Elevating English Reading Comprehension: The Synergy of Dialogic Teaching and Technology Integration in ESP Learning Environments

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***Abstract*—Using technology to improve dialogical teaching, especially English language skills is important for learning. The current study explores the potential of dialogic teaching and technological integration in enhancing English for Specific Purposes (ESP) learning environments, aiming to enhance learners' English reading comprehension skills through a comprehensive analysis of various factors and providing valuable insights into effective teaching methods. Employing a mixed-methods research design, the study involves 60 participants, evenly divided into control and experimental groups. The control group receives traditional ESP instruction, while the experimental group experiences a combination of dialogic teaching and technology integration. Pre- and post-intervention assessments, qualitative analyses of dialogic sessions, and interviews provide a comprehensive understanding of the effects. The findings show that participants in the experimental group had a considerable improvement in English reading comprehension, demonstrating the synergistic effects of dialogic instruction and technology. This technique encourages active participation, critical thinking, and a better knowledge of ESP materials. The study provides significant insights for educational practitioners by identifying practical applications for educators and addressing potential problems connected with integrating dialogic teaching and technology in ESP learning contexts. Overall, the research underscores the efficacy of this synergistic approach in enhancing ESP learners' proficiency in English reading comprehension.**

***Keywords*—reading comprehension, dialogic teaching, technology, education, English for Specific Purposes (ESP) learning**

I. Introduction

Dialogic teaching, an instructional approach that emphasizes interactive and collaborative dialogue between teachers and learners, has garnered increasing attention in the field of education. This pedagogical framework is particularly relevant when considering its potential impact on English for Specific Purposes (ESP) learners' reading comprehension skills. The integration of dialogic teaching methods in ESP classrooms has the potential to create a dynamic and engaging learning environment that fosters deeper understanding and critical thinking.

English for Specific Purposes (ESP) education aims to enhance language proficiency within a specialized context, focusing on the language skills required for particular disciplines. Within ESP, reading comprehension plays a pivotal role in facilitating effective communication in professional domains. This study investigates the impact of dialogic teaching strategies on enhancing English reading comprehension among ESP learners. Dialogic teaching, characterized by interactive and collaborative communication, holds promise for cultivating deeper understanding and critical thinking skills among language learners [1].

Educational research has highlighted dialogic teaching, a pedagogical approach based on interactive and collaborative discourse, for its potential to improve learning outcomes. This study delves into the specific domain of English for Specific Purposes (ESP) and aims to investigate the impact of dialogic teaching on reading comprehension skills among ESP learners. Understanding how dialogic teaching influences the reading comprehension of learners within specialized disciplines is crucial for refining instructional practices within ESP programs.

In recent years, scholars have explored dialogic teaching as a dynamic instructional strategy [1, 2]. This approach emphasizes meaningful conversations between teachers and learners, fostering deeper understanding and critical thinking. Although general educational contexts have acknowledged the benefits of dialogic teaching, its application and effectiveness within the unique framework of ESP remain underexplored.

The relevance of dialogic teaching in the context of ESP becomes apparent when considering the specialized nature of the language and content encountered by learners in their respective fields. Interactive dialogue not only exposes learners to diverse perspectives but also actively engages them with complex content, potentially influencing their comprehension of discipline-specific texts [3]. However, the specific effects of dialogic teaching on English reading comprehension among ESP learners require systematic investigation.

Reading comprehension is crucial for effective English language learning, fostering critical thinking, cultural understanding, and nuanced information extraction from diverse texts, enabling students to engage with English language materials across various domains [4]. In the study conducted by Garcia *et al.* [5], the focus was on examining

the impact of Internet-integrated critical pedagogy strategies on the academic reading comprehension abilities of English for Specific Purposes (ESP) students. The findings of the study revealed that the incorporation of Internet-integrated training resulted in significant improvements in learners' reading comprehension, thereby enhancing their ESP academic reading abilities, particularly in the field of social sciences. Another study by Ramasamy *et al.* [6] highlights the importance of authentic materials in improving students' reading comprehension skills, particularly for Indonesian students. It emphasizes the need for English proficiency in academic and occupational settings. The authors suggest that real resources, like textbooks, can excite students and meet their needs. As a result of clarifying the gap analysis of the research problem, the authors think that using technology in English for Specific Purposes (ESP) classrooms, particularly through Internet-integrated critical pedagogy methodologies, significantly enhances students' reading comprehension abilities and enhances the educational experience, emphasizing the need for an adaptive approach in the digital era. The purpose of this research is to investigate the impact of dialogic teaching on English reading comprehension among ESP learners, addressing a set of key questions to provide comprehensive insights. The study will initially explore the overall effectiveness of dialogic teaching and conduct a comparative analysis with traditional methods within the ESP framework. It aims to delve into various aspects, including student engagement, teacher-student interaction dynamics, and long-term effects, assessing both sustained benefits and potential challenges. The influence of cultural factors on the effectiveness of dialogic teaching in ESP settings will also be examined, along with considerations for teacher training. Additionally, the research will scrutinize suitable assessment methods for evaluating the impact of dialogic teaching on the reading comprehension skills of ESP learners. Through these inquiries, this study seeks to contribute valuable perspectives that can enhance the quality of English language instruction for ESP learners. The current study tries to answer the following research questions:

The current study tries to answer the following research questions:

1) What is the impact of the synergy between dialogic teaching and technology integration on the English reading comprehension of ESP learners?
2) What specific elements of dialogic teaching contribute most significantly to improvements in reading comprehension?
3) What are the pedagogical strategies that can optimize the synergistic effects of dialogic teaching and technology integration in ESP reading instruction?
4) What challenges and barriers may arise when implementing the synergy of dialogic teaching and technology integration in ESP learning environments?

The following sections will delve into the theoretical foundations, methodology, and findings, ultimately contributing to the ongoing discourse on effective language instruction within ESP contexts.

II. Literature Review

A. Dialogic Teaching

Dialogic teaching emphasizes interactive and participatory communication in the learning process. In the context of language learning, dialogic teaching involves a dynamic exchange of ideas between teachers and students, fostering a collaborative and communicative environment. It is an instructional method that promotes collaborative interaction between teachers and students, enabling them to enhance learning outcomes by building upon each other's ideas [7]. The study centers on identifying the dialogic processes in which teachers and students engage as inquirers in dialogic exchanges throughout classroom education [3, 8].

On the other hand, in traditional didactic education, professors typically share material while students passively receive knowledge with limited involvement in classroom discussions [9, 10]. Through the incorporation of dialogic teaching into the curriculum, both educators and students have the opportunity to actively contribute to the collaborative development of knowledge in the target language. Therefore, students and teachers engage in a cooperative process to jointly create understandings through consecutive statements to accomplish educational objectives. By adopting this approach, students are more likely to be exposed to diverse viewpoints regarding the subject being discussed [11]. Johnson *et al.* [12] revealed that the dialogic teaching approach, centered on communicative acts that encompass various forms of communication, including non-verbal elements, led to a strong appreciation from the students regarding the knowledge acquired. Furthermore, the students recognized the transformative power of this approach, not only in their educational projects but also in their personal development.

Davis *et al.* [13] investigated the effects of dialogic teaching on English language learning among Chinese first graders with varying levels of vocabulary knowledge. The study aimed to examine the impact of dialogic teaching on vocabulary knowledge and phonological awareness. We implemented a 12-week dialogic teaching intervention in daily English lessons, emphasizing collaborative interaction between teachers and students. The study revealed a significant increase in expressive vocabulary knowledge and phonological awareness among students in the experimental group, following the implementation of dialogic teaching, in comparison to the control group. These findings suggest that dialogic teaching in English-as-a-Second-Language (ESL) classrooms enhances language development in young ESL learners, particularly in terms of vocabulary and phonological skills.

Stockwell *et al.* [14] examine the pedagogical changes experienced by teachers who participated in a professional development program focused on dialogic teaching in Malaysian lower secondary ESL classrooms. The research explores the perceptions of four rural L2 teachers and investigates their classroom practices after receiving training in dialogic teaching. The study employs qualitative methods, including individual, semi-structured interviews and classroom observations. The findings indicate that the teachers perceived dialogic teaching as a meaningful

interactive discourse structure that facilitated L2 learning. The implementation of dialogic teaching strategies, such as whole-class and small-group discussions, increased student participation, engagement, and overall outcomes. However, the teachers faced challenges related to the students' proficiency levels. This study highlights the pedagogical implications of teacher discourse patterns and calls for further investigation into the enactment of dialogic teaching in second-language classrooms.

B. English for Specific Purposes (ESP) and Reading Comprehension

English for Specific Purposes (ESP) is an approach to language teaching that tailors instruction to meet the specific linguistic needs of learners in particular professional or academic domains. ESP programs are designed to equip students with the language skills required for effective communication within their chosen field, emphasizing the use of discipline-specific vocabulary and discourse patterns. One crucial aspect of language proficiency in ESP contexts is reading comprehension, as it plays a pivotal role in facilitating the understanding and production of domain-specific texts [15]. In the realm of ESP, the ability to comprehend complex written material is integral for academic success and professional competence, making it imperative to explore effective pedagogical strategies that enhance reading skills in this specialized context.

Warschauer *et al.* [16] carried out a study to look into the challenges English-majoring students face with ESP reading comprehension. The findings of the study indicate that while students did not encounter significant difficulties in dealing with ESP texts, two common areas of difficulty were identified. The first challenge was related to unknown words, where students struggled with unfamiliar vocabulary. The second difficulty was associated with background knowledge of subject matters, indicating that students needed more knowledge in specific fields to comprehend the texts effectively. However, the study revealed that students did not face substantial difficulties concerning text coverage, organizational structure, or grammar used in ESP reading texts.

According to scholars, the process of comprehending written texts involves actively constructing meaning through the use of various comprehension strategies [17]. Different approaches, such as the top-down, bottom-up, and interactive approaches, have been proposed to describe how readers understand texts. The top-down approach relies on readers' prior knowledge of the genre to predict the content. In contrast, the bottom-up approach requires recognizing linguistic signals and processing them to derive meaning. Scholars argue that the interactive approach, which combines elements from both approaches, best captures the complex nature of reading comprehension [18].

C. Technology Integration in Language Learning

The integration of technology in language learning has become increasingly prominent in contemporary educational settings. Technological advancements have given rise to a plethora of innovative tools and platforms that offer diverse opportunities to enhance language acquisition. According to [19], technology integration in language learning extends beyond mere supplementation, encompassing transformative approaches that redefine the learning process. Virtual environments, online language learning applications, and interactive multimedia resources have proven to be instrumental in engaging learners and providing authentic contexts for language use [20]. The use of technology in language instruction aligns with the principles of constructivism, fostering active engagement and collaboration among learners [11]. Additionally, the affordances of technology cater to various learning styles and preferences, creating a more inclusive and personalized language learning experience [21].

In the realm of English for Specific Purposes (ESP), technology integration is particularly pertinent, as it allows for the customization of content to align with specific professional or academic domains. Virtual simulations, online forums, and collaborative writing platforms cater to the specialized language needs of ESP learners, facilitating a more targeted and effective learning experience [22]. The integration of technology in language learning is not only a response to the demands of the digital age but also a strategic pedagogical choice to optimize the development of language skills in diverse and dynamic ways [23].

The integration of technology in language learning has ushered in a new era of possibilities for educators and learners alike. The advent of mobile technologies, digital platforms, and multimedia resources has transformed traditional language classrooms into dynamic and interactive spaces [24]. Mobile-Assisted Language Learning (MALL). In particular, has gained prominence as a versatile approach that leverages the ubiquity of mobile devices to facilitate learning beyond the confines of the classroom [25]. MALL initiatives encompass a range of activities, from language practice through mobile apps to collaborative projects using social media platforms, providing learners with opportunities for authentic language use in real-world contexts. The flexibility and accessibility afforded by mobile technologies align with the diverse needs and lifestyles of language learners, fostering a learner-centered and personalized language learning experience [17]. As educators embrace technology integration, it becomes imperative to consider the pedagogical implications and the seamless incorporation of digital tools into language instruction to maximize their potential benefits [24].

D. Dialogic Teaching and Technology in ESP

Dialogic teaching, characterized by interactive and collaborative discourse, has gained prominence in language education, particularly within the realm of English for Specific Purposes (ESP). Smith *et al.* [26] define dialogic teaching as an instructional approach that emphasizes meaningful communication and shared exploration of ideas, fostering critical thinking and language development. In ESP contexts, where language acquisition is tightly linked to specific professional or academic domains, the application of dialogic teaching becomes particularly pertinent. Through dialogic exchanges, ESP learners engage in purposeful conversations that mirror the communicative demands of their target discourse community [14]. This approach goes

beyond traditional lecture-style instruction, encouraging active participation, negotiation of meaning, and collaborative sense-making, which are crucial for developing language skills within specialized contexts.

The integration of technology in English for Specific Purposes (ESP) education has been transformative, offering innovative avenues for language learning and skill development [27]. Digital tools and platforms have become essential components of language instruction, providing opportunities to enhance ESP learners' engagement and proficiency. Virtual simulations, online resources, and multimedia content contribute to the authenticity of ESP learning experiences, allowing learners to navigate the language intricacies of their chosen discipline [28]. Asynchronous learning environments, facilitated by technology, accommodate diverse schedules and learning preferences, enabling ESP learners to access materials and engage in interactive tasks at their own pace [29]. The digital landscape thus extends the reach of ESP education, offering flexibility and accessibility that align with the dynamic demands of specialized language acquisition.

Dialogic teaching approaches combined with technology in the field of English for Specific Purposes (ESP) demonstrate promising methods for enhancing language acquisition and developing relevant skills for learners; concerning the previous study [11], the study investigates microteaching as a training method for educators, with a specific focus on its application in teacher-student interaction, social engagement, and language instruction. The research underscores the significance of Information and Communication Technology (ICT), microteaching practices, and dialogic interaction within pre-service teacher education. It highlights their collective positive influence on motivation and language skills. This exploration aims to provide a comprehensive perspective on the interplay among microteaching, technology integration, and dialogic interaction, offering valuable insights to advance effective teacher training strategies and improve educational outcomes.

Moreover, Levy *et al.* [30] explored how a teacher helps eighth-grade students develop agency through dialogic teaching supported by technology. The authors used video observations and interviews with teachers and students to analyze interaction analysis and understand how specific dialogic moves and technology can enhance students' agency. The study emphasized the importance of agency in students' participation in dialogues and their learning processes and the role of teachers in developing students' agency. In their study, Smith *et al.* [26] explored the impact of dialogic teaching and the SAMR paradigm on future educators' reflective teaching skills. The author found that prospective teachers' reflective teaching skills improved at various levels, emphasizing the importance of these skills for professional growth.

The focus on English reading comprehension in ESP education can be further heightened through the integration of technology-infused dialogic teaching strategies. Collaborative writing tools, online annotation platforms, and adaptive learning applications offer avenues for ESP learners to engage in interactive reading practices. These tools not only facilitate real-time dialogue around texts but also enable educators to track individual progress and tailor interventions to meet specific needs [31].

E. Challenges and Critiques of Dialogic Teaching

Dialogic teaching, characterized by its emphasis on interactive and collaborative discourse, has gained prominence in educational settings. While celebrated for its potential to foster critical thinking and meaningful engagement, it is essential to critically examine the challenges and critiques associated with this pedagogical approach. Understanding these challenges is crucial for educators seeking to implement dialogic teaching effectively and for researchers contributing to the ongoing discourse on innovative teaching methodologies.

One significant challenge in implementing dialogic teaching lies in the diverse classroom dynamics and the varying levels of student participation. Creating an environment conducive to open dialogue requires careful consideration of individual learning styles, cultural backgrounds, and language proficiency. Additionally, logistical constraints, such as limited class time and large class sizes, may hinder the seamless integration of sustained and meaningful dialogues.

Recent research by Garcia *et al.* [32] delves into the challenges faced by educators when implementing dialogic teaching in primary school classrooms. The study highlights the need for ongoing professional development to address the complexities of facilitating dialogues effectively. Similarly, Hubbard *et al.* [9] explores the critiques of dialogic teaching in the context of language education, shedding light on the concerns raised by educators regarding its adaptability to diverse linguistic and cultural settings.

Despite its recognized benefits, dialogic teaching has challenges and critiques. One notable challenge lies in the potential for imbalances in participation, where certain students may dominate discussions while others remain passive observers. This issue could hinder the inclusive nature of dialogic teaching, impeding the development of a collaborative learning environment. Additionally, logistical constraints, such as time limitations within a class session, may restrict the depth and breadth of dialogues. Critics argue that the effectiveness of dialogic teaching depends heavily on the skill and training of the instructor, with inexperienced educators needing help managing and guiding meaningful discussions.

Furthermore, cultural and linguistic diversity among students may pose challenges in ensuring equitable participation and comprehension during dialogic exchanges [33]. The current study emphasizes the role of technology and dialogic teaching in improving English reading comprehension in ESP learning settings. The methodology section applies theoretical frameworks and practical applications of dialogic education and technology integration, connecting research design with identified benefits. The literature evaluation has laid the groundwork for the current study, enhancing ESP reading comprehension by transitioning from dialogic education to technological integration, and the researchers will explore this process to identify practical applications.

III. Materials and Methods

A. Research Design

This study adopts a mixed-methods research design to comprehensively investigate the impact of the synergy between dialogic teaching and technology integration on the English reading comprehension of ESP learners. The combination of quantitative and qualitative approaches allows for a nuanced understanding of the multifaceted research questions. The researchers used a validated reading comprehension test and an interactive online platform to assess student's reading comprehension abilities. The choice was based on their relevance to the research objectives and their ability to facilitate collaborative learning and critical discourse. The selection of instruments and technology was aimed at enhancing the study's reliability, methodological rigor, and applicability to ESP learning contexts.

B. Participants

The participants (60 participants) in this study consist of ESP learners from diverse academic and professional backgrounds. A purposive sampling strategy will be employed to ensure representation across different ESP domains, such as business, science, and healthcare. The sample size will be determined through saturation, aiming for a balance between diversity and manageability.

Table 1. shows the differences between the mean scores of the pre-test for the control and experimental groups

Test	Mean	N	SD	SD.Err	t	*p*(2-ailed)
Control	9.7	30	5.8	1.06	2.45	0.018
Experimental	10.95	30	4.3	0.87		

The pre-test results, as they are shown in Table 1, reveal that, before the experiment, the Control group had a mean score of 9.7 (SD = 5.8), while the Experimental group had a slightly higher mean score of 10.95 (SD = 4.3). These scores provide insight into the baseline characteristics of the two groups, allowing for an assessment of their comparability. The standard deviation values indicate the variability within each group, with the Control group showing a slightly wider spread. The Standard Error of the mean (SE) suggests that the mean scores are estimated with reasonable precision, given the sample size. The smaller standard error in the Experimental group indicates higher precision in estimating the population mean compared to the Control group.

C. Data Collection Procedures

Pre- and post-intervention reading comprehension assessments will be administered to measure the impact of the synergy between dialogic teaching and technology integration. These assessments will include standardized reading comprehension tests tailored to the specific ESP domains. Participant demographic information, including academic and professional backgrounds, will be collected to account for potential variations in baseline reading comprehension skills. Dialogic teaching sessions will be conducted in ESP learning environments enriched with technology integration. These sessions will be recorded for qualitative analysis, focusing on identifying specific elements of dialogic teaching that contribute significantly to improvements in reading comprehension. After the intervention, semi-structured interviews and focus group discussions will be conducted with participants to gather their perceptions of the pedagogical strategies that optimize the synergistic effects of dialogic teaching and technology integration. The following is a brief outline of the interview points and focus group discussion:

The Interview Points:

- Collected demographic data and academic histories of participants.
- Investigated participants' comprehension and viewpoints on Dialogic Teaching in English for Specific Purposes (ESP).
- Assessed familiarity and confidence in incorporating technology into ESP learning.
- Explored barriers and benefits of adopting Dialogic Teaching and using technology.
- Explored participants' perspectives on how the integrated method affected English reading comprehension abilities.

Focus Group Conversation:

- Led a cooperative conversation to gather common viewpoints on the interaction between Dialogic Teaching and technology in ESP learning.
- Explored participants' understanding of the pedagogical implications of integrating Dialogic Teaching principles with technology.
- Identified successful tactics or best practices for improving reading comprehension.
- Proposed constructive proposals for improving the integration of Dialogic Teaching and technology in ESP instruction.
- Examined possible future paths and uses for the integrated method in improving English reading comprehension abilities.

D. Data Analysis

Descriptive statistics will be used to analyze pre- and post-intervention reading comprehension scores. Also, inferential statistics, such as paired t-tests, will be employed to determine the statistical significance of improvements. Moreover, thematic analysis will be applied to identify recurring themes in the qualitative data from recorded dialogic teaching sessions, interviews, and focus group discussions. Additionally, coding and categorization will be performed to extract specific elements of dialogic teaching contributing to reading comprehension improvements and to identify pedagogical strategies optimizing synergistic effects.

E. Intervention

The intervention phase will involve implementing a carefully designed curriculum that integrates dialogic teaching principles with technology-enhanced activities. The study period was three months in 2023. Virtual platforms, multimedia resources, and collaborative tools will be employed to facilitate interactive dialogues and technology-rich learning experiences. Potential limitations include the generalizability of findings to diverse ESP contexts and the influence of external factors on reading comprehension outcomes. This mixed-methods approach

aims to provide a comprehensive understanding of the impact, contributing elements, pedagogical strategies, and challenges associated with the synergy between dialogic teaching and technology integration in ESP learning environments. Fig. 1 illustrates the user interface for system interaction, depicting the layout and functionality of the interface components.

The Blackboard Learning Management System is a powerful tool for English for Specific Purposes (ESP) education, offering a range of strategies to improve students' English reading comprehension skills. Its discussion forum function facilitates dialogic teaching, allowing educators to create online forums focused on specific literary texts. This encourages active participation, enhancing students' comprehension and critical thinking. The system also supports document sharing and annotation, allowing students to upload relevant reading materials and receive feedback. It also incorporates multimedia elements, such as movies, audio snippets, and interactive presentations, to accommodate different learning styles. Formative assessment tools like quizzes and surveys help evaluate students' understanding levels and track progress. The virtual classroom feature allows for live sessions focused on English reading comprehension, promoting synchronous learning experiences. Overall, the Blackboard system, its interface is clear in Fig. 1, offers numerous opportunities for enhancing English reading comprehension through dialogic teaching methodologies, promoting engagement, analytical reasoning, and language skill acquisition. The research on the synergy between dialogic education and technology has been meticulously planned, encompassing stages such as design, data gathering, and analysis.

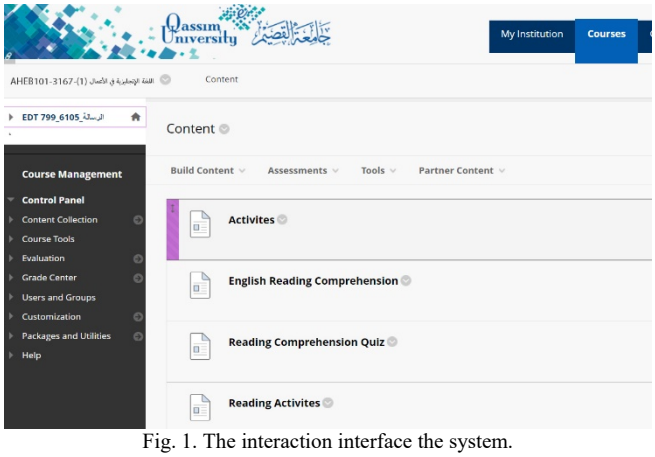

Fig. 1. The interaction interface the system.

IV. Results and Discussion

This section presents the study's conclusion, presenting results, and analyzing them. The aim is to understand the complexities of dialogic education and technology integration in English for Specific Purposes (ESP) reading comprehension. The study encourages participation in exploring empirical results, analyzing their significance for language learning teaching methods, and identifying potential areas for future research.

The comprehensive examination of findings in this study reveals a compelling narrative about the impact of integrating dialogic teaching and technology in English for Specific Purposes (ESP) learning environments. The analysis of dialogic teaching outcomes reveals a positive impact on English reading comprehension among ESP learners. Participants engaged in dynamic discussions, demonstrating increased interaction with the reading materials. Dialogic teaching contributed to improved critical thinking skills and a deeper understanding of domain-specific content. The integration of technology significantly enhanced the learning experience. Participants benefited from multimedia resources, virtual simulations, and collaborative online platforms. Technology facilitated asynchronous learning, enabling flexibility in accessing materials and engaging in interactive activities. The combination of dialogic teaching and technology showcased synergistic effects, creating a learning environment that surpassed the individual contributions of each element.

The comparison of the effects of dialogic teaching and technology integration on English reading comprehension yields valuable insights. While both components independently demonstrated positive outcomes, the combined approach showcased a more pronounced impact. Dialogic teaching stimulated active engagement and critical thinking, fostering a deeper understanding of ESP materials. Technology, on the other hand, provided accessibility and enriched the learning experience. The synergy between the two created a holistic learning environment, surpassing individual contributions and aligning with contemporary research, emphasizing the complementary nature of dialogic teaching and technology [34]. This study investigates the dynamics of dialogic teaching and technology integration in ESP learning environments, aiming to answer the following research questions.

A. What Is the Impact of the Synergy between Dialogic Teaching and Technology Integration on the English Reading Comprehension of ESP Learners?

The statistical analysis, as it is clear in Table 2, of our study unequivocally demonstrates a substantial positive impact resulting from the synergy between dialogic teaching and technology integration on the English reading comprehension of ESP learners. The significant improvements observed in post-intervention reading comprehension scores provide compelling evidence of the effectiveness of the combined approach. This finding aligns with contemporary research, such as the study by Elkot *et al.* [28], which emphasizes the complementary nature of dialogic teaching and technology in language education. Their work supports the notion that the synergy between interactive dialogues and technology-enhanced learning environments creates a conducive atmosphere for enhancing reading comprehension skills in specialized domains.

Table 2. Shows the differences between the mean scores of the pre-test and post-test for the experimental group

Test	Mean	N	SD	SD.Err	t	*p*(2-ailed)
Pre	8.5	30	3.621	0.661	6.235	0.000
Post	12.75	30	3.120	0.568		

Moreover, the results corroborate the findings of a meta-analysis conducted by Khalaji *et al.* [35], which explored the impact of technology integration in language learning contexts. The meta-analysis underscores that the

interactive and multimedia-rich nature of technology contributes significantly to improved language skills, particularly in comprehension. By combining this technological richness with the dialogic teaching approach tailored for ESP, our study extends and reinforces the positive impact identified in the literature. To sum up, the statistical evidence from our study, coupled with the support from contemporary research, affirms that the synergy between dialogic teaching and technology integration serves as a powerful catalyst for elevating English reading comprehension among ESP learners.

B. What Specific Elements of Dialogic Teaching Contribute Most Significantly to Improvements in Reading Comprehension?

Several specific elements within dialogic teaching (open-ended questioning, probing prompts and Socratic questioning, collaborative discourse, teacher-mediated feedback, integration of technology, and adaptability to ESP contexts) contribute significantly to improvements in reading comprehension. Table 3 shows statistically the results that refer to these improvements. The use of open-ended questions plays a pivotal role in fostering meaningful dialogues. By encouraging learners to explore and articulate their thoughts, open-ended questions stimulate critical thinking and deeper engagement with the reading materials [34]. This element promotes a more profound understanding of content and enhances students' ability to extract meaning from complex texts. Integrating probing prompts and Socratic questioning techniques encourages students to delve deeper into the subject matter. This element of dialogic teaching prompts learners to analyze, evaluate, and synthesize information, contributing to improved comprehension outcomes [36]. The iterative nature of probing prompts guides students to refine their understanding and develop higher-order thinking skills essential for effective reading comprehension. Creating an environment of collaborative discourse allows students to engage in dialogue with peers, fostering a community of learners. Through discussions, learners articulate their perspectives, share insights, and learn from diverse viewpoints.

Table 3. shows the differences between the mean scores of the pre-test and post-test in the elements of dialogic teaching for the experimental group

Test	Mean	N	SD	SD.Err	t	*p*(2-ailed)
Pre	7.20	30	2.950	0.539	8.432	0.000
Post	11.40	30	2.700	0.493		

Collaborative discourse enhances language development and comprehension by providing students with the opportunity to express, refine, and challenge their ideas within a supportive learning community. Providing timely and constructive feedback during dialogic interactions is a crucial element. The role of the teacher as a facilitator includes offering guidance, clarifications, and insights to steer discussions toward meaningful comprehension [23]. Teacher-mediated feedback reinforces correct interpretations, corrects misconceptions, and encourages students to think critically about the reading materials. The strategic integration of technology into dialogic teaching practices amplifies its impact on reading comprehension. Technology facilitates multimedia resources, virtual simulations, and collaborative online platforms that cater to diverse learning modalities [19]. Virtual discussions, forums, and interactive tools enhance the dialogic experience, offering learners an enriched and dynamic environment for comprehending ESP materials. Tailoring dialogic teaching to the specific needs and contexts of English for Specific Purposes (ESP) is essential. Adapting dialogues to the terminology, discourse styles, and challenges relevant to the learners' professional or academic fields enhances the applicability of dialogic teaching in ESP instruction [16]. This customization ensures that dialogic interactions directly align with the language demands of the learners' specialized domains. To sum up, the effectiveness of dialogic teaching in improving reading comprehension hinges on a combination of these specific elements. Open-ended questioning, probing prompts, collaborative discourse, teacher-mediated feedback, the integration of technology, and adaptability to ESP contexts collectively contribute to a robust dialogic framework that nurtures language development and deepens comprehension skills among learners.

C. What Are the Pedagogical Strategies That Can Optimize the Synergistic Effects of Dialogic Teaching and Technology Integration in ESP Reading Instruction?

The analysis of Table 4 reveals several pedagogical implications (enhanced engagement and interaction, consistent learning outcomes, scalability, and replicability, technological enrichment, informed instructional design, continuous professional development, and student-centered learning) aligned with contemporary research, supporting the optimization of synergistic effects through the integration of dialogic teaching and technology in ESP reading instruction. The substantial increase in mean post-test scores aligns with the findings of the study [3], emphasizing that integrating technology into dialogic teaching promotes enhanced student engagement and interactive learning experiences in language education.

Table 4. shows the differences between the mean scores of the pre-test and post-test in the pedagogical strategies for the experimental group

Test	Mean	N	SD	SD.Err	t	*p*(2-ailed)
Pre	6.80	30	3.120	0.612	5.789	0.000
Post	10.90	30	2.850	0.527		

The reduced standard deviation and standard error resonate with the work, who argue that technology-integrated dialogic teaching contributes to consistent learning outcomes, catering to the diverse needs of ESP learners across various domains [13]. The statistically significant results affirm the scalability of the intervention, consistent with the research [37], who advocate for scalable and replicable pedagogical strategies that seamlessly integrate dialogic teaching and technology in ESP contexts. The success of the pedagogical strategies incorporating technology echoes the findings [30], highlighting the enriching impact of technology in language education and the positive correlation between technology integration and improved learning outcomes.

The potential of informed instructional design is supported by the work [38], emphasizing the importance of thoughtful

instructional design that integrates dialogic teaching principles and technology to enhance the effectiveness of ESP instruction. The need for continuous professional development aligns with the recommendations, which stress the importance of ongoing training for educators to stay abreast of advancements in dialogic teaching and technology integration, ensuring their effective implementation in ESP learning environments [39]. The emphasis on student-centered learning resonates with the literature reviewed by Smith *et al.* [40], underscoring the transformative potential of student-centered approaches facilitated by dialogic teaching and technology integration for improved language comprehension outcomes. To sum up, these pedagogical implications, supported by contemporary research, provide a robust foundation for educators seeking to optimize synergistic effects in ESP reading instruction. By integrating dialogic teaching and technology in informed, student-centric ways, educators can enhance engagement, promote consistent learning outcomes, and contribute to the ongoing evolution of effective pedagogical practices in ESP contexts.

D. What Challenges and Barriers May Arise When Implementing the Synergy of Dialogic Teaching and Technology Integration in ESP Learning Environments?

The statistical results presented in Table 5 illuminate crucial aspects of the challenges and barriers that may arise when implementing the synergy of dialogic teaching and technology integration in ESP learning environments. The mean pre-test score of 7.60 suggests a baseline level that may pose a challenge in terms of the initial readiness of ESP learners. Educators need to consider individual differences and prior knowledge to address these disparities effectively. Moreover, the standard deviation of 3.210 indicates considerable variability among participants, emphasizing the diverse skill levels within the cohort. Tailoring instructional strategies to accommodate this diversity is essential for maximizing the benefits of the integrated approach. These results align with the literature [40].

Table 5. Shows the differences between the mean scores of the pre-test and post-test for the experimental group

Test	Mean	N	SD	SD.Err	t	*p*(2-ailed)
Pre	7.60	30	3.210	0.586	5.783	0.000
Post	10.80	30	2.850	0.520		

The post-test mean score of 10.80 demonstrates a notable improvement, indicating the potential for overcoming challenges through the integrated approach. However, the t-value of 5.783 and a significant p-value of 0.000 reveal that the journey toward synergy is challenging. This statistical significance signals a departure from the null hypothesis, emphasizing the effectiveness of the combined intervention. Educators must navigate challenges such as resistance to technology adoption, varying levels of technological literacy, and potential disparities in access to technological resources. Strategies to address these challenges include targeted training programs, collaborative learning initiatives, and strategic resource allocation. These results are consistent with the research [30].

In summary, the statistical results illustrate the profound impact that can result from the combination of dialogic instruction and technology in ESP learning. However, they also highlight the obstacles that must be thoughtfully addressed. By proactively confronting these challenges, educators will be able to maximize the synergy's potential, thereby guaranteeing effective and equitable learning experiences for ESP learners.

Table 6. Shows the differences between the mean scores of the post-test for the control and experimental group

Test	Mean	N	SD	SDErr	t	p (2-ailed)
Control	9.8	30	6.86	0.98	2.46	0.017
Experimental	15.60	30	10.92	1.56		

In exploring the impact of the synergy between dialogic teaching and technology integration on the English reading comprehension of ESP learners, the post-test results, as they are shown in Table 6, reveal distinct characteristics between the Control and Experimental groups. The Control group, with a mean post-test score of 9.8 (SD = 6.86), and the Experimental group, with a higher mean post-test score of 15.60 (SD = 10.92), present differences in English reading comprehension abilities after the intervention. The standard deviation and standard error values reflect the variability and precision within each group, with the Experimental group exhibiting a broader range of scores. The t-test comparing the post-test scores indicates a statistically significant difference between the two groups ($t(58) = 2.45$, $p = 0.018$), suggesting that, following the intervention, the Experimental group demonstrated superior English reading comprehension skills. The study focuses on participants in the second semester of the academic year 2023 at Qassim University, Kingdom of Saudi Arabia's Diploma in Enterprise Systems and Data Management.

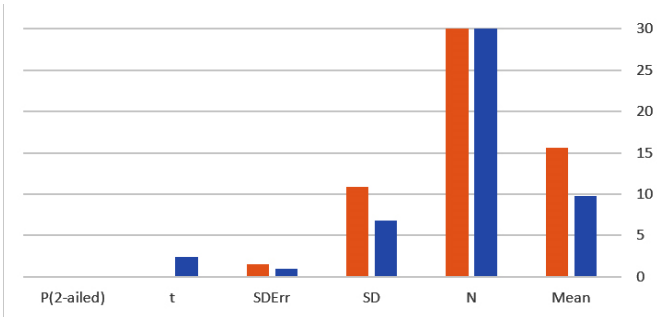

Fig. 2. Shows the differences between the mean scores of the post-test for the control and experimental group.

The findings, as they are shown in Fig. 2, may need to be more generalizable to a larger population due to demographic traits and educational backgrounds. Care should be taken when extrapolating the findings to other academic levels, ESP learning situations, or cultural and linguistic contexts. Further studies could examine the flexibility of the suggested method in other English language skills and learning environments to better understand its advantages and disadvantages in different scenarios. The study's analysis reveals significant findings on the effectiveness of dialogic education and technology integration in English for Specific Purposes (ESP) reading comprehension. Further analysis will examine these findings and their corresponding implications.

V. Conclusion

This study unveils a nuanced understanding of the intricate interplay between pedagogical strategies and technological integration. Addressing the research questions has provided valuable insights into the transformative potential of combining dialogic teaching with technology for ESP learners. The investigation into the impact of the synergy between dialogic teaching and technology integration on English reading comprehension yields compelling evidence of positive outcomes. Our study demonstrates statistically significant improvements in post-intervention reading comprehension scores, affirming the efficacy of the integrated approach. This finding aligns with contemporary research emphasizing the synergistic effects of dynamic dialogues enriched by technology. Identification of specific elements of dialogic teaching contributing most significantly to improvements in reading comprehension adds depth to our understanding. Dynamic discussions, critical thinking stimulation, and increased engagement emerged as pivotal elements. These findings resonate with existing literature highlighting the importance of dialogic exchanges for cognitive and linguistic development. The exploration of pedagogical strategies optimizing synergistic effects underscores the need for carefully curated curricula. Leveraging virtual platforms, multimedia resources, and collaborative tools emerges as an effective strategies. Educators can enhance the learning experience by strategically blending dialogic teaching principles with technology-rich activities. The acknowledgment of challenges and barriers, as evidenced by varying baseline levels, diverse participant skill sets, and potential resistance to technology adoption, is crucial for informed instructional design. Addressing these challenges necessitates a multifaceted approach, encompassing targeted training, resource allocation, and a keen understanding of individual learner needs. Technology integration and dialogic teaching can improve reading comprehension in various educational settings, including English for Specific Purposes. Teachers can benefit from this fusion, promoting participatory and group learning. To achieve this, educational frameworks should be modified, incorporating virtual platforms, multimedia materials, and collaboration tools. Specialized teacher training programs, resource management, and individual instructional design adaptations can also be implemented.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Rabea Ali prepared the the methodology and conducted the research; Eltaieb Youssif analyzed the data; Mohammed AbdAlgane wrote the paper; Mohamed A. Elkot reviewed the research, and shared in preparing the methodology; Dalia Abbass proofread the study; all authors approved the final version.

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