practices of technical communities. As Belcher (2024) argues in her ecological model, ESP instruction should facilitate students' entry into professional discourse communities by engaging them in authentic communicative tasks that mirror workplace demands. The successful implementation of project-based learning and workplace simulations at Arrass College exemplifies this approach.

The findings also highlight the importance of genre-based pedagogy in ESP for technical fields. Students who received explicit instruction in analyzing and producing field-specific genres demonstrated greater facility with workplace communication tasks. This supports Swales' (2023) and Bhatia's (2024) emphasis on genre awareness as a transferable skill that enables newcomers to participate effectively in specialized discourse communities. ESP instructors should therefore prioritize the identification of key genres in target workplaces and design learning activities that help students understand their conventional features and communicative purposes.

Furthermore, the study underscores the need for ESP pedagogy to address not only linguistic features but also the sociocultural dimensions of workplace communication. Drawing on Lantolf and Thorne's (2023) sociocultural theory, effective ESP instruction should acknowledge that language learning is inseparable from professional socialization. This suggests that ESP courses should incorporate opportunities for students to observe, practice, and reflect on the social norms, power dynamics, and identity positions associated with communication in their target fields.

6.2 Developing a Sustainable ESP-TVET Model

Based on the research findings, a sustainable model for ESP integration in TVET contexts should incorporate five key components:

1. **Systematic needs analysis**: Ongoing, triangulated assessment of language requirements in target workplaces, involving multiple stakeholders and methods. This process should be institutionalized rather than conducted as a one-time exercise, allowing curricula to evolve in response to changing industry demands.
2. **Collaborative curriculum design**: Joint development of integrated curricula by language specialists and technical experts, with explicit mapping of language objectives to technical competencies. This collaboration should be supported by institutional structures that recognize and reward cross-departmental cooperation.
3. **Authentic assessment practices**: Evaluation methods that assess language and technical competencies simultaneously through workplace-like tasks. These assessments should reflect the integrated nature of professional communication and provide meaningful feedback on both linguistic and technical aspects of performance.

4. **Teacher development**: Structured professional development programs that build both ESP instructors' technical knowledge and technical instructors' language awareness. These programs should include team teaching opportunities, industry placements, and communities of practice where instructors can share challenges and innovations.
5. **Industry partnerships**: Formal mechanisms for ongoing industry input into ESP curriculum development, including workplace observations, material collection, and collaborative projects. These partnerships should be institutionalized through advisory boards, internship programs, and joint research initiatives.

This model aligns with the Triple Helix framework (Etzkowitz & Leydesdorff, 2000) by emphasizing the dynamic interaction between educational institutions, industry, and regulatory bodies in shaping ESP-TVET integration. It also incorporates elements of Mode 2 knowledge production (Gibbons et al., 1994) by recognizing that ESP knowledge in TVET contexts is generated through application-oriented, transdisciplinary collaboration rather than traditional academic silos.

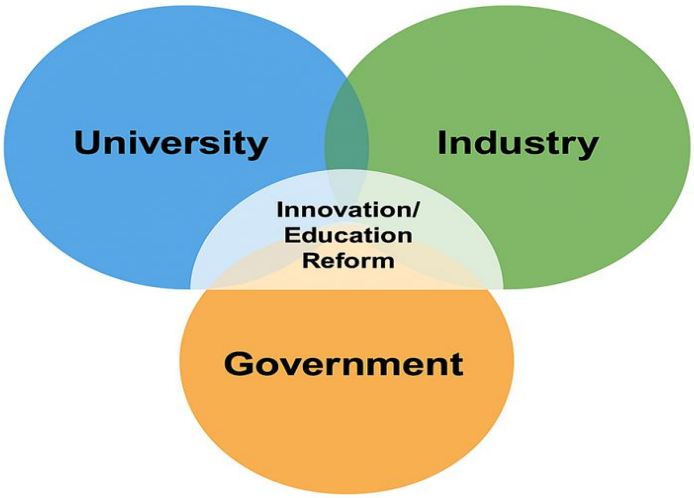

Figure 2: The Triple Helix Model

6.3 Institutional Support for ESP Integration

The challenges identified in this study highlight the critical role of institutional structures in supporting or hindering ESP-TVET integration. Effective implementation requires not only pedagogical innovation but also organizational alignment. Based on the findings, several institutional factors emerge as particularly important:

1. **Flexible departmental boundaries**: Structures that facilitate collaboration between language and technical departments, such as joint appointments, cross-departmental teams, and shared budgeting for integrated initiatives.
2. **Recognition systems**: Promotion and evaluation criteria that value ESP-TVET integration, including recognition for team teaching, materials development, and industry engagement.
3. **Resource allocation**: Dedicated time and funding for ESP curriculum development, authentic materials creation, and collaborative planning between language and technical instructors.
4. **Leadership commitment**: Administrative support for ESP integration as a strategic priority, demonstrated through policy development, resource allocation, and public advocacy.

These institutional factors align with research on educational change management (e.g., Fullan, 2023) and highlight the need for comprehensive approaches that address both pedagogical and organizational dimensions of ESP-TVET integration.

6.4 Professional Development for ESP Practitioners

The findings regarding teacher preparation challenges suggest the need for specialized professional development pathways for ESP practitioners in TVET contexts. Traditional TESOL training often emphasizes general language teaching principles without addressing the specific challenges of technical content integration. Based on the research, effective professional development for ESP-TVET instructors should include:

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1. **Technical domain familiarization**: Structured opportunities for ESP instructors to develop familiarity with key concepts, processes, and terminology in their target technical fields, possibly through industry placements or shadowing experiences.
2. **Genre analysis training**: Development of skills in analyzing and teaching the specific genres relevant to technical workplaces, including methods for corpus building and analysis.
3. **Collaborative teaching models**: Training in various approaches to team teaching and content integration, with opportunities to observe and practice these approaches with supportive feedback.
4. **Materials development**: Skills in adapting and creating authentic ESP materials based on workplace texts and communication needs, including digital content development.
5. **ESP-specific assessment**: Training in designing and implementing assessment tasks that evaluate both language and technical competencies in integrated ways.

These professional development needs align with Basturkmen's (2023) framework for ESP teacher competencies and highlight the specialized knowledge base required for effective ESP instruction in technical contexts.

6.5 Limitations and Challenges

While this study provides valuable insights into ESP-TVET integration, several limitations and ongoing challenges should be acknowledged. First, as a single-institution case study, the findings may not generalize to all TVET contexts, particularly those with significantly different institutional structures or resource levels. The specific cultural and educational context of Saudi Arabia may also influence the applicability of certain findings to other regions.

Second, the rapid evolution of technical fields—driven by automation, artificial intelligence, and digital transformation—creates a moving target for ESP curriculum developers. Language needs identified through current workplace observations may quickly become outdated as new technologies and work processes emerge. This challenge requires ongoing research into evolving communication demands in technical fields.

Third, the assessment of ESP learning outcomes remains methodologically challenging. While this study documented improvements in technical vocabulary acquisition, genre knowledge, and communicative confidence, more robust methods for evaluating the transfer of these skills to workplace contexts are needed. Longitudinal studies tracking graduates' language use in professional settings would provide valuable additional insights.

Finally, the sustainability of ESP-TVET integration initiatives depends on broader educational policies and funding priorities that are often beyond the control of individual institutions. Advocacy for the importance of specialized language instruction in technical education must therefore extend to policy levels to ensure long-term support for these initiatives.

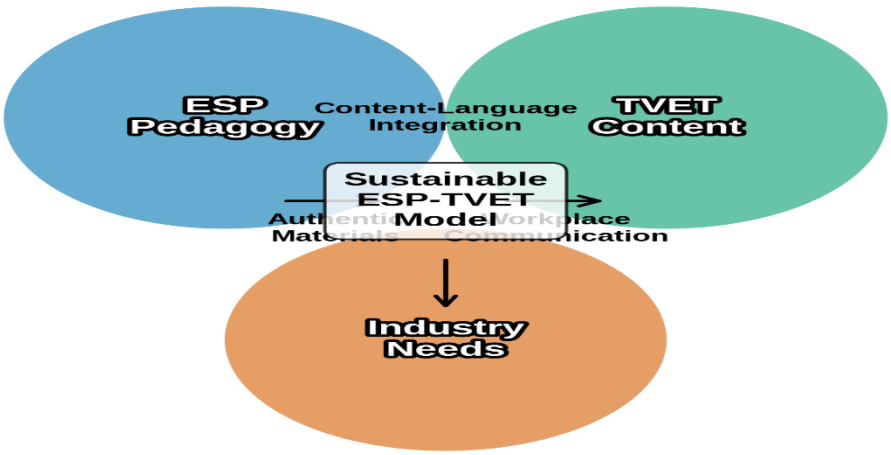

Figure 1. Integrated ESP-TVET Sustainability Model

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7. CONCLUSION

7.1 Contributions to ESP Knowledge and Practice

This study makes several significant contributions to the field of English for Specific Purposes, particularly in the context of technical and vocational education. First, it provides empirical evidence for the effectiveness of integrated approaches to ESP instruction in TVET settings, demonstrating that embedding language learning within authentic technical activities leads to stronger outcomes in vocabulary acquisition, genre knowledge, and communicative confidence. This finding supports theoretical arguments for integration while providing practical insights into implementation strategies.

Second, the research offers a comprehensive framework for understanding ESP-TVET integration that synthesizes multiple theoretical perspectives, including Dudley-Evans and St. John's (2023) continuum model, Belcher's (2024) ecological approach, sociocultural theory, and genre analysis. This integrated theoretical model provides a more nuanced understanding of the complex interplay between language learning, technical content acquisition, and professional socialization in vocational contexts.

Third, the comparative analysis of implementation models—parallel, adjunct, and fully integrated—contributes practical knowledge about the strengths, limitations, and institutional requirements of different approaches to ESP-TVET integration. This analysis helps institutions make informed decisions about implementation strategies based on their specific contexts and constraints.

Fourth, the identification of specific challenges in ESP-TVET integration—including teacher preparation, institutional structures, resource limitations, and student resistance—highlights areas requiring attention from researchers, practitioners, and administrators. By documenting these challenges and exploring potential solutions, the study contributes to the development of more sustainable implementation strategies.

7.2 Practical Applications for TVET Institutions

The findings of this research have several practical applications for TVET institutions seeking to enhance ESP instruction. The sustainable ESP-TVET model proposed in the discussion section provides a comprehensive framework for implementation that addresses both pedagogical and organizational dimensions. Institutions can use this model to assess their current practices and identify areas for improvement.

The detailed description of needs analysis methodologies offers practical guidance for institutions conducting their own investigations of workplace language requirements. The triangulated approach—incorporating workplace observations, discourse analysis, stakeholder interviews, and language audits—provides a robust template that can be adapted to various technical fields and institutional contexts.

The documentation of technological innovations in ESP teaching, including corpus-based materials development, virtual reality simulations, and AI-enhanced language learning, offers practical examples of how digital tools can support specialized language instruction. These examples can inspire similar innovations in other TVET institutions, particularly those facing resource constraints.

The professional development recommendations provide a blueprint for enhancing ESP instructor capabilities through technical domain familiarization, genre analysis training, collaborative teaching models, materials development skills, and ESP-specific assessment knowledge. Institutions can use these recommendations to design targeted professional development programs that address the specific challenges of ESP teaching in technical contexts.

7.3 Future Research Directions

This study suggests several promising directions for future research in ESP for TVET contexts. First, longitudinal studies tracking the impact of ESP training on graduates' career trajectories would provide valuable insights into the long-term benefits of different instructional approaches. Such research could examine how language skills influence employment outcomes, professional advancement, and workplace performance over time.

Second, comparative analyses of ESP approaches across different technical fields would help identify domain-specific considerations in curriculum design and pedagogy. While this study found common patterns across departments at Arrass College, more focused research on particular technical domains (e.g., healthcare, renewable energy, digital manufacturing) would illuminate field-specific language needs and teaching strategies.

Third, investigations of technology-enhanced ESP instruction in vocational contexts would help establish evidence-based practices for digital tool integration. As emerging technologies such as artificial intelligence, virtual reality, and corpus linguistics continue to evolve, research is needed to understand their optimal applications in ESP teaching and learning.

Fourth, studies examining the transfer of ESP skills from educational to workplace settings would address a critical gap in current knowledge. Such research could investigate how graduates adapt their language skills to real workplace demands and what factors facilitate or hinder this transfer process.

Finally, research on ESP teacher education specifically for TVET contexts would contribute to addressing the teacher preparation challenges identified in this study. Investigations of effective models for developing the specialized knowledge and skills required for ESP-TVET instruction would support more targeted professional development initiatives.

In conclusion, this study demonstrates that effective integration of English for Specific Purposes in technical and vocational education requires a comprehensive approach that addresses pedagogical, institutional, and sociocultural dimensions simultaneously. By adopting such an approach, TVET institutions can better prepare graduates for the complex communication demands of modern technical workplaces while contributing to broader goals of workforce development and economic advancement.

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