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Research Paper

Exploring Subject Knowledge Gap in ESP Teaching: Perspectives of Language and Subject Specialist Teachers on AI Integration

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Abstract

This study investigates the dynamics of subject knowledge among non-native language ESP teachers and the use of artificial intelligence (AI) technologies, notably ChatGPT, in addressing the subject knowledge gap. Drawing on insights from language and subject specialist ESP instructors, the study investigates their strategies for dealing with subject knowledge gaps as well as their opinions of AI integration in professional development. The study uses a mixed-methods approach that includes surveys and interviews to reveal the problems that language experts experience while accessing subject-

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specific content and emphasizes the need for sustainable methods for professional development. Furthermore, the study reveals a cautious attitude toward AI technologies among ESP professionals, with reservations voiced regarding the efficacy and frequency of using ChatGPT to bridge the subject knowledge gap. Despite reservations, there remains an optimistic outlook on the potential of AI tools to support subject knowledge acquisition. The findings highlight the need for a balanced approach to AI integration, combining technological advancements with human expertise to enhance language learning outcomes in ESP instruction.

***Keywords**:* Artificial Intelligence; ChatGPT; Subject Knowledge; ESP; Language Teaching

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1. Introduction

The global need for English for Specific Purposes (ESP) in the TEFL curriculum stems from the rising need for a lingua franca in science and technology education. ESP has established itself as a vibrant and distinctive sector within the field of ELT. ESP courses are gaining more interest and attention from different stakeholders, most notably learners in non-English-speaking countries. In recent years, most ESP research studies have focused on corpus-based linguistic studies, teaching initiatives, material evaluation, needs analysis, and cases from underrepresented contexts (Assassi & Rouaghe, 2024; Basturkmen, 2022).

The teaching and learning environment in ESP received increasing attention given the growing number of issues and challenges in the ESP classroom. A strange and uncharted land is how Hutchinson and Waters (1987) describe the ESP classroom. Belcher (2006) adds that this type of classroom is quite intimidating to language teachers. That is to say, English language teachers typically do not possess extensive subject or content knowledge. Their main training consists of theories and practices for teaching English as a second or foreign language. Accordingly, Hutchinson and Waters (1987) and Belcher (2006) did not exaggerate with their statements, given how language teachers, as ESP practitioners, feel in their classes teaching language through unfamiliar specialized content and knowledge. It seems quite logical to have more specialty subject-knowledge-inclined learners in an ESP classroom. Either as professionals in the field or as trainees, we expect these learners to possess a deeper understanding of the subject matter than their ESP teacher. However, Rachayon's (2020) study notes that language teachers may struggle to explain unfamiliar topics, leading to less comfortable teaching, particularly when asked to elaborate.

The issue of unfamiliarity with subject knowledge of specific or several domains the language teacher faces in ESP classes is still causing perpetual debate. This led ESP researchers to shed light on the core of the issue, asking the question: who should teach ESP classes, language or subject teachers? This long-standing inquiry questions language teachers' ability to manage a successful ESP teaching experience. Subject specialists or content teachers can create more credibility and rapport with learners and materials (Rechayon, 2020), provide a deeper understanding of field-specific discourse (Bracaj, 2014), help learners grasp the cultural and communicative dynamics of the field (Al-Ghamdi, 2022), and be closer to ESP learners because of the

common aspects they share (Manakhova & Yurieva, 2023). This might favor subject specialists over language teachers in teaching ESP classes; however, we have to understand that the 'E' in English for Specific Purposes stands for English, which is a language, and teaching the language is the purpose of the ESP course.

Accordingly, Ibrahim (2019) confirms that the main focus of ESP is language instruction, skills, collaboration, and research. The majority of ESP teachers are non-natives and language teachers by training, most notably in the global south. In addition to gaining subject knowledge, ESP teachers must possess a set of crucial skills to ensure a successful teaching-learning experience in an ESP class. The main skills are knowledge of the English language, process of needs analysis, principles of course design, production of teaching materials, and mastery of assessment and course evaluation (Dou et al., 2023). Jeyaraj (2014) and Coşgun (2024) cite commitment to professional growth, adoption of a research culture, design of courses and published papers on ESP, and attendance at in-service special training and workshops to develop teaching and assessment skills as additional tasks and skills required in the domain of teaching ESP courses.

Kashani et al. (2007, p. 85) support the former statements, clarifying that the ESP teacher in the classroom is "a knowledge provider and a facilitator of students' learning and no more as a resourceful authority." Thus, the language teachers in ESP are not expected to be domain or subject specialists because of the tasks they already have at hand; however, having subject knowledge enhances fresh perspectives and adaptability in the ESP class, which will eventually increase learners' motivation and develop their communicative competence (Fălăuș, 2017). Rachayon (2020) lists several

tactics that ESP teachers usually use to deal with a lack of subject specialty knowledge. While in class, she states that teachers rely on avoidance of questions, focusing on morphology, admitting ignorance, risk-taking, and shifting example statements to save face and evade this dilemma. However, such strategies might not be a durable approach to maintaining a healthy and efficient teaching-learning context.

Given the large number of language specialists as ESP teachers and the difficulty of continuous collaboration between language and subject specialists, there exists a significant gap in research concerning the subject knowledge of ESP teachers, particularly those who have received training primarily as language instructors. Even though language instructors are increasingly taking up ESP teaching duties across the world (Assassi, 2020), there is a dearth of literature addressing the unique requirements and issues that this group faces.

The digital age has made it easier for ESP teachers to access and employ authentic materials and resources that can help in the teaching process, regardless of their subject expertise (Otilia, 2015). Artificial intelligence (AI), as a growing aspect of the digital world today, may have the potential to revolutionize education through personalizing learning experiences and teaching practices. OpenAI labels ChatGPT as a conversational model based on artificial intelligence. The model is based on the Generative Pre-trained Transformer architecture. It aims to provide human-like responses when presented with written input texts, also known as prompts. ChatGPT has been beneficial for teachers and learners in different fields because of the variety of natural language processing applications it offers, such as summarization, translation, and conversation generation (Assassi & Rouaghe, 2024).

Conclusively, ChatGPT has become a familiar tool among the education community around the world.

Recognizing this scope, including issues with subject knowledge among language teachers in ESP and the advantages of ChatGPT in educational text generation, the current study aims to close the gap by proposing ChatGPT, an artificial intelligence tool, as a viable way to help language ESP teachers improve their subject knowledge. The purpose of this study is to promote ESP pedagogy and teacher professional development by eliciting ESP instructors' thoughts on the efficacy and usability of ChatGPT in expanding their topic knowledge.

The following are the primary research questions that guided this study:

- How do language specialist ESP teachers deal with the dilemma of a lack of subject knowledge?
- How do language and subject specialist ESP teachers perceive the use of ChatGPT in overcoming language teachers' lack of subject knowledge in ESP courses?

These questions served as the compass for the study's investigative endeavors, shedding light on the dynamic interplay between the intriguing issue of language specialists' lack of subject knowledge in ESP courses and the use of ChatGPT to fill in this gap.

2. Literature Review

2.1 English for Specific Purposes

Ever since the 1960s, there has been a growing necessity for a lingua franca because of global advances in science, technology, and the economy. This growing necessity has led to an increasing demand for ESP courses in Teaching English as a Foreign Language (TEFL). Today, ESP has gained international recognition as a dynamic area of English Language Teaching (ELT), evolving in various directions (Alhasani, 2021; Assassi & Benyelles, 2016; Basturkmen, 2022; Dudley-Evans & St. John, 1998). The definition of ESP as a process and a product has created its own debate zone, with scholars and practitioners focusing on different aspects of the developing ELT branch (Faraji et al., 2023). LSPs are languages that are "used for particular and restricted types of communication (e.g., for medical reports, scientific writing, air-traffic control) and which contain lexical, grammatical, and other linguistic features that are different from ordinary language" (p. 295). This is what Richards and Schmidt (2010) say about LSPs in a broad sense. They further state that the specific needs of a particular group of learners determine the content and aims of the [ESP] course. A decade later, Hijuelos-Cruz et al. (2020) described ESP as an ‘approach to language teaching’ or an ‘attitude of mind’ in which the learner’s main motive for learning the language controls the decision on the type of content and method used in teaching. As a result, a decade of studies shifted the focus from only the learner's linguistic needs to their communicative objectives, known in ESP as competencies.

2.2 Teaching ESP

Teaching ESP has been problematic as a process, given the various aspects that come into play within the teaching-learning context. Mohammed

(2021) states that "ESP teaching produces many problems, such as problems for learners, problems for teachers, problems of methodology and materials, and problems of assessment and testing" (p. 505). Wide-ranging expectations have shifted towards ESP teachers in particular, intending to efficiently assist learners in achieving further career-related competencies using English (Basturkmen, 2017, 2022; Belcher, 2013; Papadima-Sophocleous et al., 2019). Hyland and Jiang (2021) clarify that the initial focus of ESP teaching was on written text-based grammar in the technical genre, with instructors expected to elucidate technical lexis and establish a connection between lexicogrammar and the author's rhetorical purposes. On the other hand, current teaching and learning focuses on learners' language use in relation to their pre-determined needs. These requirements must inform ESP practice and ensure a link between theoretical frameworks and pedagogical practice in and outside of the classroom (Anthony, 2018; Belcher, 2009; Johns, 2013). Accordingly, more weight is on ESP teachers' shoulders to ensure not only language learning but also language teaching techniques, subject-specific knowledge, and efficient language usage in learners' domains. Therefore, given the assistance, quality, innovation, and time-saving nature of technology in education today, we encourage ESP teachers to enhance their digital literacy.

2.2 Technology Integration in Teaching ESP

Educational technology has gained tremendous popularity among EFL teachers in general and ESP practitioners and researchers in particular (Arnó-Macià, 2012; Zawacki-Richter et al., 2019; Chiu et al., 2023; Dashtestani & Mohamadi, 2023). Considerable affordances of modern technology have been provided for ESP instruction, which encouraged practitioners to integrate Computer-Assisted Language Learning (CALL) into ESP course

design. Butler-Pascoe (2009) affirms that such technologies have revolutionized ESP material development and course design. The following list cites different merits of using technology more specifically in ESP instruction (Dashtestani & Stojkovic, 2016):

- Merits of using technology in ESP instruction
- Providing interactive and communicative activities related to professions, majors, or specific purposes of students,
- Appreciating the socio-cultural dimensions of the language and the specific content,
- Nourishing students with adequate specific input related to students' needs can foster their language production,
- Equipping students with strategies that they need to learn languages for specific purposes,
- Facilitating the integration of task-based instruction in ESP instruction,
- Using authentic learning materials related to students' specific needs and content area,
- Providing access to international academic discourse communities,
- Promoting critical thinking and cognitive abilities in ESP students,
- Encouraging collaborative and group learning,
- Making it possible to learn language skills more easily,
- Creating learner-centered and needs-specific learning environments,
- Adapting teaching to students' learning styles and preferences and affective aspects of learning,
- Providing appropriate tools for giving feedback and assessing students' language knowledge and knowledge of the specific content.

AI is currently one of the most radical technological transformations. Artificial Intelligence is defined as "computers that perform cognitive tasks, usually associated with human minds, particularly learning and problem-solving" (Baker & Smith, 2019, p. 10). Machine learning, big data, deep learning, cloud computing, and natural language processing are all developing aspects of AI that glow brightly in education. Cutting-edge technology has the potential to revolutionize teaching and learning, as it has already been active in higher education and language teaching, for instance (Chiu et al., 2023; Crompton & Burke, 2023). Recent discussions have explored numerous applications of AI in education across various domains. Grunhut et al. (2022) elaborated on the use of AI-based technologies in medical teaching, whereas Ouyang et al. (2023) focused on computing technologies in teaching engineering. The available literature extends the uses of AI in education to encompass big data and English education (Sun & Li, 2020), personalized and adaptive learning for language learners (El-Sabagh, 2021), and content creation (Somosi, 2022). Chatbots, an important type of AI tool in language education, have shown great promise in developing efficient teaching and learning processes. Zhai and Wibowo (2022) investigated the development of empathetic strategies for using chatbots to improve language learners' learning outcomes. ChatGPT, one of the most prominent chatbots, is labeled as a conversational model based on artificial intelligence. ChatGPT has been beneficial for teachers and learners in different fields because of the variety of natural language processing applications it offers, such as summarization, translation, and conversation generation (Assassi & Rouaghe, 2024).

Conclusively, ChatGPT has become a familiar tool among the education community around the world. Several studies investigated the use of the chatbot in learning foreign languages (Chiu et al., 2023; Crompton & Burke,

2023). However, investigating the employment of ChatGPT in ESP courses and the teaching process is still on the verge of an interesting burst, given its numerous advantages. In her analysis of the language model's responses, Coancă (2023) explains that ChatGPT provides flexibility and extended functionality, achieves a wide range of tasks on different topics, and generates contextual and updated responses relying on machine learning. Among the limited number of studies focusing on the use of ChatGPT in ESP practices is Kovačević (2023), who studied the uses of the AI tool in teaching engineering students and found that even though it cannot replace human instructors, it is highly valuable in terms of enhancing personalization, interactiveness, feedback, and scalability. Shahidi et al. (2023) describe several AI tool practices in teaching engineering students, such as text generation, the development of grammar and vocabulary exercises, the integration of interactive learning and virtual tutors, and the provision of instant feedback. On the other hand, Assassi and Rouaghe (2024) investigates one of the most critical aspects of ESP course design, which is needs analysis. He explains that ChatGPT, with the precise application of prompts, can be very efficient in detecting target and learning needs in a specific field in comparison to the standard method of needs analysis and identification. As a sum up, studies on the use of AI tools in general and ChatGPT in particular in ESP focus more on the teaching and learning practices without shedding light on teachers' practices and challenges, most importantly the issue of teachers' knowledge and professional development in the uncharted land of AI-oriented education.

2.3 Subject Specialist or Language Teacher

ESP is generally needs-based, context-focused, competency-oriented, and learner-centered. The focus on the learner and the learner's needs has led to

less focus on the ESP teacher's profile and tasks. The literature has long debated the ESP teacher's profile as either a language teacher or a subject specialist without reaching a clear consensus. The misconception of subject specialists teaching ESP in the non-anglophone global south countries is that ESP is a matter of teaching specialized vocabulary, or more precisely, a set of technical lexis, while language teachers are mere general English instructors (Assassi, 2021; Assassi & Ghodbane, 2023).

Therefore, there are differing opinions and perspectives among academics and education professionals regarding the requirement that a teacher of ESP must be a subject specialist. According to some, subject knowledge is a basic pre-requisite for all ESP teachers because it fosters a thorough comprehension of content, credibility, rapport between instructors and learners, and designed materials (Rachayon, 2020). Among the main advantages of subject knowledge is a deeper understanding of domain-specific discourse and communicative styles (Bracaj, 2014). Subject expertise helps ESP teachers effectively endorse learners' mastery of discipline-specific communicative conventions. For instance, in the field of medicine, Al-Ghamdi (2022) asserts that a subject specialist ESP instructor possesses a strong comprehension of technical terms like 'electrocardiogram', 'pulmonary embolism', and 'intravenous infusion'. These terms, when taught contextually, can resonate more effectively with novice practitioners or professionals. Al-Ghamdi (2022) adds that teachers can help learners grasp the cultural and communicative dynamics of the target situation, as cross-cultural communication may have a noticeable effect on professional tasks, most notably in business negotiations and relations. Psychopedagogically, Manakhova and Yurieva (2023) explain that subject knowledge creates confidence in the ESP classroom as learners become more interested in their teacher's content knowledge, which ignites their passion in the field of their

profession. A high level of authenticity in tailored teaching materials is another advantage of subject knowledge. Baştürkmen (2017) supports this argument and endorses the importance of subject knowledge in material selection and development. Domain-related teaching methods and techniques (Anthony, 2018) and alignment with industry trends and standards in the field (Bayram & Canaran, 2020) are two additional advantages of ESP teachers' subject knowledge.

The importance of subject knowledge for ESP teachers is undeniable. However, a skilled teacher with language teaching methodologies may simplify the language learning process even without being a subject expert (Wu & Badger, 2009), as the main aim of the ESP course is teaching language for developing communicative competencies and not content perse. Omenda (2024) affirms that teaching content is not a priority, as we may find an ESP instructor teaching several ESP courses in different domains. Hutchinson and Waters (1987) and Dudley-Evans and St. John (1998) have previously discussed this claim, asserting that the ESP teacher's duty does not include 'teaching underlying knowledge', or subject knowledge, as this may occur unintentionally during the ESP class. The continuum below elaborates on the status of ESP in EFL teaching and underscores the significance of this study:

Figure 1. Continuum According to the Learning of Contents and Foreign Language (Garcia Laborda & Litzler, 2015, p: 38).

Papadima-Sophocleous et al. (2019) add that understanding learning theories, teaching methods, and specific learners' needs are sufficient for efficient ESP courses, and these traits are the ones that subject specialists may fail to offer. As a result, ESP teachers' primary responsibility is to address learners' language needs in order to achieve specific target competencies. In theory, ESP learners are active contributors to the ESP course, starting with needs analysis and continuing through course evaluation, where they can provide learning preferences, feedback on adopted teaching strategies, and even subject-specific suggested contents or materials. Dudley-Evans and St. John (1998) initially noted this contribution, which could potentially alleviate the ESP teacher's subject knowledge requirements. On a similar note, Dou et al. (2023) highlight the essential skills required in an ESP teacher, which are needs analysis, course design, material selection and development, course evaluation, and special linguistic features of ESP

such as objectivity and use of impersonal language. Jeyaraj (2014) did not stop at the essential standard skills of the ESP teacher; he recommended commitment to professional growth, adopting a research culture through presenting and publishing papers on ESP, and participating in in-service training and workshops to develop skills such as team teaching, assessment, and classroom management. Chaovanapricha and Chaturongakul (2020), as well as Otilia (2015), went further and recommended collaboration with Subject Matter Experts or Instructors (SMEs-SMIs), where coordination for course design and the creation of connections are essential for active ESP teaching.

To sum up, being an expert in different domains as an ESP teacher for several courses seems far-fetched. Fitria (2023) asserts that ESP teachers are not required to be experts in different domains, but they can develop subject expertise through active research and familiarization with the field. In today's digital era, it is more accessible to develop such knowledge, especially with the rise of AI conversational models such as ChatGPT, which are user-friendly, interactive, and quite resourceful. However, this paper seeks to unravel ESP experts' and practitioners' perspectives and assumptions on the use of ChatGPT to help ESP teachers as language instructors develop their subject knowledge. This is due to the larger number of ESP teachers who are language instructors compared to their SME counterparts, particularly in non-anglophone countries.

3. Research Methodology

3.1 Research Purpose and Question

The study's main goal is to elicit experienced ESP practitioners' perceptions of using ChatGPT to develop subject knowledge as a requirement for successful ESP teaching. The literature shows the importance of subject

knowledge. Moreover, teaching ESP courses by language teachers in medicine, aviation, or law, for example, might be critical for students or novice professionals in these domains. The growing number of language teachers as ESP instructors led several researchers in the domain to shed light on the lack of subject knowledge among this large number of teachers. Additionally, scholars still advocate the importance of subject knowledge in ensuring an interactive, fruitful, and engaging teaching and learning experience in ESP courses with specialized learners. In addition to this overarching aim, the study inquires about ESP practitioners' experience in incorporating subject knowledge in ESP courses and the techniques they opt for to minimize the threat of demotivation and lack of interaction, in addition to saving face when encountering gaps in domain knowledge that may affect the teaching operation negatively. Through a set of intriguing questions in the form of a semi-structured interview and a questionnaire, the study attempts to answer the following questions:

Q1. How do language specialist ESP teachers deal with the dilemma of lack of subject knowledge?

Q2. How do Language ESP teachers perceive the use of ChatGPT in overcoming language teachers' lack of subject knowledge in ESP courses?

Q3. How do subject specialist ESP teachers perceive the use of ChatGPT in overcoming language teachers' lack of subject knowledge in ESP courses?

3.2 Research Context and Participants

The data collection procedure began in mid-January and continued until the end of March 2024. The interviews were administered based on respondents' availability to ensure the validity and accuracy of their responses. Before initiating the administration procedure, we analyzed and validated the interview questions (11 items) and the questionnaire (nine items) by

conducting intra-rater and inter-rater evaluations of the form, contents, and objectives of the data collection tools, focusing on the main aim of the research and the reliability of its outcomes. The researchers, through reiterative reading, evaluated the instruments twice with an interval of 15 days. This process allowed the researchers to approach the items with a fresh perspective; thus, providing enough time for reflection on the clarity, relevance, and effectiveness of the questions. They then sought assistance from two ESP practitioners to eventually validate the interview questions.

We received a total of 30 responses from ESP practitioners worldwide. A semi-structured questionnaire was designed following the same process of validation employed for the interview to triangulate responses and ensure the research outcomes' reliability. The items, as stated above, were revised after the pilot stage to enhance clarity and comprehension of the questions. This questionnaire sought to find out both language and domain expert ESP teachers' perceptions on the use of ChatGPT to develop language teachers' subject knowledge. Nine audio-recorded responses were received and analyzed by ESP practitioners. The investigation focused on the diversification of respondents' affiliations to ensure global coverage and divergence of perceptions from different backgrounds. The sample selection is sought to achieve saturation of themes and ensure adequate population representation.

Amid the purposeful sampling of the research respondents, the study considered the following criteria in the selection process to enhance the quality and validity of the responses.

ESP practitioners with:

- ✓*Different affiliations*
- ✓*Different backgrounds (language and subject specialists)*
- ✓*Experience in teaching, designing courses, or researching*

- ✓*Published papers, books, or book chapters on ESP*
- ✓*Experience in national and international collaboration projects in ESP*
- ✓*Experience teaching specialized courses for graduate and undergraduate students on ESP*
- ✓*Experience in ESP teacher training*
- ✓*Familiarity with AI tools and ChatGPT*

We contacted nine respondents either face-to-face or online via a video chat for the interview. We discussed the number of eligible participants with colleagues who evaluated the data collection tool and found it adequate, adhering to Creswell and Creswell's (2018) recommendations regarding the study's nature and the research questions it aims to address. The questionnaire was administered to respondents using Google Forms. The eligible participants were all qualified and resourceful given the experience they have in teaching, training, presenting, and researching subjects in the domain of ESP. The participants came from different backgrounds, experiences, and scientific interests. This divergence created a solid ground of thick descriptions of experiences and rich responses to the main research inquiries.

3.3 Analytical Instruments for Data Collection

This empirical study employed a mixed-methods approach to explore the experiences, strategies, and perceptions of ESP practitioners regarding the lack of subject knowledge in ESP instruction and the potential role of AI tools, specifically ChatGPT, in addressing this challenge. The methodology consists of both semi-structured interviews and questionnaire surveys to accumulate inclusive data from ESP practitioners, including both language specialists and subject specialists. The rationale for selecting the chosen instruments stems from the importance of delineating quantitative data using different types of items in the questionnaire. This approach emphasizes the

questionnaire's structured format and standardized items, which aim to measure respondents' experiences of dealing with a lack of subject knowledge and their perceptions of integrating ChatGPT to bridge this practice gap. This underscores its suitability in capturing the detailed and nuanced perspectives of ESP practitioners regarding the challenges posed by a lack of subject knowledge, the strategies employed to address this lack, and the potential impact of utilizing ChatGPT to bridge this gap.

To clarify, the questionnaire focused on both types of respondents' views on the lack of subject knowledge and approaches used in dealing with this instruction challenge. The questionnaire consisted of three main sections: participants' demographics, lack of subject knowledge, and the use of AI tools to mitigate the risk of lack of knowledge in ESP teaching. A range of responses were captured using Likert-scale, multiple-choice, and open-ended questions. We introduced the semi-structured interview protocol as a second data collection tool for data saturation and triangulation. This instrument is characterized by 11 open-ended questions aimed at eliciting detailed responses from language specialists and subject specialists regarding their experiences, challenges, and perceptions associated with ChatGPT usage in building language specialists' subject knowledge.

With the participants' consent, audio records of the interviews were transcribed verbatim for analysis. Thematic analysis is employed based on recurring themes, patterns, and narratives from detected codes on participants' impressions regarding the effectiveness, potential, challenges, and impact of using ChatGPT for developing language specialists' subject knowledge in ESP courses.

4. Results

4.1 Questionnaire Analysis

The recurring issue of subject knowledge in teaching ESP courses has led the current study to shed light on experienced ESP practitioners' experiences of this lack of knowledge, challenges, and strategies in approaching the issue, in addition to practitioners' perceptions of using ChatGPT to fill in the knowledge gap. The study considered both types of ESP practitioners: language and subject specialists, given the importance of their different backgrounds in achieving validity and data saturation. In this section, a descriptive overview of the obtained data from 30 participants who answered the questionnaire was presented.

Participants' demographics

Participants' demographics showed a variation in affiliation, ESP interests, and roles. Different universities and educational organizations in Algeria, Bulgaria, China, Serbia, Qatar, the United Kingdom, and the United States of America hosted these participants. The respondents' primary roles in ESP were ESP course design, material development, teacher training, and ESP specialism instruction. However, the majority of them listed teaching ESP and researching ESP (46.7% and 73.3%, respectively) as their main tasks as ESP practitioners. As for domain experience, the range was between two and 30 years of experience, with 50% of them having between 10 and 15 years in the domain. Among the main interests of our respondents, teaching ESP ranked first (80%). Research also took its fair share of interest, with 66.7% of respondents currently conducting studies on ESP. Some of the domains mentioned in the survey were medicine, law, political sciences, engineering, aviation, business, administration, nursing, and economics. Finally, the

majority of respondents were language specialists (93.3%), while only two were subject specialists.

Lack of subject knowledge

The two main questions in Section 2 inquired about respondents' experiences with a lack of subject knowledge. Regarding this analysis, 20 of them agreed and strongly agreed that they feel confident enough to teach ESP courses despite a lack of domain knowledge. Nevertheless, 60% of the same sample declared that they face issues related to a lack of subject knowledge when dealing with topics and vocabulary, for instance, while 30% either disagreed or disagreed with the statement. As for seeking different resources and assistance in material selection, 90% of practitioners said they do so when faced with a lack of subject knowledge. The collected responses did not strongly debate collaboration with subject specialists, with 87% of practitioners believing it would be beneficial for ESP instruction in general. In the question about practitioners' beliefs on the impact of a lack of subject knowledge on ESP instruction, 50% believed that it was a limitation, while 20% were undecided. As for techniques employed to overcome lack of knowledge, the figure below summarizes the methods opted for by respondents to enhance the teaching quality by limiting the negative impact of lack of knowledge. Practitioners employed textbooks and academic journals as their main technique (73.3%). Other methods seemed to work for ESP teachers when faced with subject knowledge issues, such as collaboration with subject specialists (60%), conducting research (56.7%), integrating real-world examples and case studies (53.3%), attending professional development seminars (36.7%), and seeking guidance from colleagues (26.7%). Practitioners did not favor options such as relying on corpus studies, background, and learners' feedback.

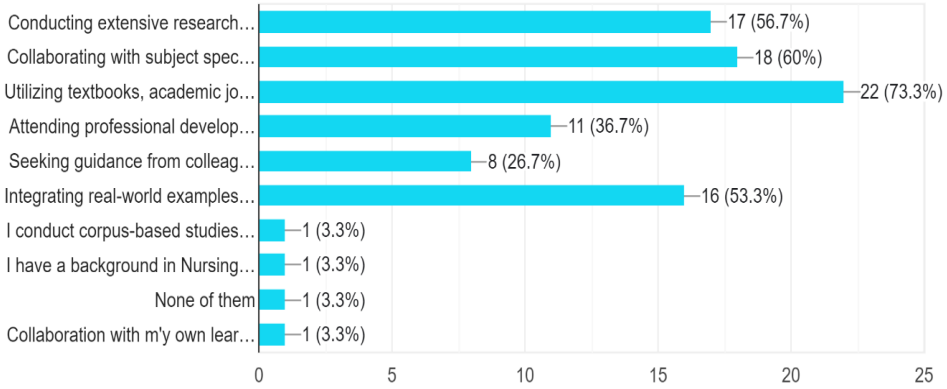


Fig. 1 Techniques employed by ESP practitioners to Overcome Lack of Subject Knowledge (N=30)

AI tools and subject knowledge in ESP courses

The last section of the questionnaire attempted to elicit information on participants' perceptions of the efficiency, challenges, and advantages of using ChatGPT in developing ESP practitioners' subject knowledge. The first question was designed to gauge practitioners' agreement with statements about ChatGPT's role in subject knowledge development. The statements from left to right in the figure below investigated ChatGPT's efficiency in assisting the acquisition of subject knowledge, enhancing confidence, generating accurate data, improving teaching materials quality, and joining language and subject specialists' efforts to crosscheck generated data accuracy. In these statements, approximately a third of participants seemed to have reserved opinions (undecided) on using ChatGPT for developing subject knowledge. However, the remaining respondents primarily concurred with four of the five statements, which pertain to acquiring knowledge, boosting

confidence, enhancing teaching, and collaborating between language and subject specialists to verify data. Out of 30 respondents, the majority showed uncertainty (15) and refusal (10) in terms of the total reliability of data generated by ChatGPT, while only five trusted the system.

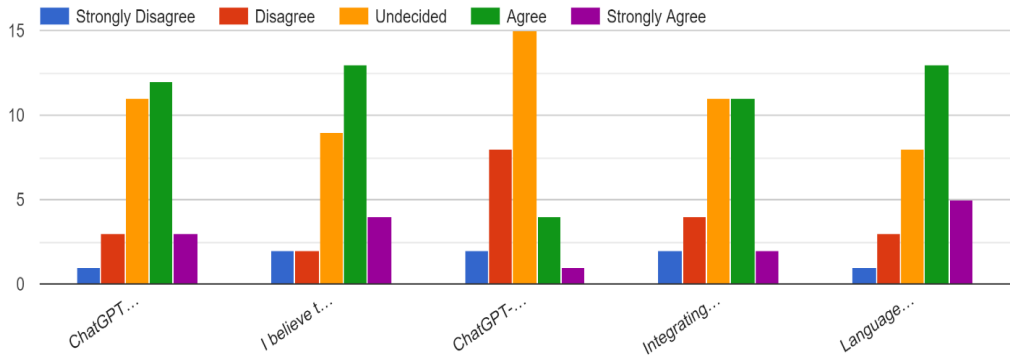


Fig. 2 Levels of Agreement of ESP Practitioners with Statements on the Use of ChatGPT to Develop Language Specialists' Subject-Specific Knowledge (N=30)

Two respondents were totally against using the AI tool when they shared their additional insights on the matter; one of them stated, "*I don't accept it as a reliable source in this area.*" Nine of the respondents argued in favor of using the AI tool, but with a noticeable 'suspicion', as one respondent labeled the operation. They all raised a red flag, highlighting the issue of reliability and recommending further, meticulous research. One respondent brought up a language-related concern, pointing out that ESP is still a language course and that ChatGPT does not "*generate*" language. *It generate[s] answers. Those answers can only be as good as the language inside ChatGPT. "This is*

a very important difference to consider when using ChatGPT for material design in language courses." Two respondents in the undecided category added that the AI tool under scrutiny is not the only one. *"We are language teachers, not teachers of the subject matter. Nevertheless, further research is a must to ensure the quality of the course. "ChatGPT is not the only AI source we can rely on."* Six practitioners showed their support for the use of the large language model chatbot in developing subject knowledge, stating, for example, *"It can provide targeted assistance and resources, enhancing both teaching effectiveness and student learning outcomes,"* and *"AI can help ESP practitioners improve their course content and teaching methods."*.

Figure 3 below shows that respondents do not find the AI tool extremely effective, as they still hold reservations against the strong claim. However, 70% of the whole sample still believes that using ChatGPT can be helpful for language specialists to develop their subject knowledge.

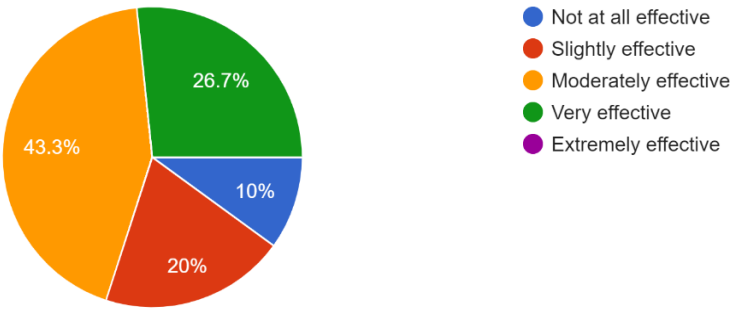
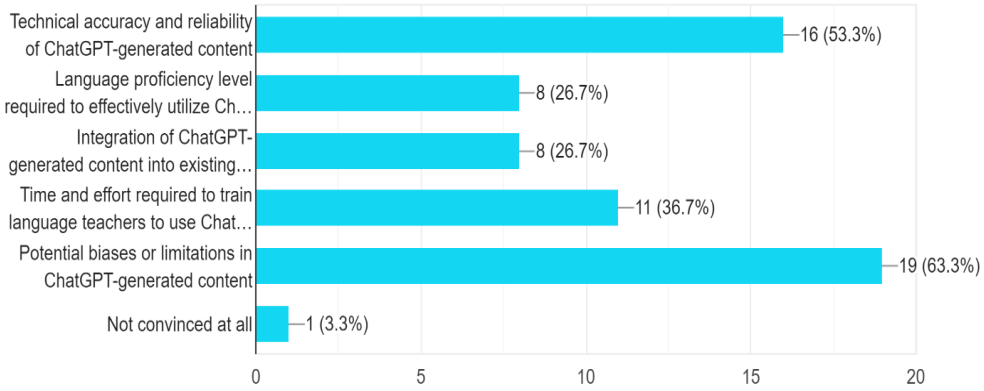


Fig. 3 ESP Experts' Views on the Efficiency of Integrating ChatGPT in ESP Course Design to Bridge the Gap between Language and Subject Specialists (N=30)

Regarding participants' recommendations on the matter, 60% of them endorsed the use of the large language model in enhancing language specialists' subject knowledge. Half of that percentage claimed they would very likely recommend using ChatGPT.

In their view of the challenges and concerns of using the AI tool to develop domain knowledge, 63.3% of the ESP practitioners chose issues with bias. Similarly, 53.3% believed that technical information accuracy might be among the overarching inadequacies when relying on the AI tool to learn about the subject. Time and effort requirements for efficient use of ChatGPT were among the challenges shared by 36.7% of the practitioners in this study. Language proficiency requirements to use ChatGPT and the challenges of integrating AI-generated information into already existing teaching materials were both concerns shared by the practitioners (26.7%), as shown in the figure below.



The ESP practitioners provided more information on approaches that language specialists can opt for to develop their subject knowledge. Seeking collaboration with subject specialists was the most selected option (76.7%). Next, 66.7% claimed that professional development opportunities must be an important part of ESP teachers' careers. Surprisingly, nearly half of the sample (46.7%) stated that language specialist ESP teachers should prioritize language teaching expertise over subject-specific knowledge. As for the use of AI tools, 43.3% still believe that language teachers must use AI tools to develop their subject knowledge. Only two respondents (6.6%) recommended other additional approaches such as corpus analysis, books, videos, lectures, and technical dictionaries.

Finally, additional comments from the respondents varied between encouraging the cautious use of AI tools and the importance of pairing traditional teaching and learning with AI. One respondent showed experience-based reservations, stating, "*Chat GPT often claims that it doesn't have access to real-world documents such as patient files, reports, referral letters, and investigation results, which is understandable considering the confidentiality of such papers, but it seems to be the main reason why responses generated by AI are often misleading in terms of subject matter."* On the other hand, another respondent supported the use of AI by encouraging collaboration and cross-checking data accuracy, with subject specialists claiming that *"I think AI tools like ChatGPT can help supplement domain knowledge, but to know what to ask ChatGPT, there has to be some baseline knowledge to be able to ask the right questions to get more informative responses. In any subject area, there are critical terminologies, ways of doing things, and real-world competencies expected of students and practitioners, which teachers should be aware of. ChatGPT is not yet 100%*

accurate, so teachers must know if the information they are using is appropriate or not. In this regard, subject matter experts can help language teachers identify which information is accurate and relevant, so collaboration would be beneficial.".

4.2 Interview Analysis

To cross-check and back up answers from the questionnaire, an in-depth interview with nine participants provided a more robust description of the challenges faced by language specialists with a lack of subject knowledge and perceptions about the use of ChatGPT to resolve the issue. To reach the research objective and answer these questions, two language specialists and seven subject specialists from different domains, such as economics, physics, law, and biology, participated in the interview. The analysis of the nine respondents' answers generated four main themes concerning the research questions: language specialists' subject knowledge, techniques for resolving lack of subject knowledge, the use of AI chatbots for learning subject knowledge, and the advantages and challenges of relying on AI to solve the issue.

Language specialists' subject knowledge

All ESP practitioners acknowledged the dilemma of language specialists' subject knowledge in ESP courses. They all believed that a lack of subject knowledge has a negative impact on teaching and learning efficiency. Six ESP practitioners, of whom four are subject-specialists, claimed that a lack of subject knowledge affects not only teaching and learning as a process but also language teachers' psychological readiness. In other words, one respondent labeled this issue as *"problems with the state of mind,"* elaborating that when the problem persists, teachers will face a lack of

confidence, anxiety, and even embarrassment. One respondent (a language specialist) added that ESP learners still expect language teachers to have subject knowledge in English just because *"they know English."* Three respondents pointed out the effect of teachers' lack of subject knowledge on ESP learners' motivation. In essence, they stated that a lack of subject knowledge may disrupt the smooth flow of teaching and learning, which leads to *"misunderstandings"* and eventually less learner engagement. Finally, respondents shared various statements about how a lack of subject knowledge affects course design, material selection, and teaching methods. According to them, these issues, in addition to the misinterpretation of domain-specific language, could jeopardize learners' comprehension and retention.

Adapted techniques for resolving lack of subject knowledge

Subject specialists were less resourceful in answering this inquiry because they had never experienced such an issue in their teachings. However, they all shared similar suggestions on resolving the issue for language specialists, which revolved around consulting with subject specialists and researching for more information. On the other hand, language specialists claimed that subject specialists might not be available at all times, and usually, research and use of online sources were more available for answering subject-specific inquiries. One language specialist shared her experience when faced with issues relating to subject specialty knowledge. She explained that when teaching an EOP course for medical doctors and pilots, she relied on the knowledge of experienced learners to actively collaborate in the teaching-learning process. In a different situation, she asserted that acting as a language and subject specialist was her role in teaching EOP classes for beginners (pre-service courses).

The integration of AI chatbots for learning subject knowledge

The use of AI for subject knowledge learning was not under as much scrutiny as expected. Despite this, subject specialists exhibited caution in their responses, and they unanimously praised the domain specialists for validating the information they received from the chatbot. One subject specialist asserted that acquiring subject knowledge through AI chatbots might be encouraging for language teachers, but caution is highly required, especially with the data accuracy of complex subjects and updated information that ChatGPT, as an example, might not possess. He added, *"Evaluating information by experts is a must, most notably with case studies and contextual knowledge."* The general use of AI tools as support rather than a trusted source of knowledge was a point of agreement among all respondents. Accordingly, they believed such tools would enhance the efficiency of professional development by acquiring subject knowledge.

Advantages and challenges of using AI chatbots for acquiring subject knowledge

Apart from two subject specialists who seemed more cautious than optimistic, respondents recognized the utility of using ChatGPT and other AI tools to improve teaching and learning in general. Both subject and language specialists carefully debated the acquisition of subject knowledge. They recognized the advantages of using such tools for saving time and facilitating knowledge acquisition and exchange. To prevent misunderstandings between ESP teachers and learners due to misinterpretation of AI-generated content, subject specialists continue to advocate for consultations with experts during the instructional phase. A language expert also mentioned that the AI tool aids in needs analysis and the development of interactive tasks. She added that curating *"good prompts usually results in accurate and beneficial*

information and ideas." Data accuracy, on the other hand, was one of the most debated issues with the use of AI tools. In addition to ethical concerns about AI and biased information, respondents held the view that experienced subject specialists should consult and validate data accuracy, particularly for novice language teachers in ESP. One of the respondents also noted an overreliance on AI tools. He felt that we needed to study and discuss the careful use of these tools. *R*espondents unanimously agreed that while AI tools like chatbots can aid teachers and enhance interactive and engaging learning, they cannot supplant human intelligence and creativity.

5. Discussion

Subject knowledge in ESP teaching has been a hot topic for debate. Several scholars, including Rachayon (2020) and Al-Ghamdi (2022), acknowledge that subject specialists, with their expertise and domain knowledge, tend to be more resourceful in ESP classes. Conversely, researchers such as Omenda (2024) assert that the ESP course prioritizes teaching and learning English and communicative competence over teaching domain knowledge. Therefore, it was crucial to investigate the issue of subject knowledge among non-native language ESP teachers, as they represent a larger proportion of ESP teachers around the world (Forteza Fernandez & Batista Gonzalez, 2019).

Q1. How do language specialist ESP teachers deal with the dilemma of lack of subject knowledge?

The first research question in this study addressed the issue of subject knowledge with language ESP teachers and the tactics they use to overcome it. The respondents mostly recognized the issue and asserted the negative impact it has on their teaching performance and the efficiency of the

teaching-learning process. Given the large number of language specialists who teach ESP, it is high time ESP experts found more teacher-friendly and efficient methods to help these instructors develop professionally more sustainably and durably. Language teachers usually conduct research and consult different sources to come up with engaging learning tasks in order to address learners' needs and meet the course's objectives. Some of the sources teachers rely on to select authentic or non-authentic materials are books, articles, and websites. When faced with subject-specific dilemmas, teachers focus more on language teaching while consulting with more experienced learners. According to language specialist ESP teachers, a lack of subject knowledge causes several issues, such as misinterpretation of data, lack of interactiveness in the classroom, and demotivation of learners. Consequently, language teachers need to develop professionally (Turlybekov et al., 2024), but more importantly, they need to provide opportunities for professional development through efficient methods and tools.

Q2 and Q3. How do Language and subject specialist ESP teachers perceive the use of ChatGPT in overcoming language teachers' lack of subject knowledge in ESP courses?

AI tools, particularly ChatGPT, have gained increasing popularity over the last five years. The use of AI in education and language learning has been intensively researched by researchers seeking to find durable uses of AI in developing language learning and instructional interactiveness in ESP classes, such as the work of Kovačić and Bubaš (2023). However, further intensive research is still required to explore the use of AI tools in teacher professional development. The second question of this study investigated ESP experts' perceptions of the use of AI tools and ChatGPT, particularly in

filling the subject knowledge gap with language specialist ESP teachers. The respondents initially accepted the proposal but expressed serious reservations about the frequency and adequacy of the tool for generating and acquiring domain-specific knowledge for language ESP teachers. The results of the study go hand in hand with recent investigations on CALL and AI use in education (Coancă, 2023; Shahidi et al., 2023). Despite cautious statements from respondents, most notably subject specialists, there is still an optimistic view on adopting AI tools in professional development and subject knowledge acquisition. Subject specialists maintain their preference for consultations with domain experts regarding AI-generated content, particularly in complex and contextualized subjects. On the same train of thought, the advantages elicited from using AI tools, such as saving time and acquiring instant information when subject specialists are not available, still make it worthwhile to open a broader discussion on the whole matter.

6. Conclusion

Artificial intelligence has sparked widespread interest and debate, particularly in education. There are numerous inquiries about its influence on the acquisition of knowledge and skills by learners, as well as the recruitment and training of teachers. The potential for AI in language teaching is significant, with recent developments like ChatGPT offering new opportunities for language practice. However, realizing this potential requires effort and expertise from learners, teachers, and other stakeholders. While AI offers promising benefits, some barriers and risks need careful exploration. It is essential to heed the perspectives of those directly affected by these technologies to ensure their effective and ethical implementation. Therefore, that was the main objective of this study.

This investigation aimed to shed light on an important issue in the ESP world: language ESP teachers' lack of subject knowledge. It also investigates the techniques used by ESP teachers to overcome this problem, as well as their perceptions of using AI chatbots to overcome this challenge. The findings highlight the challenges faced by language specialists in dealing with subject-specific content, including misinterpretation of data and demotivation of learners, emphasizing the urgency for more sustainable and efficient methods for professional development in this domain. Moreover, the study revealed a cautious acceptance of AI tools among ESP experts, with concerns raised about the adequacy and frequency of using ChatGPT to bridge the subject knowledge gap. Despite reservations, there remains an optimistic outlook on the potential of AI tools to support professional development and subject knowledge acquisition. Moving forward, future research should investigate novel approaches to integrating AI tools into ESP instruction while addressing the study's limitations, such as the need for more comprehensive teacher training and support, as well as the importance of bias and ethical considerations in AI implementation in education. Using the findings from this study, educators and policymakers may redirect the changing environment of ESP education and successfully connect to the revolutionary potential of AI technology for improved language learning results.

The current study's limitations include its reliance on a relatively small sample size, which may not fully represent the diverse range of ESP teaching contexts and experiences globally. Furthermore, while the study explores the potential of AI tools such as ChatGPT for addressing subject knowledge gaps in ESP teaching, it does not account for the long-term effects of using such tools in ESP professional development or provide a detailed analysis of their efficacy in different subject areas. Additionally, the study does not

sufficiently address the ethical concerns and biases inherent in AI technologies, which could impact their effectiveness in supporting teacher professional development. Future research is encouraged to explore these aspects more comprehensively and provide broader, empirical evidence on the role of AI in ESP education.

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