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DEPARTMENT OF ENGLISH

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TITLE:

Investigating the Challenges Faced by Algerian PhD Researchers in Conducting and Publishing Scientific Research in English: The Case of STEM PhD Researchers at Mohamed El Bachir El Ibrahimi University – Bordj Bou Arreridj

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الذي يحدد القواعد المتعلقة بالوقاية من السرقة العلمية ومكافحتها

الجمهورية الجزائرية الديمقراطية الشعبية

وزارة التعليم العالي والبحث العلمي

مؤسسة التعليم العالي والبحث العلمي:

نموذج التصريح الشرفي

الخاص بالالتزام بقواعد النزاهة العلمية لإنجاز بحث

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ABSTRACT

In the evolving global academic landscape, English has emerged as the dominant language for scientific communication, posing significant challenges for non-native speakers. This study explores the difficulties encountered by STEM PhD researchers at Mohamed El Bachir EL Ibrahimi University, Bordj Bou Arreridj in Algeria in conducting and publishing their research in English. The research adopted a phenomenological design to explore the lived experiences of doctoral researchers regarding the challenges of writing and publishing in English. In-depth semi-structured interviews were conducted with 21 PhD candidates from the Departments of Science and Technology, Mathematics, and Computer Sciences. Thematic analysis revealed a constellation of challenges including linguistic barriers, lack of mentorship, limited access to English-language resources, and difficulties adhering to international publication standards. The findings Indicated that these obstacles significantly Affected the researchers' productivity, confidence, and publication success. Despite these challenges, participants adopted coping strategies such as peer support, translation tools, and informal learning networks. This study Highlighted the urgent need for institutional support systems and targeted language training programs to empower Algerian researchers and facilitate their integration into the global scientific community.

Key words: Scientific Communication, Non-native English Speakers, STEM PhD Researchers, Language Barriers, Academic Publishing.

DEDICATION 1

*A*bove all, my deepest gratitude and praise go to Allah the Almighty, who granted me the patience and strength to undertake this study and reach this milestone. Without His guidance and blessings, this work would never have been accomplished.

I humbly dedicate this work to my **dad**, the best man in this world and my first love, who sacrificed everything to make me the woman *I* am today. *T*hank you for always being there for me.

*T*o my **mom**, the queen of my heart, my best friend, and my everything, for all her encouragement over the years. *T*his thesis is a token of my gratitude for all that you have done for me.

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DEDICATION 2

*With all my heart "**Alhamdulillah.**"*

*All praise and thanks are due to **Allah**, the Most Merciful, the Most Generous the One who gave me strength when I had none, hope when I was tired, and success beyond what I thought I could reach. Without His guidance and mercy, this would not have been possible.*

I dedicate this dissertation to the soul of my beloved father, Manari Abd Elhamid may God have infinite mercy on him. Not a day passes without his memory in my heart. His love, his strength, and his quiet wisdom live on in every part of who I am. This work is a piece of him.

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And finally, I dedicate this to myself and my dream to the girl who dared to hope, who worked late into the night, who doubted and cried but never gave up. This is for her. This is for everything she dreamed of in silence, and for everything she still hopes to become.

AMINA.M

DEDICATION 3

In the name of Allah, the Most Gracious, the Most Merciful.

All praise and gratitude are due to Allah, whose infinite mercy and guidance have granted me the strength and perseverance to complete this work.

*This thesis is dedicated to my beloved **parents,** whose unconditional love, prayers, and sacrifices have been the cornerstone of my achievements.*

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"Indeed, with hardship [will be] ease."

— Surah Ash-Sharh (94:6)

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LIST OF ACRONYMS

STEM: Science, Technology, Engineering, and Maths

BBA: Bordj Bou Arreridj

ELF: English as a Lingua Franca

NS: Native Speakers

NNS: Non-Native Speakers

EIL: English as an International Language

EIntraL: English as an Intranational Language

AW: Academic Writing

APA: American Psychological Association

MLA: Modern Language Association

AMA: American Medical Association

ASA: American Sociological Association

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GENERAL INTRODUCTION

1. Background of the Study

English has become the dominant language for international communication, profoundly twentieth and early twenty-first centuries, it has established itself as the global lingua franca, facilitating communication and collaboration among speakers from diverse linguistic and cultural backgrounds (Canagarajah, 2006; Nickerson, 2013). Within the scientific community, research articles play a pivotal role in sharing knowledge, where successful publication enhances reputation, prestige, peer acceptance, and access to funding, thereby promoting intellectual growth and career advancement. Consequently, writing for publication has become an essential skill for scientists across disciplines and languages. Because writing reflects cultural and linguistic conventions (Kaplan, 1966; Connor, 1996), non-native English-speaking researchers often face significant challenges in mastering academic writing. This makes conducting and publishing scientific research in English both demanding and essential for active participation in the global scientific community.

2. Statement of the Problem

Jobling (2014) reviewed a key resource on writing scientific research articles, underscoring the strategic steps and rigorous structure essential for effective scholarly communication. This systematic approach is particularly critical considering that a variety of researchers, especially those in scientific disciplines who are non-native English speakers, encounter significant challenges with the English language itself. Their lack of proficiency, a challenge often more pronounced for individuals from monolingual countries compared to their bilingual or trilingual counterparts, directly hinders their ability to publish scientific or academic articles.

Mastery of English is crucial for career advancement, job applications, dissertation writing, and ultimately, successful article publication. However, these researchers consistently face obstacles in achieving both the necessary linguistic proficiency and a comprehensive understanding of international publishing standards. This struggle which may ultimately undermine the perceived impact of their valuable research findings, making the systematic guidance highlighted by Jobling's

review all the more pertinent.

3. Research Questions

After clearly defining the research problem, the study's research questions are carefully formulated as follows:

- What challenges do STEM PhD researchers at BBA University face when writing and publishing their research in English?
- How do these challenges affect their research progress and publication success?
- What strategies do STEM PhD researchers use to overcome these challenges?

4. Research Aim and Objectives

This study aims to examine the difficulties faced by STEM PhD researchers at BBA University when conducting and publishing research in English. To achieve this, the following objectives have been established:

- To determine and examine the particular difficulties that BBA University's STEM PhD researchers encounter When writing and publishing their research
- To assess how these difficulties have affected the researchers' publication success and overall research progress
- To investigate the strategies adopted by these researchers to address the difficulties encountered in academic writing and publishing.

5. Significance of the Study

The global scientific and academic landscape is increasingly characterized by English as its undisputed lingua franca. This pervasive dominance means that for researchers world-wide, particularly those aspiring to contribute to and gain recognition within this expansive global dialogue, proficiency in English is not merely advantageous but an indispensable pre-requisite for effective scholarly communication (Jobling, 2014). Indeed, publishing in reputable English-language journals has become a foundational component for career advancement, securing research grants, and establishing academic credibility for scholars and clinicians across disciplines (Vessuri, 2017).

This study holds significant implications for various stakeholders within the Algerian academic landscape and the broader global scientific community. By thoroughly investigating the

specific challenges faced by Algerian STEM PhD researchers in conducting and publishing scientific research in English, this research aims to bridge a critical gap in local knowledge. Understanding these particular obstacles is mandatory, this research serves as a foundational step towards fostering a more supportive and effective environment for Algerian STEM PhD researchers, enabling them to overcome linguistic barriers and contribute more robustly to the global scientific discourse.

6. Research methodology

This study is guided by the interpretive paradigm and adopted a phenomenological research design to investigate the lived experiences of doctoral researchers regarding their challenges of writing and publishing in English. To collect data, in-depth semi-structured interviews were conducted with a sample of 21 PhD researchers in STEM disciplines at BBA university. For sampling technique, purposive sampling was used for selecting doctoral researchers in STEM disciplines from three departments: Science and Technology, Mathematics and Computer Science at BBA university. Thematic analysis was employed to identify recurring themes and patterns, thereby providing a comprehensive understanding of the publication-related difficulties experienced by the participants.

7. Structure of the dissertation

This dissertation is systematically organized into three chapters, each contributing to a comprehensive exploration of the research topic. The study begins with a general introduction that outlines the background and context of the research, articulates the research objectives and questions, and highlights the significance of the study. Additionally, it provides an overview of the research methodology and presents the structure of the dissertation.

The first chapter presents a critical review of the relevant literature divided into two sections. The first section examines existing research on academic scientific writing, particularly for non-native English speakers in STEM fields. The second section, English as the Language of Science, addresses the broader challenges PhD researchers encounter in conducting scientific research and disseminating their findings in English. This includes barriers in publishing, presenting, and communicating their work within the global scientific community. **Chapter two** is dedicated to the practical aspects of the study. It details the research methodology, including research paradigm, design research instruments, sampling technique, data collection procedures, and data analysis methods. This chapter also discusses the strategies employed to maintain the research quality and ethics. **The third chapte**r presents the research

results and findings derived from the research tools. It also discusses these findings in relation to the research questions and objectives.

The dissertation concludes by acknowledging the limitations of the research and offering recommendations for educational practice and future research.

CHAPTER ONE: LITERATURE REVIEW

1. Section One: Academic and Scientific Writing

1.1 Introduction

Scientists and educators increasingly recognize the demand for enhanced STEM (science, technology, engineering, and math) communication skills, particularly in writing. Effective writing is vital not only for disseminating research results and improving policy outcomes but also for engaging with public audiences (Fischhoff, 2013; Kuehne and Olden, 2015). For STEM PhD researchers at BBA University, strong writing skills are essential for the clear communication of complex scientific concepts, leading to impactful insights and scholarly publications (Klein, 2008; Ismail et al., 2018). This proficiency sharpens their analytical thinking and helps address the unique challenges of conducting and publishing research in English. The present chapter provides a comprehensive review of the literature on the development of STEM writing skills among graduate researchers. It begins by defining effective STEM writing and examining its significance within academic and professional contexts. It then highlights common challenges faced by STEM PhD students. Following this, the chapter discusses effective pedagogical approaches, including genre-based instruction and mentorship programs that support the development of writing skills. Lastly, it identifies gaps in existing research, especially the lack of studies focused on diverse educational contexts like BBA University, which this study aims to address.

1.2 Definition of Writing

Writing is fundamentally the process of representing language through visible symbols to communicate thoughts, ideas, or information. Lado (1971) defines writing as "a graphic representation of a language and information through the written medium by the use of conventional graphemes" (as cited in Ahmed, 2019, p. 120). This definition emphasizes the symbolic nature of writing as a system that visually encodes language. However, writing extends beyond mere transcription; it is a complex cognitive activity. White and Arndt (1991) highlight that writing requires intellectual effort, involving idea generation, planning, goal setting, monitoring, and evaluating both what is to be written and what has been written to ensure clarity and precision of meaning. Similarly, Nunan (2003, p. 88) describes writing as a mental process that includes organizing ideas into coherent statements and paragraphs that

readers can easily understand. Thus, writing is not simply a mechanical skill but a thoughtful and purposeful act that enables individuals to express and share their understanding within specific contexts.

Within the broader field of writing, scientific writing represents a specialized form of academic writing. It plays a critical role in clearly articulating observations, methodologies, and solutions in research (Bahar, 2014). Scientific writing adheres to strict conventions that promote clarity, precision, and objectivity, ensuring that research findings are accessible and comprehensible to the intended academic audience. Mastery of both academic and scientific writing is therefore essential for researchers to effectively communicate their work and contribute meaningfully to their disciplines.

1.3 Definition of academic Writing

Academic writing is a valuable skill that bolsters professional qualifications, especially at the tertiary level, where it can be demanding. It is defined in the dictionary as any written work such as essays, theses, reports, or journal articles aimed at educating the reader or achieving a scholarly goal for the writer. Essentially, academic writing encompasses all writing done to meet school or university requirements (Bourekkache, 2022).

In order to give an accurate definition of the term academic writing, many efforts have been made by scholars. These definitions differ in accordance with the context in which they are delivered. Murray (2008) claims that " “Academic writing is that set of conventions we see in a thesis or a published paper in our disciplines, a definition that becomes more precise once you scrutinize examples of published writing in your target journal.” Similarly, Hartley offers an academic perspective, stating that "academic writing is a style of communication that researchers employ to delineate the intellectual boundaries of their fields and their particular areas of expertise" (Hartley, 2008). Therefore, researchers utilize academic writing to effectively present their scientific contributions.

From theses previous definitions, academic is the formal writing used in college and university-level courses, serving as the primary communication medium among scholars in various disciplines (Johnson, 2016; Greene & Lidinsky, 2015), as it requires a set of conventions to be followed such as in thesis, dissertations, research papers and articles.

As noted by Maulana Azad National Urdu University (2024), it is essential for researchers and scholars to convey their ideas, research findings, and analyses within the academic community, fulfilling crucial purposes in educational settings, such as:

Formal Presentation: Academic writing adheres to a formal style, employing precise language and specific terminology, which facilitates the clear and professional communication of information.

Objectivity and Impersonality: Authors are expected to maintain an objective and impartial tone, with an emphasis on presenting evidence and logical arguments rather than personal opinions or emotive language.

Audience Awareness: Writers of academic content are cognizant of their audience, typically fellow scholars, researchers, or students and tailor their writing to meet the expectations and standards of the academic community.

1.4 Features of academic writing

Scholars interpret academic writing (AW) in various ways depending on its characteristics. For instance, Osmond (2016) contended that AW reflects writers' deep knowledge, critical thinking, and analytical abilities as they engage with diverse academic subjects within their fields of study. Additionally, AW is viewed as a form of inquiry, enabling writers to uncover their values, beliefs, strengths, and areas for development in their writing (Starkey, 2015).

Johnson (2016) noted that academic writing (AW) possesses three key characteristics, stating that it "is an art, a science, and a craft" (p. xi).

1.4.1 Academic Writing as an Art

AW is considered an art because it allows writers to express their unique ideas and thoughts. There is no one-size-fits-all method or technique that suits every academic writer, as their writing skills vary (Johnson, 2016; Singh & Lucarelli, 2017). Consequently, each academic writer identifies individual strategies and techniques that effectively enhance their writing and communicate their ideas, thoughts, and messages to their intended audience.

1.4.2 Academic Writing as a Science

Johnson (2016) and Lester and Lester (2012) argued that AW is considered a science because writers adhere to specific styles for citing sources and formatting academic texts. Various academic disciplines and programs employ different citation styles and formats in higher education. The American Psychological Association (APA) and Modern Language Association (MLA) are two of the most commonly used citation styles globally. For instance, APA style is typically utilized in the social sciences, while MLA style is preferred in literature, arts, and humanities. Similarly, the American Medical Association (AMA) style is applied in medicine, health, and biological sciences, whereas Chicago and American Sociological Association (ASA) styles are used in sociology, geography, and history (Johnson, 2016).

1.4.3 Academic Writing as a Craft

Johnson (2016) argued that AW is understood as a craft, referring to the skill set that enables writers to create texts suitable for academic contexts. Academic writers continuously develop their skills throughout their academic careers, as mastering this craft is challenging with limited exposure. Instead, they enhance their writing abilities through constant practice, critical thinking, seeking feedback, and revising their work multiple times.

In the current context, AW is perceived more broadly than in the past. It is seen as a social practice informed by the diverse social and cultural values of academic institutions. In higher education, AW has evolved into "a peer-to-peer communication about knowledge and inquiry within research communities…. [It is] scholarly writing, the research genres and writing in the disciplines" (Giltrow et al., 2014, p. 313). Furthermore, AW serves as a medium of communication among members of a discourse community a group of individuals who share similar social values, beliefs, specialized knowledge, and language use (Giltrow et al., 2014).

1.5 Definition of scientific writing

Scientific writing is a specific type of academic writing characterized by distinct methodologies and conventions that set it apart from other writing forms. Researchers in scientific disciplines produce papers and articles to share their studies, contributions, and ideas with fellow scientists. To achieve clarity and effectiveness in writing, scholars must follow guidelines that ensure their work is comprehensible to the intended audience (Tanti, 2014).

According to Tanti (2014), scientific writing is vital for cultivating academic and communication skills among emerging researchers. These individuals improve their writing proficiency through activities such as writing, reading, listening, engaging in discussions, giving and receiving feedback, and self-reflection. Unlike other forms of academic writing, scientific writing follows a strict structure and is characterized by qualities such as accuracy, specificity, conciseness, clarity, caution, and objectivity (Aliotta, 2018), which are essential for effective communication within the scientific community.

In addition, Gastel and Day (2016) describe scientific writing as the documentation of original research in journals that adheres to a standardized format. However, it also includes a broader spectrum of scientific communication, encompassing review papers that synthesize existing studies, as well as various professional communication forms like grant proposals, oral presentations, and poster sessions. Moreover, it extends to public communication, commonly referred to as science writing.

Scientific writing aims to convey scientific information to peers, grounded in rigorous scientific methods that demand precision consistent with the research process (Mugah, 2019). Each assertion made must be supported by evidence and properly cited (Hofmann, 2017). This writing style is crucial for documenting original research findings, emphasizing clear and concise communication while avoiding unnecessarily complex or ambiguous language. Additionally, scientific writing enables researchers to publish their findings in journals or other media that comply with international writing standards. Peats (2002) offers an intriguing perspective, stating that "scientific writing is a well-defined technique rather than a creative art," highlighting three key aspects of effective scientific writing: thought, structure, and style (p. 08).

1.6 Characteristics of Scientific Writing

Osvaldo et al. (2014) assert that scientific writing is fundamental to research, concentrating on specific areas and serving as a nucleus for disseminating new findings. It adheres to a systematic structure, employs particular language styles, and allows for creativity in presenting ideas. Moreover, it provides clear guidelines for the content of each section, thereby enhancing the clarity and consistency of research communication.

The main characteristics of scientific discourse are outlined by Tahan (2022):

1.6.1 Impersonal: To enhance credibility and convey objectivity, it avoids the use of first-person pronouns.

1.6.2 Objective: It refrains from personal opinions and subjective elements, focusing instead on observations derived from scientific tests.

1.6.3 Concise: Scientists express their ideas using only the necessary number of words, ensuring clarity and directness.

1.7 Conclusion

As the demand for effective communication in STEM fields continues to grow, the importance of strong writing skills for STEM PhD researchers at BBA University cannot be overstated. Writing serves as a critical tool not only for clearly conveying complex scientific concepts but also for disseminating research findings to diverse audiences, including policymakers and the general public. This chapter has highlighted that academic writing is characterized by its formal structure, objectivity, and audience awareness, while scientific writing emphasizes clarity, precision, and systematic documentation. Recognizing academic writing as both an art and a craft empowers researchers to develop their unique voices within established conventions. By honing these skills, emerging scientists enhance their ability to engage with the academic community, contribute to knowledge advancement, and foster meaningful dialogue between science and society. Ultimately, strengthening STEM communication through writing is essential for bridging gaps between researchers and the public, supporting informed decision-making, and promoting broader understanding of scientific developments.

2. Section Two: English as the Language of Science

In today's globalized academic world, English serves as the dominant language of scientific communication, creating challenges for non-native speakers, this study specifically explores the difficulties faced by Algerian STEM PhD researchers in conducting and publishing scientific research in English, emphasizing the role of English as a Lingua Franca (ELF) and identifying potential solutions to support these researchers. Despite producing high-quality research, these individuals often encounter obstacles related to writing, publishing, and accessing prestigious journals due to language barriers. The requirement to publish in English imposes additional pressure on researchers, necessitating the development of advanced academic writing skills, especially in competition with native English speakers. This study explores these challenges in two parts: first, the difficulties encountered during the research process, such as linguistic barriers, cultural factors, and lack of support; and second, the obstacles faced during publication, including journal selection, high rejection rates, and the need for extensive language editing (Ghounane, 2022).

In 1967, English was recognized as the language of international science (Gordin, 2015), and it continues to dominate global scientific activities to this day. Throughout history, various languages have served as the primary medium for scientific communication, including Sumerian, Greek, Arabic, and Latin (Hamel, 2007). The Scientific Revolution of the 16th to 18th centuries, often associated with Nicolaus Copernicus, marked a significant shift in scientific discourse. Copernicus, writing in Latin, challenged the geocentric model of the universe in De revolutionibus orbium coelestium (1543), demonstrating the role of Latin as the dominant scholarly language at the time.

Subsequent advancements in mathematics, chemistry, human physiology, and physics necessitated efficient communication channels. The establishment of the Philosophical Transactions of the Royal Society of London in 1660 provided a formal outlet for disseminating scientific knowledge, primarily in English but not exclusively (Kaplan, 2001). By the early 20th century, French, German, Russian, and English were widely used in scientific publications, with multilingual conferences being standard practice. German maintained its dominance, particularly in medicine, biology, and chemistry, from 1900 to 1920 (Hamel, 2007). However, its role declined after World War I due to restrictions on its use in international scientific forums (Ammon, 2001).

The increasing dominance of English in scientific literature emerged as German's influence declined, aligning with the growing prominence of American scientific research. Several factors contributed to this

shift. The post-World War II period saw the preservation of the American scientific and educational infrastructure, while much of Europe faced significant destruction (Kaplan, 2001). Additionally, the migration of European scientists to the United States and substantial Cold War-era investments in scientific research further solidified English as the leading language in scientific communication (Ferguson, 2007). The dominance of English in scientific research is largely attributed to its role as the primary language of high-impact academic publishing. The proliferation of English as the global academic language has been reinforced by the increasing reliance of universities on bibliometric indicators, such as citation counts and impact factors, to evaluate research output (Flowerdew, 2008). Currently, approximately 98% of scientific publications are produced in English, including those authored by researchers from English as a Foreign Language (EFL) background (Ramírez-Castañeda, 2021). This linguistic hegemony not only facilitates interdisciplinary collaboration but also standardizes scientific communication, ensuring the accessibility and dissemination of knowledge on a global scale.

2.1 The Role of English as a Lingua Franca in Scientific Research

English, as a global lingua franca (ELF), has been extensively examined in applied linguistics and socio linguistics since the 1990s. Defined as a mode of communication between speakers of different first languages, ELF encompasses both native (NS) and non-native speakers (NNS) of English (Jenkins, 2007). Research in this field emphasizes communicative success through shared strategies, collaborative engagement, and the flexible deployment of linguistic resources (Hall, 2018), thereby highlighting the adaptability of English in facilitating communication across diverse linguistic backgrounds.

The application of ELF in academic and scientific contexts, however, presents distinct challenges, particularly for non-native English-speaking researchers. Scholars such as Seidlhofer (2011) and Mauranen (2018) have conceptualized ELF as a contact language, functioning as a medium for intercultural discourse among speakers of different linguistic origins. Seidlhofer (2011) distinguishes ELF from historical lingua francas, such as Latin and French, asserting that English serves as a dynamic and inclusive medium of communication that does not exclude native English speakers from intercultural exchanges. Mauranen (2018) reinforces this perspective by defining ELF as a communicative tool that, when employed by at least one party as a second language, facilitates academic engagement across linguistic boundaries.

Given the prevalence of ELF in cross-national academic discourse, scholars have debated its overlap with English as an International Language (EIL), with some considering the terms interchangeable (Kirkpatrick, 2007; Rubdy & Saraceni, 2006). However, this conflation has been critiqued for overlooking the distinction between ELF's international and intranational functions. To address this, Firth (1990) and Matsuda and Friedrich (2010) delineate ELF into two subcategories: EIL (English as an international language) and EIntraL (English as an intranational language). While EIL pertains to cross-border communication, such as scientific conferences and international journal publications, EIntraL refers to the use of English within multilingual nations, as exemplified by communication between Hindi and Punjabi speakers in legal and educational settings in India (Matsuda & Friedrich, 2010). This distinction is crucial in scientific discourse, where ELF operates across multiple registers, from international academic exchanges to laboratory discussions in linguistically diverse research institutions.

Furthermore, the integration of English into higher education and academic publishing underscores its significance as a gatekeeping mechanism for professional advancement. The majority of scholarly resources, including textbooks, research articles, and technological materials, are exclusively available in English, reinforcing its necessity for academic success. The expectation for researchers to publish in internationally recognized English-language journals has intensified with the globalization and marketization of academia, further entrenching English as the de facto medium of scientific exchange (Flowerdew, 2008). As a result, proficiency in academic English has become a prerequisite for scholarly engagement, shaping the trajectory of scientific research and the career progression of researchers worldwide.

This widespread adoption of English, while facilitating international academic collaboration, simultaneously presents challenges for non-native researchers, particularly in STEM disciplines. Algerian STEM PhD students at BBA University, for example, encounter significant obstacles in navigating the complexities of academic writing and publishing. These challenges stem from linguistic barriers, disparities in access to high-impact journals, and the broader implications of linguistic hegemony in academia. Thus, while ELF functions as an inclusive medium for global scientific discourse, its impact remains asymmetrical, disproportionately benefiting native English speakers and institutions from Anglophone countries.

2.2 English Language and Its Impact on Research Quality

English serves as the primary academic language, enhancing the international mobility of emerging researchers (Graddol, 2006). As the dominant language of numerous prestigious scholarly journals, English has become indispensable for academic discourse. Effective academic writing is characterized by complexity, formality, objectivity, precision, and structured argumentation. It requires clarity and coherence while maintaining a balance between confidence and caution (Glatt horn, 1998). The prominence of English in academia extends beyond scholarly publishing, as it is now a critical tool for both academic and professional advancement. Recognized as the most essential language for an increasingly globalized and mobile academic community, English has also solidified its status as the lingua franca of business and scientific communication (Schütz, 2005). Consequently, its widespread adoption continues to facilitate knowledge exchange, collaboration, and the professional development of researchers across international borders.

The widespread dominance of English in academic and research settings is the result of multiple interrelated factors. A primary reason is that the majority of highly esteemed scientific journals are published in English, making proficiency in the language essential for scholars seeking international recognition. This linguistic hegemony is further reinforced by the prominence of leading universities and research institutions located in English-speaking countries, which serve as hubs for academic excellence and innovation. The pervasive use of English extends to international conferences and academic forums, where researchers from diverse linguistic backgrounds converge to exchange ideas and collaborate. The adoption of a standardized language in these contexts ensures clarity, facilitates effective communication, and enhances the dissemination of scientific knowledge. (Rao, Rao, & Kumar, 2025)

A significant barrier to academic publication is the inadequate proficiency of many researchers in English, particularly in terms of technical vocabulary, terminology, and syntactic structures. Scientific writing necessitates clarity, conciseness, accuracy, and precision to enhance reader comprehension. Unlike informal discourse, academic English avoids colloquial expressions, idiomatic phrases, slang, and journalistic styles, instead favoring a formal and structured approach to communication. The ability to articulate research findings in precise academic language is crucial for publication success, as linguistic limitations often contribute to manuscript rejection. (Rao & Kumar, 2025)

English has become an indispensable tool in both academic and professional domains, solidifying its position as the global lingua franca in commerce and scientific research (Schütz, 2005; as cited by CS Rao, 2018). Given its international reach, English proficiency is increasingly recognized as a prerequisite for engaging with the global academic community. The standardization of English as the primary academic language facilitates the mobility of early-career researchers, enabling them to pursue educational and professional opportunities across borders (Graddol, 2006; as cited by CS Rao, 2018). Consequently, the widespread adoption of English in scholarly communication continues to shape the trajectory of global research, ensuring accessibility and coherence within the international scientific community.

2.3 Challenges in Conducting Scientific Research in English

2.3.1 Linguistic barriers

English is unequivocally the preeminent global language, ranking as the second most widely spoken native language and serving as the official language in 70 nations. Moreover, countries where English is predominantly spoken contribute approximately 40% to the global Gross National Product (Torres, 2015).

Chamot (2004) further addressed pertinent language issues in the context of research and pedagogy. His findings underscore that language significantly influences learning strategies, encompassing the identification of learning procedures, the terminology used, and the classification of how learner characteristics affect strategy utilization. Additionally, he highlighted the impact of cultural and contextual factors on strategy application, the necessity for explicit and integrated strategy instruction, the language of instruction, the transfer of strategies to novel tasks, and frameworks for language learning strategy instruction.

The study "Is English Language a Barrier in Research Productivity Among Information Professionals?" revealed that English serves as a significant barrier to research productivity among information professionals in Pakistan. Respondents acknowledged the need for training in reading, writing, speaking, and listening skills, believing that improved proficiency would enhance their research output. Notably, the study found demographic differences in perceptions of language barriers, with female respondents viewing English as a greater obstacle compared to their male counterparts. Additionally, collaboration with English language experts was deemed beneficial for bridging these gaps. The findings underscore the necessity of integrating English language training into the curricula for information professionals to boost their research capabilities (Tariq, Ahmad, & Rehman, 2016).

2.3.2 Cultural Factor

Cultural challenges have been extensively examined in academic research, particularly in relation to their impact on communication, social integration, and organizational dynamics. Studies indicate that cultural differences influence individuals' cognitive frameworks, shaping their perceptions, behaviors, and interactions (Hofstede, 2001). Such disparities often manifest in misunderstandings, value conflicts, and difficulties in adapting to unfamiliar social norms, which can hinder collaboration and cohesion in diverse settings (Trompenaars & Hampden-Turner, 2012). Furthermore, research highlights the role of cultural biases and ethnocentrism in reinforcing stereotypes, limiting cross-cultural engagement, and impeding knowledge exchange (Triandis, 1995). Addressing these challenges requires a research-based approach that emphasizes intercultural competence, cultural intelligence, and adaptive strategies to foster inclusivity and effective communication (Gudykunst, 2005). As globalization accelerates, scholarly inquiry continues to explore frameworks for mitigating cultural barriers and promoting intercultural understanding in various disciplines.

2.3.3 Lack of Mentorship and Guidance

The concept of research mentorship remains without a universally accepted definition, and its scope, along with the roles of those involved, has yet to be clearly established (Abedin et al., 2012). Within the biological and social sciences, much of the literature on research mentorship focuses on procedural aspects, such as selecting mentors, as well as structural considerations (Steiner, 2014). Some studies have framed research mentorship around key themes, including the development of research skills, academic productivity, and career advancement (Ragsdale, Vaughn, & Klein, 2014). Keyser and colleagues define research mentorship as the process of effectively passing down the values, standards, and practices of scientific research from one generation to the next (Keyser, Abedin, Schiltz, & Pincus, 2012). Expanding on these perspectives, research mentorship can be understood as a collaborative relationship between a seasoned mentor and a mentee, aimed at providing career guidance in a unidirectional manner while also fostering mutual professional growth. This professional development includes improving research and networking skills, gaining experience in presentations and publications, and receiving support in conceptualizing, executing, and troubleshooting research projects.

2.4 Challenges in Publishing Scientific Research in English

The landscape of scholarly publications by academicians is shaped by the increasing global competition for academic excellence (Flowerdew, 2015). Publishing in reputable international journals

is a crucial component of doctoral students. It plays a key role in enhancing research quality by evaluating the significance, accuracy, and rigour of findings through academic peer-review processes (Badley,2009; Aitchison et al.;2010). Many universities worldwide, now require publishing articles in peer- reviewed academic journals as a graduation criterion for doctoral programs. This initiative is founded on the concept that higher education serves as leading centres of knowledge, responsible for generating ,assessing, and disseminating knowledge to society (Sheehy,2022).Publishing in well-regarded journals is highly competitive, with high standards for quality and impactful research(Chien,2019).However, publishing in English -language academic journals is challenging ,especially for non-native speakers who face additional challenges in meeting the rigorous language standards. These challenges may include: Journal selection, rejection rates, adherence to submission guidelines and language and editing issues. Due to the new trends, research for publication has, now become a sign of the quest for world-class universities and the essential need for quality assurance in higher education(Lei,2019).

2.4.1 Journal selection

The process of selecting the right journal is a crucial step in scholarly publishing, particularly for doctoral researchers. Among the different types of academic publications, a peer –reviewed journal article is highly regarded due to its significant visibility, credibility, and prestige. Articles published in international journal, especially those accessible electronically, are frequently referenced and widely read.

The primary motivation for scholars to publish should be to contribute to the advancement of scientific knowledge in their field or to improve professional practices by sharing research findings or experiences with peers. Publishing in journals indexed in international databases facilitates reaching the intended audience connecting with networks or groups sharing similar interests, and increasing the likelihood of being cited more frequently (Thompson,2007).

Belcher (2009) contends that while targeting high – ranking journals may seem attractive, it is not always the best approach for every researcher. Instead, she underscores the importance of selecting the appropriate journal at the outset of the research process. This selection should take into account various factors, including the journal's focus, target audience, and specific submission requirements. By identifying a target journal at the beginning, authors can tailor their research to align with the journal's expectation, thereby increasing the chances of acceptance.

Moreover, while it is important to consider a journal's impact and reputation within the filed, this should not overshadow the relevance of the research topic to the journal's aims. A manuscript that closely matches the journal's interest is more likely to engage its readership and editorial team, resulting in a more favorable review process. The quality of research publications has increasingly become a key metric for evaluating the performance of both individuals and institutions (Guerin, 2016).

This growing emphasis on publication output plays a significant role in how academic success is measured. Despite its critical role in equipping doctoral students for research careers, the "publish or no degree" has frequently been identified in academic studies (e.g. Lei,2021; Li,2016; Robins &Kanowski,2008), as an additional burden for students. This policy exacerbates the already considerable challenges of doctoral studies as highlighted by Schmidt and Hansson (2018), making an arduous journey even more difficult. PhD researchers 'lack of prior experience in publication, even in local journals, makes the choice of a suitable journal a sustainable obstacle. The pressure to publish academic work before defending a thesis, combined with inadequate English writing skills, drives some students to submit their research to predatory journals. These journals often target inexperienced researchers and exploit the high pressure they face, as well as their limited research skills and perceived bias from Western journals (Xia et al.,2014).

Factors to consider when seeking a scholarly publication for a research.First,reputation of the journal: When deciding where to submit your scholarship, the journal's reputation plays a crucial role and to assess the quality of a journal's reputation ,several methods can be employed(Jones,2021).Second ,review both national and international journals that fit the content and the discipline you are investigating .Third, review the guidelines for submission including aims, scope of the journal, audience of publication ,and word count. According to Xia et al.2015), there has been a notable rise in Open Access journals(OA) over the past few years. This growth has led to a shift away from traditional publishing practices, opening new avenues for academic examination and publication. However, the proliferation of OA journals has often been accompanied by issues of transparency with a failure to disclose their editorial boards. Moreover, several of these journals impose substantial fees on authorship, often prioritizing rapid profit over rigorous peer review. It is essential for academics to remain vigilant and critically evaluate any publication that requests payment for submission. Generally, reputable academic journals do not require authors to pay for publication. Another important factor that early-career researchers should take into consideration is the Journal Ranks. Academic journals typically undergo ranking based on bibliometric analyses and specific

algorithms aimed at assessing their influence. Generally, a journal's impacts are gauged by its ranking; higher-ranked are considered more credible and trustworthy. The soundness, ethical integrity and innovative nature of a journal also contribute to its reputation. Furthermore, peer review is a crucial mechanism that supports the integrity of scholarly work, serving as a key method to maintain public trust in these publications (Brembs et al.,2013). The impact factor is another important factor new publishers have to take into account. The journal's impact factor is determined by taking the total number of citations in a year and dividing it by the count of articles published in the previous two years.

This metric reflects the extent to which the journal 's research is being shared within the academic community(Jones,2021).

2.4.2 Rejection Rates

The publication process plays a pivotal role in research by ensuring the dissemination of findings and amplifying the impact of a study beyond its completion.

Despite its importance only a fraction of researchers publish their work due to various obstacles(Masango,2015).Research indicates that 62% of submitted papers are rejected by at least one journal prior to eventual publication(Hall &Wilcox,2007).Ethical considerations such as fraudulent practices ,intetellectual property misuse and plagiarism are closely related to these challenges(Babalola et al.,2012).Regardless of whether the publication originates from local or international institutions ,its significance lies in legitimizing and validating an article's reliability within its field(Hausmann &Murphy,2016;Pho&Tran,2016).

The rejection of academic papers plays a significant and essential role in scholarly writing (Krausman,2020) as it helps authors refine and improve their research manuscripts to align with the norms of academic publication. Numerous factors contribute to the rejection of scholarly papers. Previous researchers like Khadilkar (2018) and Krausman (2020) have identified several of these elements. The imperative to publish scholarly articles in academic institutions, often summed up by the saying ''Publish or perish'' has intensified due to the growing emphasis on rankings and bibliometrics. This pressure has led to proliferation of unethical academic writing practices that compromise research integrity such as plagiarism, duplicate publication and data falsification. These are various reasons for paper rejection including the scholarly failure to follow journal guidelines, lack of novelty or originality, poor presentation, questionable methodology and lack of interpretation. Moreover, it has been observed that exaggeration of

research implications, inadequate academic writing competencies and insufficient mastery of the language and grammar are significant factors contributing to the failure in the publication process(Khadilkar,2018). While rejection can demoralize authors universally, it tends to have an especially profound effect on novice researchers, for whom the repercussions of rejection may be excessively discouraging(Gopaldas,2016).

The role of English language skills in acceptance of articles for publication: The readership of English –language journals is substantial, underscoring the significance of English proficiency in academic writing. As English is not the native language for many scholars, producing error-free manuscripts in terms of grammatical mistakes is important. In 2015, approximately seven percent of submitted manuscripts were rejected due to inadequate English expression (Griffiths &Norman,2016). To mitigate such rejections, some researchers suggest utilizing professional language editing services prior to submission (Ahlstorm,2012). Edanz and Tang (2016) also emphasized this point, highlighting the crucial role of editing service providers in the publication process.

STEM PhD researchers at Elbachir Alibrahimi University encounter significant challenges in publishing their research in English and participating in scientific conferences that demand a high level of English proficiency. This is largely due to the prevalence of French as the second language in Algeria' educational system. Moreover, the tendency to directly translate from Arabic or French often results in inappropriate vocabulary choices, which can lead to paper rejection. The writing process presents significant challenges for individuals who lack regular practice, as noted by Powell (2012). This is particularly pertinent for non-native English speakers, who often face difficulties in expressing their ideas clearly and accurately due to limitations in language proficiency and stylistic conventions.

2.4.3 Adhering to submission guidelines

Researchers strive to publish in top-tier journals due to the prestige and impact these publications offer. They serve as benchmarks of excellence and conduits for disseminating ground-breaking research globally (Kurambayev &Freedman,2021;Newell et al .,2022).However ,the quest is challenging due to increased competition and rigorous scrutiny (Petousi &Sifakri,2020;Soliman et al.,2021).The process involves meticulous manuscript preparation ,navigating online systems and engaging with peer feedback (Albanna et al.,2021).Compliance with journal guidelines is essential to rigorously adhere to the specific guidelines set forth by the target journal. This includes meticulous attention to prescribed formatting, citation style and word limits. Failure to comply with these requirements can lead to delays or potential

rejection during the review process. Submitting a manuscript to a leading academic journal represents a critical milestone in the pursuit of publication. Researchers must navigate this phase with great care, ensuring that their work aligns effectively with the standards and expectations of the selected journal (Beck et al.,2021). Novice PhD researchers in STEM fields often struggle with adhering to submission guidelines while also navigating ethical considerations and strict adherence to ethical standards to maintain research credibility. Researchers must meticulously review and follow the specific guidelines provided by their target journal, often found under ''Author Instruction'' or similar sections on the journal's website (Kurambayev &Freedman,2021; Newell et al.,2022).

2.4.4 Language and editing issues

Researchers from non-English speaking countries often face the necessity of writing and publishing their work in English especially the PhD students as part of their doctoral thesis. Language accessibility is crucial for the transfer of knowledge and information especially in the realm of academic publishing. Amano, Gonzalez-Varo, and Sutherland (2016) highlight that language barriers can hinder effective information exchange. Scholars like Hyland (2016) contend that those who advocate for language privilege inadvertently create divisions between native and non-native English speakers. He argues that an emphasis on language limitations can lead non-native authors to perceive bias rather than constructive feedback, which may discourage them from writing. Hyland (2016) also points out that claims of linguistic privilege overlook the challenges faced by native English-speaking academics in the publishing process. In contrast, Polizer-Ahles et al. (2016) assert that language privilege does exist in academic publishing. They acknowledge that while English serves as a universal academic language, non-native speakers face distinct disadvantages that must be recognized.

Harboard (2018) emphasizes that the trend of disengagement among the English-speaking (L2) academic elite from national scientific communities is influenced by various factors that deter publishing in local languages. Publishing in English allows researchers to connect with broader and more proficient professional audience as well as to gain career advantages for non –Anglophone scholars. Conversely, publishing in local languages is often perceived as being on the fringes of the scientific community. As a result, English has come to represent the pinnacle of global scientific discourse.

Scholars with English as an Additional Language (EAL)face significant challenges when publishing in international journals, as noted by Flowerdew & Ho Wang (2016). These authors identified key non- standard features in texts by EAL writers who are not proficient in English, leading to both minor and major revisions. Minor corrections typically involve surface –level issues such as determiners, singular/plural forms, punctuation, spelling errors, and verb forms.

Major revisions, however require more substantial changes at the word and morpheme levels, including additions, deletions, and rearrangements of clauses, prepositional groups, and other grammatical elements to clarify meaning (Flowerdew & Ho Wang, 2016). Joining the global English-speaking scholarly writing community necessitates significant effort and expertise. Novice PhD researchers often find themselves on the periphery of this communities, and in some cases , they may remain there indefinitely , rather than fully integrating into the core of global science (Cheung, 2010).It is only after they have become acquainted with the conventions of this discourse community that non – Anglophone academics may have the opportunity to participate .However, it is important to note that proficiency in the appropriate English discourse serves merely as an entry point and does not guarantee publication or citations on an international scale.Praveen et al. (2022) noted that each journal has its own set of guidelines, which can complicate the submission and publication process for researchers. Achieving consistency among the guidelines of different journals would facilitate the review process for articles that have been rejected. The researchers have the option to submit their article to a different journal (Praveen et al.,2022). Chang and Su (2022) highlighted that researchers from non-English speaking countries often face challenges related to language and the type of publication. The diversity across academic disciplines contributes to variations in journal guidelines and the need for language standardization.Garcia-Costa et al. (2022) established that peer review plays an essential role in enhancing the quality of academic papers .Reviewers meticulously evaluate the methodology ,analysis and results actions which are critical components of scientific research.Notably,quantitative articles tend to experience higher rejection rate compared to qualitative studies conducted by novice researchers.

According to According to Simon et al. (2020), the process of publishing an article demands considerable effort and consistency, highlighting the importance of understanding both the writing and publication processes. Mulyatiningsih and Sugiyono (2020) further emphasize that students and teachers often find research paper writing unenjoyable due to a lack of awareness regarding the significance of research papers in their fields. Kurt (2018) suggest that adequate training in research methodology and

journal selection can enhance the capabilities of researchers in both developing and developed countries. Additionally, while publishing in reputable journals can elevate a writer's status

within the academic community, Kurt (2018) cautions that the presence of articles on Google Scholar does not guarantee their quality. Moreover, Simon et al. (2020) note that rejection from journals does not necessarily reflect the quality of an article; rather it is crucial to consider feedback and resubmit to a more suitable journal.

2.5 Conclusion

Academic and scientific writing are essential for effectively communicating research findings, particularly for STEM PhD researchers that emphasize clarity, precision and adherence to established conventions. It serves as a fundamental tool for scholarly exchange, requiring critical thinking and analytical depth. Scientific writing adheres to a rigorous methodological framework to ensure precision, objectivity, and reproducibility. By emphasizing clarity, conciseness, and logical structure, it facilitates the communication of complex research to both academic and professional audiences. Proficiency in these skills enables researchers to contribute effectively to their fields, foster scholarly discourse, and bridge the gap between theoretical inquiry and practical application.in global communication

The dominance of English, while facilitating discourse, exacerbates inequalities within scientific publishing. This phenomenon predominantly favours native speakers and well- resourced institutions, thereby marginalizing non-native researchers. To rectify these disparities, it is imperative to enhance support mechanisms for non-native scholars through targeted language training, editorial assistance, and the implementation of inclusive publication policies.

In summary, while the dominance of English undoubtedly facilitates global commination simultaneously perpetuates systemic inequalities within the realm of scientific publishing. This dynamic disproportionately favours native English speakers and well-resourced institutions, thereby limiting the opportunities available to non-native scholars. This support should encompass comprehensive language. training, editorial assistance, and inclusive publication policies aimed at fostering equitable participation in global scientific discourse. Ultimately, such measures are essential not only for advancing scholarly contributions from diverse linguistic background but also for enriching the global knowledge landscape as a whole.

CHAPTER TWO: METHODOLOGY

1. Introduction

Exploring the multifaceted challenges faced by Algerian doctoral researchers in conducting and publishing scientific work in English, especially within STEM fields at BBA University, requires a carefully structured methodological approach. This section presents the research paradigm, along with the design, methodology, data collection and analysis procedures, selected techniques, quality assurance measures, and ethical considerations. This comprehensive methodological framework allows readers to assess the thoroughness and reliability of the study's results.

2. Research Questions and Objectives

The fundamental objective of this study is to examine the obstacles encountered by Algerian PhD researchers, particularly STEM candidates at BBA University, in conducting and publishing scientific research in English. To achieve this aim, the following three central research questions guide the investigation:

1. What challenges do STEM PhD researchers at BBA University face when writing and publishing their research in English?

How do these challenges affect their research progress and publication success?

2. What strategies do STEM PhD researchers use to overcome these challenges?

Based on the research questions, this study intends to achieve the following objectives:

1. To determine and examine the particular difficulties that BBA University's STEM PhD researchers encounter When writing and publishing their research
2. To assess how these difficulties have affected the researchers' publication success and overall research progress
3. To investigate the strategies adopted by these researchers to address the difficulties encountered in academic writing and publishing.

3. Research Paradigm

Theoretical frameworks serve as lenses through which researchers interpret data and develop hypotheses or propositions (Kivunja, 2018; Osanloo & Grant, 2016). The choice of theory significantly influences research outcomes by shaping how observations and experiences are understood (Elliott & Higgins, 2012; Rogers, 2016). Thus, selecting a suitable theoretical framework is vital for any social science project, as it enhances comprehension of complex issues and supports the design of effective research strategies (Angeles et al., 2014).

A paradigm is not merely a methodology but a guiding philosophy that shapes the entire research process. It represents the way researchers comprehend and investigate reality (Rehman & Alharthi, 2016), providing a framework that directs both research and practice within a specific field (Willis, Jost, & Nilakanta, 2007). Acting as a lens, the paradigm enables researchers to view and make sense of the world around them (Shek & Wu, 2018). Importantly, the choice of paradigm, together with the research questions posed, fundamentally influences the methods of data collection and analysis that are most appropriate for a given study (Mackenzie & Knipe, 2006).

The selected paradigm should guide the selection of the research methodology. It is important for the quality of the process that there is coherence throughout the research between the paradigm and meth od. (Creswell & Clark, 2007). In this study, the interpretivist paradigm was selected to provide a foundation for exploring the research phenomenon.

The interpretivist paradigm is a way of understanding the world that emphasizes the role of interpretation in understanding reality. This paradigm has its roots in Edmund Husserl's phenomenological theory, which focuses on the study of human consciousness and self-awareness (Chilisa and Kawulich, 2012). The interpretivist paradigm posits that there is no single objective reality, but instead that our understanding of reality is shaped by our individual perspectives (Tuli, 2010). This means that reality is not fixed or the same for everyone. Instead, people understand and experience reality differently based on their own viewpoints and backgrounds. Interpretivism is a "response to the over-dominance of positivism" (Grix, 2004, p. 82).

Interpretivism rejects the notion that a single, verifiable reality exists independent of our senses. According to Grix (2004), "researchers are inextricably part of the social reality being researched, i.e. they are not 'detached' from the subject they are studying" (p.83).

4. Research Approach

There are several ways to examine and explain a study, typically based on the use of numbers, descriptive narrative, or a combination of both. These research approaches are known as quantitative, qualitative, and mixed methods. Quantitative research relies on numerical data and statistical analysis, while qualitative research focuses on descriptive, non-numerical insights to explore meanings, experiences, or concepts. Mixed methods, on the other hand, combine elements of both approaches to provide a more comprehensive understanding of the research topic. In this study, we have chosen to adopt a qualitative approach. According to several prominent qualitative scholars (Creswell 2002; Pope & Mays 1995; Denzin & Lincoln, 1994), qualitative research is intended to deeply explore, understand and interpret social phenomena within its natural setting.

By using a qualitative approach, researchers want to collect richer information and get more detailed picture of issues, cases or events (Arora and Stoner 2009). They want to explore the why and how of a situation, not only what, where, when. Qualitative research can be understood as a dynamic, cyclical process aimed at deepening scholarly insight by generating meaningful conceptual distinctions through close engagement with the subject of study. Aspers & Corte, 2019, p. 155. In contrast, quantitative research is centered on testing objective theories by examining relationships among measurable variables. This approach relies on closed-ended instruments, such as structured surveys and observations, to collect numerical data that can be analyzed statistically (Creswell, 2014).

Qualitative research is suited for studies aiming to generate deep insights through close engagement with participants and iterative analysis. It enables researchers to produce new, meaningful distinctions by engaging with real-world settings and reflecting on data throughout the research process. As Aspers and Corte (2019) assert, qualitative research can be understood as an iterative process that enhances scholarly understanding by generating significant new conceptual distinctions through direct, detailed engagement with the phenomenon under study.

This study aims to examine the difficulties faced by STEM PhD researchers at BBA University when conducting and publishing research in English. Given the focus on exploring nuanced, lived experiences and individual perspectives, a qualitative approach is most appropriate. Qualitative research involves an iterative, in-depth engagement with participants and contexts to generate meaningful insights and distinctions, thereby enhancing our understanding of complex social phenomena**.**

5. Research Design

A research design is the 'procedures for collecting, analyzing, interpreting and reporting data in research studies' (Creswell & Plano Clark 2007, p.58). It is the overall plan for connecting the conceptual research problems with the pertinent (and achievable) empirical research. In other words, the research design sets the procedure on the required data, the methods to be applied to collect and analyze this data, and how all of this is going to answer the research question (Grey, 2014).

Additionally, research design, as emphasized by Khanday and Khanam (2023), serves as the structural framework within which appropriate methods and techniques are logically applied to address research questions and obtain valid, context-rich findings. The choice of research design depends on the objectives of the research in order to be able to answer the research questions in research problem (Crotty, 1998).

This study aims to examine the difficulties faced by STEM PhD researchers at BBA University when conducting and publishing research in English. A phenomenological design was adopted, as it is well-suited for capturing and understanding the researchers' lived experiences. Phenomenological research, as articulated by Creswell (2009), serves as a method for uncovering the essence of human experiences through the voices of participants. This approach is rooted in the notion that the descriptions individuals provide of their lived experiences offer rich insights into the underlying meaning of these experiences. Moustakas (1994) further emphasizes the importance of seeking meanings from appearances, allowing researchers to uncover deeper understandings of human experiences. Similarly, Bliss (2016) points out that phenomenology offers a profound means to understand the complexities inherent in human life, particularly within the context of English language research. Furthermore, Donalek (2004) argues that phenomenological studies are especially valuable in areas where little prior knowledge exists, thus offering an essential approach for investigating previously unexplored phenomena.

6. Research Settings

This study was conducted at Bordj Bou Arreridj University, a higher education institution recognized for its STEM programs and commitment to research excellence among doctoral candidates. The focus is on STEM PhD researchers from the departments of Science and Technology, Mathematics and Computer Science. They were selected for their active engagement in doctoral research and emphasis on publishing in English, a critical aspect of academic discourse in STEM fields.

The context of BBA University is particularly pertinent, as it highlights the challenges faced by non-native English speaking researchers in conducting and publishing in international journals. Within these departments, English is the mandated language for scholarly communication, necessitating that PhD candidates navigate linguistic barriers while meeting rigorous publication standards. We opted for this university primarly because, as students in the department of English Language, we had direct access to the population, which facilitated participant recruitment. Additionally, time constraints discussed in the research limitations, influenced our choice of both the study site and sample.

7. Population of the Study

The study 'population comprises STEM PhD researchers from BBA University's Science and Technology, Mathematics, and Computer Science departments during the academic year (2024-2025). They were selected to ensure both accessibility and focused examination of institutions offering doctoral program in STEM fields. Targeting this specific group enables the study to generate rich, context-specific insights into the unique difficulties encountered by STEM PhD candidates such as extended time spent on reading and writing scientific papers. Moreover, the challenge in understanding and using technical terminology, and the cognitive demands of translating research ideas into English.

8. Sample and Sampling Technique

Due to the impracticality of studying the entire population because of its large size, this research employs a targeted sample aligned with the study's aims and scope. Accordingly, a non-probability sampling technique, purposive sampling, was adopted. This approach is particularly suitable for qualitative research, as it facilitates an in-depth exploration of specific issues experienced by a well-defined group (Patton, 2015).

Participants were intentionally selected based on the following criteria:

- Current enrolment in a STEM doctoral program at BBA University.
- Demonstrated experience and active engagement in conducting and attempting to publish academic research in English.
- Willingness and ability to reflect on and articulate their experiences, challenges, and strategies related to publishing in English as a non-native speaker.

By focusing on this particular sample, the study aims to yield findings that provide valuable insights into the broader context of academic publishing challenges faced by non-native English-speaking researchers in STEM fields.

The final sample consisted of 21 PhD researchers drawn from three different departments. These participants fell into two groups: those who had already published articles in national or international journals, and those currently preparing manuscripts for submission. Despite these differences, all participants had attended at least one academic conference conducted in English.

9. Data Collection

In order to achieve the aim of the study and answer its research questions, one primary data collection tool was selected: the in-depth semi-structured interview. This tool was chosen to explore the challenges faced by STEM PhD researchers at BBA University during the research writing and publication process, ensuring a focused and effective approach to gathering relevant data In-depth interviewing is a qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation.

The semi-structured interview is a method of research commonly used in social sciences. Hyman et al. (1954) describe interviewing as a method of enquiry that is universal in social sciences. Magaldi and Berler (2020) define the semi-structured interview as an exploratory interview. They further explain that the semi structured interview is generally based on a guide and that it is typically focused on the main topic that provides a general pattern. In addition, Megaldi and Berler (2020) argue that the semi-structured interview, despite its topical trajectories provided prior to the interview, enables a researcher to go deep for a discovery. The interview is mostly used to explore a life story of a person or a group of people. While the structured interview has a formalized, limited set of questions, the semi structured interview on the other hand is flexible, allowing new questions to be brought forward during the interview as a consequence of what the interviewees have said. In the semi-structured interview, an interviewer generally has a framework of themes to be explored. (Ruslin, Mashuri, Abdul Rasak, Alhabsyi, & Syam, 2022).

9.1 In Depth Semi Structured Interview Description

This semi-structured interview consists of 14 questions that aim to explore the experiences and challenges faced by STEM PhD researchers, specifically regarding the use of English in their academic and research activities. These questions focus on various aspects of their doctoral journey, such as motivations, research difficulties, publication challenges, and their perceptions of English-language resources and support systems. The goal is to gather in-depth insights into the role of English in their academic work and identify potential areas for improvement.

- **Question N 1: Can you tell me about what motivated you to pursue a PhD in your STEM field, and how your journey has been so far?**

This question explores the initial motivations for pursuing a PhD and provides context for the participant's academic journey.

- **Question N 2: Can you describe your overall experience conducting research in English during your PhD?**

  This question aims to understand how participants perceive the experience of conducting research in English, highlighting both challenges and successes.

- **Question N 3: Have you encountered difficulties while reading scientific articles in English? Could you share a specific instance that was particularly challenging?**

  This question focuses on the linguistic challenges faced when engaging with scientific literature in English.

- **Question N 4: What specific challenges do you encounter in the process of conducting research within your field of study, particularly when working in English?**

  Here, the interviewee is asked to reflect on the specific research-related challenges they face while working in English.

- **Question N 5: How do these challenges affect your confidence or motivation as a researcher?**

  This question explores the emotional and psychological impact of language difficulties on the participant's confidence and motivation.

- **Question N 6: How do you usually cope with difficulties in academic writing in English?**

  Participants are asked to describe the strategies they use to manage challenges in academic writing, such as language barriers or writing conventions.

- **Question N 7: How accessible are English-language academic resources for your research? Could you describe your typical experience finding and using them?**

  This question seeks to evaluate the availability and accessibility of English-language resources needed for research.

- **Question N 8: Have you previously published any research in English? If so, what challenges did you encounter throughout the publication process?**

  Participants are asked to discuss their experience with publishing research in English, particularly focusing on any difficulties during the publication process.

- **Question N 9: Do you think STEM PhD students in Algeria face more difficulties than students in other fields when it comes to publishing in English? Why or why not?**

  This question explores participants' perceptions of the challenges faced by STEM students in Algeria compared to those in other academic disciplines.

- **Question N 10: Have you noticed any patterns in the kind of feedback you receive from reviewers or supervisors regarding your English?**

  Here, participants are asked to reflect on the feedback they've received related to their English proficiency, identifying recurring themes or comments.

- **Question N 11: Have you had any experiences working with international collaborators or journals? How did language play a role?**

  This question explores the role of language when collaborating with international researchers or publishing in international journals.

- **Question N 12: To what extent do language difficulties influence your choice of journal or conference?**

  Participants are asked whether language proficiency affects their decision-making when selecting journals or conferences to publish in.

- **Question N 13: Do you think mastering English is a barrier or a gateway for Algerian researchers in STEM? Why?**

  This question examines participants' views on whether mastering English serves as a barrier or an opportunity for Algerian STEM researchers.

- **Question N 14: If you could design a support system or program to help PhD researchers write in English, what would it look like?**

Finally, this question asks participants to propose solutions for improving the support available to PhD researchers in writing academic English.

9.2 Piloting the Research Instrument

Prior to the main data collection phase, the researchers carried out a small-scale pilot study to test the feasibility and effectiveness of the research design, instruments, and procedures prior to the main study. Creswell (2012) defines a pilot study as "a test study before the actual study has taken place," enabling researchers to anticipate challenges and interpret participant responses more effectively. This step is integral to purely qualitative research, as it aids in refining data collection tools, addressing ambiguities, and improving clarity.

Creswell and Creswell (2018) advocate for incorporating pilot studies or their findings into research reports to underscore methodological rigor and preparedness. Such studies play a crucial role in identifying and resolving potential errors, logistical issues, and ambiguities, ultimately enhancing the trustworthiness and validity of the research process. By conducting a pilot study, researchers can ensure that the main study is both methodologically sound and effectively structured.

Before piloting the semi-structured interview questions, our supervisor offered invaluable feedback that substantially enhanced the quality of the instrument. This input resulted in the addition of several questions that had not been previously considered, thereby broadening the depth and scope of the interviews. For instance, question one was introduced upon the recommendation of our supervisor, who suggested it as an effective opening question for the face-to-face interviews. while other questions were added and reordered. Furthermore, certain items were omitted in accordance with the supervisor's recommendations to improve the overall clarity and relevance of the questions. This proposal was made to establish rapport and create a conductive environment for participants, thereby facilitating a smoother transition into the subsequent, more in-depth questions.

After implementing these revisions, the updated set of interview questions was distributed via email to three EFL instructors from the Department of English at BBA University. They all responded favourably, endorsing the effectiveness of the revised questions. This collaborative approach was instrumental in refining the interview protocol and ensuring its suitability for the main study.

9.3 Administration of in depth semi-structured interview

The administration of the in-depth semi-structured interviews was carried out through a combination of online and face-to-face methods. We, as a research team of three members, conducted nineteen interviews online via email, while two participants were interviewed face-to-face. To manage the process efficiently, we divided the participants' contact details among ourselves, with each member responsible for reaching out to a specific group of participants. The interviews were conducted on different days and times over the span of 10 days, allowing us to accommodate participants' schedules and ensure flexibility. This approach allowed us to effectively coordinate the interviews and ensure smooth communication with all participants. Additionally, we ensured that the interview process remained consistent by using the same interview protocol and maintaining a standardized approach across all interactions, regardless of the method of communication.

10. Data Analysis

Qualitative data analysis (QDA) is a fundamental component of qualitative research that involves breaking down data to identify themes and relationships. According to Marshall and Rossman (2006, p. 154), QDA is a process of establishing themes and connections by identifying key statements or phrases. Similarly, Taylor and Gibbs (2010) describe QDA as a thorough process aimed at uncovering truths and developing theoretical understanding about people, situations, and phenomena. At its core, QDA is grounded in interpretive philosophy, focusing on analyzing and interpreting the meaningful and symbolic content within data (Saldana, 2009; Peel, 2020).

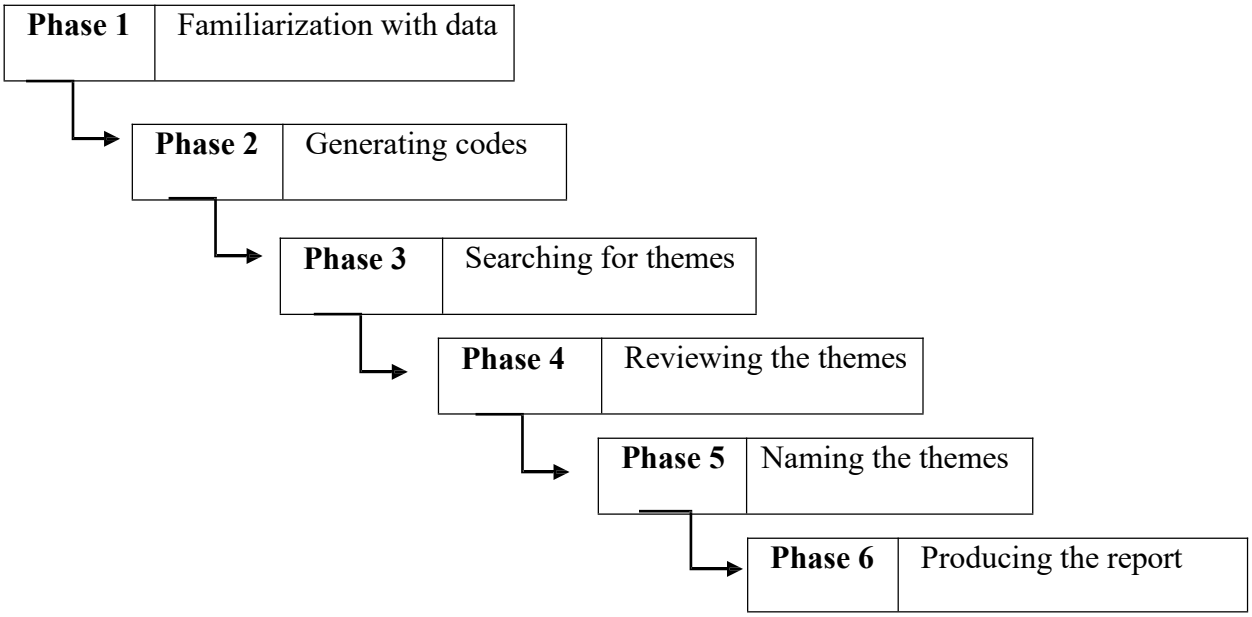
Building on this foundation, qualitative research employs a variety of analytic techniques to gain a deep understanding of complex datasets. Among these techniques, thematic analysis stands out as a widely used method that systematically classifies and interprets linguistic or visual materials to reveal both explicit and implicit meanings, whether subjective or socially constructed (Bryman, 2001). Thematic analysis has been defined broadly as “a way of seeing” and “making sense out of seemingly unrelated material” (Boyatzis, 1998, p. 4). In this study, we applied thematic analysis following Braun and Clarke’s well-established framework, which includes data familiarization, coding, theme generation, review, definition, and write-up.

10.1 Procedure of Thematic Analysis

In order to perform analysis and interpretation of qualitative dataset, we obtained 21 in-depth Semi-structured interviews. We transcribed all the interviews and prepared them to be analyzed in thematic Analysis strategy (Braun & Clarke, 2020; Braun, et al. 2006; Butcher, et al. 2001). Figure 10.1 illustrates various phases in qualitative data analysis through thematic analysis.

Figure 10-1

Phases of Coding in Thematic Analysis



Source: Gibbs (2007)

familiarization with data: In line with established qualitative research practices (Braun & Clarke, 2021; Maguire & Delahunt, 2017; Sundler et al., 2019), our thematic analysis began with thorough familiarization with the data. Our dataset consisted exclusively of interview transcripts, which we carefully and repeatedly read to gain a deep understanding and identify meaningful patterns. Recognizing the importance of active engagement beyond surface-level reading, we immersed ourselves in the transcripts through cyclical readings (Halcomb & Davidson, 2006). This process helped us stay closely connected to participants' perspectives and allowed us to note initial ideas for coding. As Miles et al. (2014) emphasize, familiarization enables early identification of data segments relevant to the research questions. Since our data were verbal, we transcribed all interviews into written form, ensuring accuracy

by cross-checking transcripts against the original audio recordings. Although time-consuming, this transcription process was essential for deep immersion and rigorous analysis (Nowell et al., 2017; Doctor, 2021). Throughout this stage, we took detailed notes and began organizing data segments relevant to our research questions, laying a solid foundation for subsequent coding and theme development.

Generating Initial Codes: Once the Document System takes some shape, the coding's process starts. According to Braun and Clarke (2012), codes are "the building blocks of analysis" (p. 61), while Boyatzis (1998) defined a code as 'the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon' (p. 63). The interview transcripts underwent thorough review, with each significant data segment carefully analyzed and assigned relevant codes. We chose an inductive coding strategy, enabling categories and themes to naturally arise from the data itself. For the coding process, we utilized "In Vivo" coding, which emphasizes capturing participants' exact words and expressions as codes. This method-also known as verbatim, literal, or natural coding-ensures that the codes remain closely tied to the participants' own language and experiences, providing an authentic representation of their perspectives (Saldaña, 2016). An example of the initial coding process is provided in Table 10.1 below:

Table 10-1

Example of Initial Coding from Returnees "Interview

Data Extract (teacher 3)	**Initial Code**
"One of the biggest difficulties has been the lack of experimental equipment. Since I haven't been able to conduct physical experiments, it has sometimes been hard to fully understand certain phenomena."	Challenge:Limited research resources

Generating and Reviewing Themes: After feeling saturated with coding and recoding all data sources included in the Thematic Analysis, we moved from codes to themes. According to Braun and Clarke (2006), themes are "patterned response or meaning within the data set" that somehow relates to the research questions (p. 82). Searching for themes is a very active process in which the qualitative

researchers actively construct themes rather than discover them even though the name of the phase is "searching" for themes.

Table 10-2

Example of Themes " Generating from the Returnees "Interview

Data Extract	Code	Initial Theme	Category
Teacher1: "Difficulty understanding meta-heuristics in data mining due to dense terminology and methodology complexity."	Technical terminology challenges	Research content complexity	Research Challenges
Teacher 3: "Published research; main publication challenge was reducing similarity index and addressing reviewers' comments."	Publication challenges	Publication process challenges	Academic Publishing Barriers

Interpretation and reporting: We carefully explored the qualitative data to uncover meaningful themes that address our research questions and objectives. To deepen our understanding, we linked these themes to clear evidence from the data. Our findings are presented through six key themes that highlight the main insights of the study.

11. Ensuring Research Quality and Trustworthiness

Trustworthiness is a foundational concept in qualitative research, ensuring that findings are credible, dependable, confirmable, and transferable (Amankwaa, 2016; Eryilmaz, 2022). Unlike quantitative research, which follows a positivist paradigm focused on objectivity and measurement, qualitative research operates within an interpretive framework where researchers seek to understand the subjective, socially constructed meanings participants assign to phenomena (Saunders et al., 2019). Although qualitative studies do not adhere to the strict methodological controls of positivism, they can achieve scholarly rigor by meeting established quality criteria (Bryman, 2008). Lincoln and Guba's (1986) "Four-

Dimensions Criteria" (FDC) provide a widely recognized framework for assessing trustworthiness in qualitative research. These four dimensions' credibility, transferability, dependability, and confirmability address different aspects of methodological rigor and collectively ensure the integrity and quality of qualitative findings (Forero et al., 2018).

11.1 Credibility

Establishing credibility is a fundamental step in ensuring the trustworthiness of qualitative research. As Merriam (2009, p. 213) explains, credibility addresses the question, "How congruent are the findings with reality?" It reflects the degree of confidence that can be placed in the truthfulness of the research findings (Holloway & Wheeler, 2002; Macnee & McCabe, 2008). Credibility confirms whether the findings accurately represent plausible information derived from participants' original data and provide a faithful interpretation of their views (Graneheim & Lundman, 2004; Lincoln & Guba, 1985). To enhance the credibility of this study, we employed member checking, a widely recognized technique in qualitative research (Lincoln & Guba, 1985; Varpio et al., 2017). Member checking involves presenting data transcripts or preliminary interpretations back to some or all participants for their feedback and validation (Elo et al., 2014). This process allows participants to confirm the accuracy of their statements, clarify any misunderstandings, and contribute additional insights, thereby ensuring that the data and interpretations genuinely reflect their experiences (Birt et al., 2016; Candela, 2019).

11.2 Transferability

Transferability is another measure to ensure trustworthiness. It refers to "the extent to which study can be transferred or applied to other settings or groups" (Creswell, 2014, p. 203). This means that the foundation of qualitative research is typically an in-depth analysis of a small number of cases (Denscombe, 2010). It assesses how effectively the results can be relevant to other contexts with diverse participants. Researchers can improve transferability by offering thorough descriptions and employing purposeful sampling (Bitsch, 2005). By providing detailed accounts of the research process and the sample, they enable readers to assess the applicability of the findings to their own situations. Consequently, we included extensive information about the research design, data collection environments, participant selection, and methods of data analysis and interpretation. This thorough documentation ensures that the study can be replicated in other contexts, aiding those interested in similar research or related topics by supplying information that can be understood and applied across various settings.

11.3 Dependability

Dependability is defined as "the stability of findings over time" (Bitsch, 2005). ensuring that results are not random but systematically derived from the data. To ensure dependability, we maintained ongoing communication with our supervisor during all phases of data collection and analysis, actively seeking guidance and support. Additionally, we offered comprehensive descriptions of our data collection procedures to enhance transparency for the readers.

11.4 Confirmability

Confirmability, the final aspect of trustworthiness, refers to the extent to which research findings are free from the researcher's bias and truly represent the participants' original statements (Denscombe, 2010). This means that the interpretation and presentation of results should be objective and based solely on the data provided by participants. To ensure confirmability, direct quotations from participants' transcripts were included as evidence to support the data analysis.

12. Ethical Dimensions

Ethics constitutes a fundamental component of the research process, encompassing all phases from the initial selection of the research topic, through data collection and analysis, to the final dissemination of the study's findings (Shamoo & Resnik,2015; Mustajoki & Mustajoki,2017). Accordingly, adherence to ethical considerations was a priority throughout our study. We took steps to ensure that the study was conducted ethically by obtaining informed consent from all participants and respecting their privacy. Following best practices, the study aimed to make participants feel comfortable and avoid placing too many demands on them (BERA, 2024, p. 20). Participants were informed about the study, allowed to ask questions, and asked to sign a consent form before taking part. Their participation was voluntary, and they could leave the study at any time without any consequences. The privacy of participants was protected, and all data collected was kept confidential and only accessible to the research team.

13. Delimitations of the Study

This study is intentionally delimited to the experiences of STEM doctoral researchers at BBA University, with a specific focus on the linguistic and academic challenges they encounter in conducting and publishing scientific research in English. By narrowing the scope to this distinct group and institutional

context, the research aims to provide a nuanced and in-depth understanding of the particular obstacles related to language proficiency and academic writing conventions, rather than attempting to generalize findings across other disciplines or universities.

Employing a phenomenological research design cantered on semi-structured interviews further delimits the inquiry to capturing rich, personal insights from participants, thereby prioritizing depth and contextual specificity over broad generalizability. Moreover, the study confines its examination exclusively to language-related difficulties and the strategies employed by these researchers to address such challenges, deliberately excluding broader institutional policies or systemic factors that may also influence research productivity.

These delimitations serve to ensure a focused and manageable investigation aligned with the study's objectives, while simultaneously acknowledging that the findings are context-specific and may not be directly transferable to other academic settings or populations beyond the STEM doctoral community at BBA University.

14. Conclusion

This chapter offers a clear and thoughtful overview of the research journey, outlining the study design, setting, sampling method, data collection tools, and procedures, each supported by sound reasoning. To uphold the study's reliability and ethical standards, we followed strict guidelines and carefully documented every step. The rich interview data were explored through thematic analysis, revealing meaningful patterns and insights. The next chapter will bring these findings to life, providing a deeper understanding of the participants' experiences and perspectives.

CHAPTER THREE: RESULTS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

1. Results and Findings

1.1 Introduction

This section presents a comprehensive analysis of the empirical findings derived from the investigation into the challenges encountered by STEM PhD researchers at BBA University in conducting and disseminating scientific research in English. Given the global predominance of English as the lingua franca of academia, particularly within STEM disciplines, non-native English-speaking scholars frequently confront multifaceted barriers that impede their research productivity and publication success. This study specifically foregrounds the experiences of Algerian researchers, whose academic trajectories are uniquely shaped by a French-based educational system, thereby adding a distinct dimension to the discourse on linguistic and institutional challenges in scholarly communication

Through a rigorous thematic analysis of in-depth interview data, this chapter elucidates six principal themes that encapsulate the linguistic difficulties, structural constraints, and adaptive strategies characterizing the research and publication processes of these scholars. The findings are systematically organized to address the study's core research questions, providing critical insights into the interplay between language proficiency, educational background, institutional resources, and academic publishing outcomes. Moreover, this chapter situates the findings within the broader scholarly literature, highlighting areas of convergence and divergence, and underscores the imperative for holistic institutional support mechanisms that transcend language training alone.

2. Presentation of Results

This section presents the interview results through thematic analysis, aligned with our research objectives and questions. Thematic analysis revealed six key themes reflecting the main challenges faced by STEM PhD candidates: challenges of academic writing and communication in English; language barriers in STEM research and publication; resource accessibility and the use of informal channels; the impact of French-based education on English academic publishing; publication challenges beyond

language; and practical, resourceful strategies to overcome English language and research challenges in STEM PhD studies.

2.1 Challenges of Academic Writing and Communication in English

This theme reflects the significant difficulties faced by Algerian STEM PhD candidates in articulating their scientific ideas clearly and effectively in English. Participants consistently highlighted that expressing complex concepts in a second language often hinders the clarity, precision, and overall quality of their academic writing. These challenges encompass issues with grammar, vocabulary, sentence structure, and the ability to formulate coherent and persuasive academic arguments.

Many participants reported spending a disproportionate amount of time revising their manuscripts for language accuracy rather than focusing on the scientific content itself. This linguistic struggle often results in research being undervalued or even rejected due to poor language presentation, regardless of the quality of the ideas being communicated. As one participant declared:

"Instead of working on the ideas in the manuscript, Algerian researchers spend a tremendous amount of time revising the language. Due to limited English proficiency or poor translation, high quality research may lose its value. Since it may become hard to review a scientific content of a paper with poor English, as the ideas are often not clearly communicated and the incorrect grammar is very distracting, papers are rejected and non-native English scholars are diverted away from international publishing."

This quote illustrates how language difficulties not only impact the clarity of communication but also serve as a barrier to entry in international academic publishing. Consequently, language proficiency becomes a gatekeeper, diverting attention from the scientific merit of the research itself.

Another participant reflects on the difficulty of verbal communication in English at the start of their academic journey. Despite being comfortable with reading and writing, they struggled to express complex ideas orally. However, through active engagement in academic environments conferences, workshops, and teaching they gradually built the confidence and fluency needed for effective communication. This journey mirrors the broader challenge of having to develop language skills alongside academic expertise, a dual burden for non-native speakers. Additionally, this participant confirmed this idea, noting that:

"*One of the challenges I encountered in the beginning was communication, particularly speaking*

skills in English. While I was comfortable reading and writing, expressing complex ideas verbally was more difficult at first. However, participating in conferences, workshops, and teaching in English has really helped me improve over time. These experiences pushed me to become more confident and fluent when presenting and discussing research."

In the same vein, third participant reinforces this by describing the difficulty of learning both technical concepts and the ability to articulate them clearly in academic English. Their experience shows that language learning is not just an academic hurdle but also a personal and professional growth process. Furthermore, their struggle with writing academic papers, particularly dealing with reviewer comments about language clarity, mirrors the situation described in the quote: research may be devalued or dismissed if the language is not polished, regardless of its underlying quality. He said:

"English is not my native language, so I've had to learn not only advanced technical concepts, but also how to express them clearly in academic English. It's been a tough process, but also a valuable one I've grown a lot both personally and professionally."

"Writing academic papers in English was also a challenge. When I submitted my first research paper, I received feedback from reviewers and editors pointing out that my English writing needed improvement. Their comments motivated me to work harder on expressing my ideas more clearly and accurately."

All these responses underscore a shared reality: for non-native English-speaking scholars, language proficiency is not just a tool but a barrier. It demands additional effort that native speakers may not face to the same degree. These experiences highlight the need for more inclusive academic practices that focus on content quality while also providing support for language development, allowing global scholars to fully participate in and contribute to the academic community.

2.2 Language Barriers in STEM Research and Publication

This theme delves into the nuanced linguistic obstacles encountered by STEM PhD candidates when engaging in research and scholarly publishing within an English-dominated academic landscape. Participants emphasized the inherent complexities of mastering technical terminology and conforming to the rhetorical and stylistic conventions of English-language scientific discourse. Unlike general academic writing, STEM communication often demands a high level of linguistic precision to convey intricate and abstract ideas, which becomes particularly burdensome for non-native English speakers.

These language barriers extend beyond basic grammatical proficiency to include the articulation of discipline-specific knowledge in a concise and intelligible manner, often requiring extensive vocabulary acquisition and familiarity with the structural norms of scientific writing. As one participant reflected:

"Writing clearly and concisely in English remains a challenge for anyone who has worked academically in a second language. Sometimes I understand a concept well in Arabic, but finding the right words in English takes time. Expressing the concept in analysis can also be difficult, especially when dealing with complex or subtle concepts."

Moreover, several participants acknowledged that language is only one layer of a broader set of challenges, including adapting to unfamiliar academic conventions and citation practices as indicated by one participant:

"There are other research challenges beyond language, such as dealing with different academic conventions or citation styles."

The pressure to publish in high-impact international journals further exacerbates these linguistic difficulties, as English remains the dominant language of scientific advancement. STEM scholars, unlike those in the humanities who may have the option to publish in regional or native-language journals, are compelled to meet the stringent linguistic and technical standards of global publication. Another participant elaborated:

"*Most STEM research is global and advances rapidly, creating higher pressure to publish in high-impact English journals. While humanities students can sometimes publish valuable work in Arabic journals with regional focus, STEM fields almost universally require English for international visibility and impact. Additionally, STEM papers often involve complex technical terminology that is particularly challenging to express precisely in a non-native language."*

This theme thus highlights how linguistic competence in English is not merely advantageous but essential for STEM researchers, and how its absence can significantly hinder scholarly productivity, international engagement, and career progression.

Participant 8 highlighted another key barrier: comprehension of academic papers in English. They emphasize the time and effort needed to decode dense texts filled with specialized vocabulary and complex sentence structures. This aligns closely with the original quote's focus on the dominance of English in

global STEM research, making it difficult for non-native speakers to keep pace with developments, participate in scholarly discourse, or build upon others' work efficiently. He presented:

"Initially, I struggled with understanding academic papers, particularly since the majority of scientific journals are published in English. Reading these articles often required substantial time and effort due to the sheer volume of information, along with specialized vocabulary and complex sentence structures, which sometimes made comprehension slow and demanding."

Together, these responses illustrate how linguistic competence in English is not simply an academic tool but a structural barrier in STEM. It shapes not only who gets published, but who can access current research, contribute meaningfully, and be recognized in the global scientific community. The French-to-English transition specific to Algerian scholars compounds this issue, adding a layer of linguistic displacement that can delay or disrupt academic progress.

2.3 Resource Accessibility and Use of Informal Channels

This theme explores the challenges faced by STEM PhD candidates in accessing essential academic resources, particularly peer-reviewed articles, books, and up-to-date scientific literature. Participants reported significant institutional and financial barriers, such as limited university subscriptions and restrictive paywalls, which hinder their ability to obtain the latest research. As a consequence, many resort to informal or unauthorized channels to circumvent these limitations, often compromising on the legality or reliability of the resources accessed.

Despite the abundance of English-language materials in STEM disciplines, access is not always equitable or straightforward. The reliance on platforms like Google Scholar and Research Gate reflects both the digital resourcefulness of students and the inadequacy of formal academic infrastructure in providing comprehensive access to scholarly content**.** One participant stated:

"Almost all books and articles in my field are in English, which makes it easy to find academic resources. I use websites like Google Scholar and Research Gate to access them. Legally it would have been hard; however, I do use illegal sources to get whatever I need, sometimes they are not up to date in which case I do ask for guidance from my supervisor."

This quote reveals the ethical and practical dilemmas faced by doctoral students who must choose between adherence to legal norms and the academic necessity of accessing critical research materials. The use of unofficial platforms, while often indispensable, raises concerns about the sustainability and integrity of scholarly practices in contexts with limited institutional support. Thus, this theme underscores the urgent need for improved access to academic databases and resources to foster equitable participation in global research.

The participant's quote, along with the reflections from participant 12 and 14, collectively shed light on a critical yet often overlooked challenge in academic research within under-resourced contexts: limited legal access to scholarly materials in English. This problem is both ethical and structural, and it directly affects the ability of researchers especially in STEM fields to participate meaningfully in global academic discourse.

Participant 12 added:

"Accessing English-language academic resources for my research can be tough, especially when it comes to paid articles. Lately, I've been facing issues with platforms like SNDL, which makes it harder to access some papers I need."

He stated that access to English-language research is especially difficult when paywalls are involved. Their mention of SNDL (Système National de Documentation en Ligne) points to the fragility of national-level academic infrastructure. When such platforms fail—due to subscription lapses or administrative issues researchers lose access to essential databases, severely disrupting their work. And participant 14 exemplified:

"Unfortunately, by my second year, researchers across Algeria lost access to SNDL because the Ministry didn't renew the subscription fees. This created significant obstacles to my research progress, forcing me to rely on alternative methods to access literature:

- *Reaching out to international colleagues to request specific papers*
- *Using Research Gate to directly contact authors*
- *Relying more heavily on open-access journals*
- *Making use of preprint repositories*

This situation has considerably slowed my literature review process and sometimes limits my ability

to stay current with the latest developments in sustainable construction materials."

Participant 14 provided deeper context, noting that by their second year, SNDL access was lost entirely across Algeria due to a failure to renew subscriptions. This institutional lapse had nationwide consequences, affecting not only individual researchers but the broader academic output of the country.

The reflections from participant 19 and 9 reinforce the previously discussed theme: limited access to academic articles especially those behind paywalls continues to challenge researchers in Algeria, prompting reliance on both institutional tools and unofficial or alternative platforms. These insights provide additional perspectives on how researchers navigate the tension between legal access and academic necessity. Participant 19 highlighted:

"*Regarding the needed articles in my research, I faced some problems due to the prices of such articles because they are for sale by editor online. Fortunately, the university gave us a tool called SNDL where we subscribe in the university's library to use prepaid articles from many journals and editors."*

This participant described a more positive experience with SNDL, highlighting its value as a university-provided gateway to paid academic resources. Their ability to access needed journal articles through university subscriptions indicates that when properly funded and maintained, institutional tools like SNDL can significantly ease the burden of accessing international literature. Participant 9 represented:

"Many journals are behind paywalls, which can be a barrier. However, I often use platforms like Research Gate or use Sci-Hub. Google Scholar also help."

This participant highlights the ongoing reliance on alternative or unauthorized platforms like Sci-Hub and Research Gate to bypass paywalls. This mirrors the earlier participant's admission of using illegal sources when official access is lacking. It again illustrates a reality where researchers are often forced into ethically gray zones simply to do their work.

2.4 Impact of French-Based Education on English Academic Publishing

This theme examines the complex challenges Algerian STEM PhD candidates face in transitioning from a predominantly French-language academic background to publishing in English, the dominant language of international scientific communication. Participants described this shift as both linguistically and cognitively demanding, requiring them to unlearn ingrained habits from French academic conventions while simultaneously adapting to the stylistic, structural, and rhetorical norms of English scholarly writing.

For many, especially those who completed the majority of their prior education in French, this transition entails more than a change in language; it involves reorienting their entire academic thought process to align with Anglophone expectations. This adjustment is often complicated by a lack of systematic training in English academic writing during earlier stages of education, which results in a steep learning curve at the doctoral level. One participant reflected:

"For most years, mostly due to cultural and educational bloat from the French language especially for older researchers, they spend most of their education in a French environment then suddenly they are forced to turn to English."

Participant 7 reflected this by pointing out the linguistic shift Algerian scholars must undergo from French to English after years of education in French. This transition creates a cultural and educational dissonance that complicates the adoption of English for academic work. The term "educational bloat" underscores how deeply embedded the French language is in Algerian academic culture, making the switch to English abrupt and burdensome. Participant 8 argued:

"Scientific words are one of the biggest problems in scientific research, especially for us Algerian students, since our studies in the lower degrees was conducted in French, the conversion from French to English was painful and time consuming, it felt like we are studying over from the beginning."

He builds on this by sharing how transitioning from French to English in scientific study felt like starting over. This suggests that for Algerian students, the issue is not just about language skills, but also about reacquiring technical knowledge in a different linguistic framework. The struggle with scientific terminology which is precise and often context-specific underscores the double cognitive load: mastering the science and mastering its expression in English. This directly reflects the earlier quote's mention of the technical precision required in STEM writing, which is especially hard for those without a strong English foundation.

Participant 3 said:

"One of the specific challenges I face in conducting research in my field, particularly when working in English, is the transition from French to English terminology. In my country, and especially for my generation, most of our education in science and engineering was done in French. As a result, I originally

learned many technical terms in French, and it has taken time and effort to adapt to their English equivalents."

Participant 3, who directly stated that most of their science and engineering education was in French, making the shift to English terminology a significant and time-consuming adaptation. This reflects how technical knowledge was first internalized in French, creating a barrier when re-learning or expressing that same knowledge in English for global publication.

Participant 5 reinforced this by acknowledging that while English is essential in their field, the switch from French dominant during the bachelor's and master's years had "negative repercussions", likely referring to delays in publication, reduced confidence, and a steep learning curve in scientific writing. Participant 5 added**:**

"The truth is that it does not constitute an obstacle, it is actually a challenge, because all research in our specialty is in English. The problem is that during our studies in the bachelor's and master's levels, we studied in French, and this change had negative repercussions for us."

2.5 Publication Challenges Beyond Language

This theme emphasizes that, while English language proficiency is undoubtedly important, it is not the most significant obstacle faced by Algerian STEM PhD candidates in the process of academic publishing. Rather, the predominant barriers lie in structural and institutional limitations that constrain their ability to conduct research that meets international standards. Participants pointed to the lack of advanced research infrastructure, inadequate access to specialized laboratories and equipment, and challenges in applying rigorous research methodologies as critical impediments to successful publication.

These limitations not only hinder the quality and scope of the research being produced but also restrict the ability of students to engage with cutting-edge scientific developments, thus placing them at a disadvantage in the competitive global research environment. One participant succinctly expressed this sentiment:

"I don't think language is the main difficulty for STEM PhD students in Algeria when it comes to publishing in English. While English proficiency is important, the real challenges are more related to the lack of equipment, limited access to advanced laboratories, and the methodology of research itself."

This statement underscores the systemic nature of the obstacles encountered by Algerian doctoral students, revealing that linguistic competence alone cannot compensate for the absence of fundamental research conditions. Consequently, efforts to improve publication outcomes must address broader infrastructural and institutional deficiencies in tandem with language support. participant 8 represented:

"personally, I see that the issue with research is not the English language, but rather the research idea."

This participant shifted the focus by stating that language is not the central issue; rather, the quality or originality of research ideas is a more fundamental concern. This reflects an important reality: even with strong English skills, weak research design, poor methodology, or underdeveloped concepts can block publication.

This perspective emphasizes that language support must go hand-in-hand with training in research methodology, critical thinking, and academic writing. Participant 9 argued:

"The biggest challenge was making sure the paper met both language and formatting requirements. Reviewer feedback often pointed out clarity and grammar, which delayed the process."

He pointed to the combined burden of language and formatting requirements, noting that reviewer feedback often targets clarity and grammar, leading to delays. This illustrates how even minor language issues can cascade, slowing down the publication process and increasing emotional and cognitive strain. Participant 12 highlighted:

"I think STEM PhD students in Algeria face fewer difficulties with terminology since much of the content is already in English. However, writing a well-structured academic paper is still challenging, especially when it comes to mastering academic English."

He added a helpful nuance: terminology in STEM may be less of a barrier because the field's language is inherently global and often taught in English. However, they stress that structuring and expressing ideas in academically appropriate English remains a major challenge especially in writing introductions, justifying hypotheses, and interpreting results with nuance. Additionally, Participant 14 argued:

"I encountered various challenges:

- *The peer review process was particularly demanding, as reviewers often highlighted language*

issues alongside scientific content. Responding to reviewers' comments required careful attention to both technical accuracy and clear expression.

- *Journal formatting requirements and citation styles varied significantly between publications, creating additional work beyond the writing itself.*
- *The publication timeline was often frustratingly long, with multiple revision rounds sometimes extending over several months, which affected my research momentum."*

Participant 14's experience showed that publishing goes far beyond just writing in English. The peer review process often reveals problems with both language and content, requiring careful and technical revisions. On top of that, dealing with different journal formatting and citation styles adds extra work that most PhD students are not trained for. Long waiting periods and multiple rounds of revision can slow down progress and reduce motivation, especially when there is little institutional support like mentoring or writing help.

In this section, we share key findings from the interview excerpts to show the real challenges Algerian doctoral students face when trying to publish their research. These include difficulties with English, the shift from French-based education, limited access to resources, and a lack of institutional support. Through the voices of the participants, we see that publishing is not just about knowing the language it's also about having the right tools, guidance, and environment. These findings highlight the need for more practical support to help researchers succeed on an international level.

2.6 Practical and Resourceful Strategies to Overcome English Language and Research Challenges in STEM PhD Studies

Doctoral candidates in STEM fields often face significant hurdles related to English language proficiency and the demands of research. The experiences of several participants in this study highlight various practical and resourceful strategies they employ to overcome these challenges.

Participant 7 shared his approach to improving academic writing in English:

"When I face difficulties in academic writing in English, I usually try to cope by reading a lot of journal articles and well-written papers in my field... I also often use tools like ChatGPT to improve my writing. It helps me refine the language, correct grammar, and make my ideas more concise and clearer."

This participant's strategy emphasizes active engagement with authentic academic discourse. By immersing himself in published research, he naturally absorbs disciplinary writing conventions, vocabulary, and rhetorical structures. Furthermore, the integration of digital writing assistants like ChatGPT demonstrates a practical approach to refining language, correcting grammatical errors, and enhancing the clarity and conciseness of his ideas.

Participant 7's approach demonstrates a flexible and persistent problem-solving strategy, emphasizing the diversification of resources including peers and AI, and a critical self-assessment to identify and address underlying knowledge gaps. he stated:

"See a different resource, discuss it with AI or someone else, if the issue persists I inspect any prior knowledge gaps that might be making the subject too hard."

This reflective and adaptive method empowers PHD student to take control of their learning process, a skill essential for navigating the layered demands of academic writing and reading in a second language. By promoting critical thinking and self-awareness, this strategy supports long-term growth in both language proficiency and research competence.

This contrasts with participant 19, who highlights a more structured path to improvement by undertaking formal English classes to bolster foundational language skills, particularly grammar, which in turn enhanced overall communication abilities. Furthermore, participant 19 developed strategic reading techniques, such as multiple reads and summarization schemes, to more effectively comprehend and retain information from complex academic texts. He said:

"In order to overcome this problem, I went to English classes to sharpen my understanding of tenses in English. Fortunately, the class helped me even in enhancing my English speaking and writing skills. Furthermore, I searched for a new way to read and understand such articles by doing multiple reads and creating schemes to summarize the general purpose."

Participant 19's method fosters discipline, language fluency, and analytical reading, all of which empower students to overcome both linguistic and content-based challenges in scientific research.

Both participant 7 and participant 19 exemplify practical and resourceful strategies that can be highly relevant to overcoming English language and research challenges in STEM PhD studies.

3. Analysis and Interpretation

3.1 Introduction

The thematic analysis yielded six interrelated themes that encapsulate the primary barriers faced by STEM PhD candidates: challenges of academic writing and communication in English; language barriers specific to STEM research and publication; the impact of a French-based educational background on transitioning to English academic publishing; resource accessibility and the use of informal channels; and broader publication challenges beyond language, including infrastructural and methodological constraints and finally the practical and resourceful strategies to Overcome English Language and Research Challenges in STEM PhD Studies. Each theme is discussed below, with explicit reference to how it addresses the study's research questions.

3.2 Challenges of Academic Writing and Communication in English

This theme directly addresses the research question concerning the real-world difficulties experienced by doctoral candidates in articulating scientific ideas in English. Participants consistently reported that limited English proficiency not only hampers the clarity and precision of their academic writing but also diverts significant time and effort away from the development of scientific content. This linguistic struggle frequently results in the undervaluation or rejection of research, irrespective of its intellectual merit. The findings thus underscore that language proficiency functions as a critical barrier, influencing both the confidence of researchers and the international visibility of their work**.**

3.3 Language Barriers Specific to STEM Research and Publication

Building on the general challenges of English proficiency, this theme delves into the specialized linguistic demands of STEM disciplines. Participants highlighted the necessity of mastering technical vocabulary and conforming to the rhetorical conventions of English-language scientific discourse. The transition from a French-based education system to English-dominated publishing environments compounds these challenges, requiring researchers to relearn scientific terminology and adapt to new academic norms. This theme responds to the research questions by illustrating the compounded difficulties of acquiring both scientific and linguistic competence, which are prerequisites for successful publication and professional advancement in the global STEM community.

3.4 Impact of a French-based Educational Background on Transitioning to English Academic Publishing

The findings reveal that the participants' prior education in French creates a unique contextual barrier, manifesting as a form of "educational bloat." Participants described the transition to English as akin to starting anew, both linguistically and conceptually. This process not only slows academic progress but also engenders a sense of cultural and intellectual displacement. By highlighting this context-specific challenge, the theme addresses the research questions by demonstrating how systemic educational history exacerbates language barriers and underscores the need for targeted support during the transition to English academic environments.

3.5 Resource Accessibility and Use of Informal Channels

A further barrier identified pertains to the limited institutional and financial access to essential academic resources. Participants reported frequent difficulties in obtaining up-to-date literature due to restrictive paywalls and insufficient university subscriptions, leading many to rely on informal or unauthorized channels such as Research Gate or direct author contact. The discontinuation of national platforms like SNDL further compounds these issues, impeding research progress and literature review. This theme answers the research questions by exposing infrastructural and systemic inequities that hinder equitable participation in global STEM research and necessitate resourceful, albeit precarious, strategies for accessing scholarly materials.

3.6 Broader Publication Challenges Beyond Language

Finally, the findings indicate that challenges extend beyond language barriers to encompass inadequate research infrastructure and methodological constraints. Such systemic limitations further impede the ability of researchers to conduct and publish high-quality work. This theme situates linguistic difficulties within a broader context of structural impediments, thereby providing a comprehensive response to the research questions and emphasizing the need for holistic interventions.

Collectively, these five themes provide a robust and nuanced answer to the research questions, revealing the complex interplay of linguistic, educational, infrastructural, and systemic factors that shape the experiences of Algerian STEM PhD researchers. This multifaceted understanding underscores the need for comprehensive academic support frameworks that integrate language development with broader

infrastructural and institutional reforms.

3.7 Practical and Resourceful Strategies to Overcome English Language and Research Challenges in STEM PhD Studies

The theme of practical and resourceful strategies to overcome English language and research challenges in STEM PhD studies encapsulates the proactive and adaptive measures employed by Algerian doctoral candidates as they confront the dual barriers of linguistic proficiency and limited research resources.

Rather than adopting a passive stance, participants consistently described engaging in intensive language practice through participation in conferences, workshops, and teaching assignments, which collectively contributed to the development of their English communication skills and academic self-confidence.

Moreover, these candidates demonstrated considerable digital resourcefulness by utilizing platforms such as Google Scholar, Research Gate, and open-access journals to access current scientific literature, thereby effectively circumventing institutional and financial barriers to resource accessibility. Peer collaboration and supervisor guidance were also identified as critical supports for refining academic writing and meeting the rigorous standards required for publication in international journals. Additionally, participants highlighted the necessity of adapting to new academic conventions and citation practices specific to English-language STEM publishing, a process made more complex by their prior educational experiences in a French-language academic environment.

This theme provides a direct and nuanced response to the study's research questions by elucidating the specific mechanisms through which Algerian STEM PhD researchers address and overcome the intertwined challenges of language proficiency and resource constraints that could otherwise impede their academic productivity and international visibility. The empirical evidence gathered from participants' experiences demonstrates that surmounting these challenges is not solely a matter of individual perseverance, but also involves the creative and strategic utilization of available resources. By detailing these adaptive approaches, the findings underscore the resilience and agency of doctoral candidates, offering valuable insights into how they sustain their research trajectories despite significant structural limitations. Ultimately, this theme highlights the importance of targeted institutional support and policy interventions, suggesting that enhanced language development initiatives and improved access to

academic resources could further empower non-native English-speaking scholars to participate more fully and equitably in the global STEM research community.

4. Comparison with Existing Literature

The findings of this study align with and expand upon existing research that highlights the significant linguistic barriers faced by non-native English-speaking researchers in scientific publishing. Consistent with the work of Flowerdew (2015) and Hyland (2016), participants in this study reported that limited English proficiency often impedes their ability to clearly express complex scientific ideas, sometimes causing the language difficulties to overshadow the scientific contributions of their work. However, this research goes further by revealing how these challenges are intensified within the Algerian context due to the legacy of a French-based educational system. Unlike much of the current literature, which broadly addresses language imperialism and marginalization (e.g., Canagarajah, 2002), this study emphasizes the "double linguistic burden" experienced by Algerian scholars who must transition from French to English while simultaneously mastering specialized STEM terminology. This dual challenge adds a unique layer of complexity to the publication process that has been insufficiently explored in postcolonial academic settings.

In addition to linguistic obstacles, the study highlights critical institutional and infrastructural barriers that compound publication difficulties for researchers from the Global South. While previous studies have acknowledged the disadvantages faced by these scholars, participants here pointed to specific limitations such as the loss of access to national databases like the SNDL and a reliance on unauthorized platforms such as Sci-Hub to obtain scholarly resources. These findings assert that inequities in access to academic infrastructure perpetuate global disparities in publishing. Furthermore, consistent with Belcher (2007), this research confirms that challenges extend beyond language to include methodological deficiencies, limited access to research equipment, and stringent formatting requirements. Importantly, the study also captures the proactive strategies employed by Algerian PhD students such as utilizing AI tools like ChatGPT, engaging in peer collaboration, and applying self-regulated learning techniques reflecting a growing recognition in the literature of the resilience and adaptability of multilingual scholars.

Collectively, the literature and this case study underscore the pressing need for enhanced institutional support in academic writing, mentorship, and training related to journal selection and submission processes to address these enduring inequities. Additionally, this comparative perspective highlights the

necessity of tailored interventions that consider both linguistic and cultural factors to improve STEM researchers 'writing proficiency and publication success.

In conclusion, the six themes identified in this study collectively reveal the intricate and multifaceted barriers faced by Algerian STEM PhD researchers in conducting and publishing scientific research in English. The interplay of linguistic challenges, educational legacies, infrastructural limitations, and broader systemic constraints not only shapes the academic experiences of these scholars but also impacts their ability to participate fully in the global scientific community. Despite these considerable obstacles, the findings highlight the remarkable resilience and ingenuity of the researchers, who continually devise and employ adaptive strategies to advance their work and overcome persistent challenges.

These insights underscore the pressing need for more inclusive and supportive academic practices, enhanced access to scholarly resources, and targeted interventions tailored to the needs of non-native English-speaking researchers. By addressing these structural and contextual barriers, academic institutions and policymakers can foster a more equitable environment that enables all scholars regardless of linguistic or educational background to contribute meaningfully to international scientific discourse and innovation.

5. Pedagogical implications

The findings of this study highlight the urgent need for higher education institutions in Algeria and similar EFL (English as a Foreign Language) contexts to rethink and strengthen their support systems for doctoral researchers in STEM fields. The prevalence of linguistic barriers, lack of mentorship, and limited access to English-language resources suggests that traditional content-focused curricula are insufficient. Pedagogically, this calls for the integration of targeted English for Academic Purposes (EAP) courses within STEM doctoral programs, with a focus on scientific writing, publication conventions, and discipline-specific language skills. Additionally, structured mentorship programs and writing workshops can provide both linguistic and practical guidance, fostering a culture of peer support and collaborative learning. Such interventions would not only improve researchers' academic writing proficiency but also boost their confidence and ability to participate in international scholarly discourse.

Moreover, the study's results underscore the importance of adopting a holistic approach to doctoral education that recognizes the interplay between language proficiency, research productivity, and academic identity. Educators and policy-makers should consider embedding ongoing formative assessment, feedback mechanisms, and access to digital tools (such as translation and editing software) into the

research training process. Encouraging the use of informal learning networks and peer review groups can help researchers develop critical self-editing and collaborative skills, while also reducing feelings of isolation and anxiety. Ultimately, these pedagogical shifts can empower Algerian PhD researchers to overcome systemic barriers, enhance the quality and visibility of their research outputs, and more fully integrate into the global scientific community.

6. Recommendations

Based on the interpretation of the findings, it is clear that both researchers and faculty members deeply value the need for enhanced institutional support to address the significant linguistic and academic challenges faced by STEM PhD researchers when conducting and publishing scientific research in English. Participants consistently highlighted the transformative potential of establishing dedicated academic writing centres within universities, which would offer targeted workshops, individualized feedback, and ongoing language support resources that are crucial for empowering non-native English-speaking researchers. Furthermore, the integration of structured mentorship programs, where experienced faculty members guide doctoral candidates through the complexities of academic writing and the publication process, was strongly recommended as a means of building both confidence and competence among early-career scholars. The study also underscores the importance of fostering collaboration between language instructors, subject specialists, and curriculum developers to ensure that academic writing instruction is both contextually relevant and tailored to the specific needs of STEM disciplines. In addition, participants suggested that providing access to professional editing services and establishing robust peer review networks would significantly ameliorate the clarity, quality, and international competitiveness of research outputs. Above all, it is vital for institutions to nurture a culture of encouragement, respect, and open communication, where researchers feel supported and empowered to seek assistance and share their experiences. By embracing these practical measures, universities can not only strengthen the academic success and global presence of their researchers but also make a meaningful contribution to the advancement of scientific research in Algeria.

7. Research Limitations

Limitations in a qualitative study refer to the inherent constraints or conditions that may influence the data collection and interpretation of findings or the transferability of results (Cresswell

&Cresswell,2018, p.199). In qualitative inquiries, a transparent acknowledgement of study limitations is paramount for establishing research integrity and methodological rigor.

Despite the rigorous efforts undertaken to ensure a robust research methodology, it is important to acknowledge several limitations that may have influenced the outcomes of this study. Firstly, the limited availability of prior research specifically addressing the challenges faced by Algerian STEM PhD researchers in conducting and publishing scientific research in English restricted the breadth of the literature review and may have constrained the interpretation of the findings. Secondly, due to time constraints and logistical considerations, the study focused exclusively on STEM PhD researchers at BBA University without incorporating perspectives from other Algerian universities. This narrow scope may not fully capture the diversity of experiences and challenges encountered by STEM PhD researchers across the country.

This narrow scope, coupled with a sample size comprising a specific group of participants, may not fully capture the diversity of experiences and challenges encountered by STEM PhD researchers across the country. Furthermore, the qualitative nature of the study, relying primarily on semi-structured interviews, inherently limits the transferability of the results. While qualitative research does not aim for generalizability, efforts were made to ensure transferability of the findings. Rich, contextual descriptions were provided to enable readers to assess the relevance of the results to other settings. However, given the study's focus on a single institution and a specific participant group, the findings may still be more applicable to similar academic contexts rather than the wider population of Algerian STEM PhD researchers. Additionally, the reliance on written responses for some interviews may have affected the depth and richness of the data collected, potentially limiting the insights derived from participants' experiences. Acknowledging these limitations not only provides a clearer understanding of the boundaries of this research but also offers valuable guidance for future studies seeking to explore similar issues in wider and more diverse academic contexts.

8. Suggestions for further research

In light of the findings and limitations of the present study, it is recommended that future research expand its scope to encompass a broader range of academic institutions and disciplinary contexts, both within Algeria and internationally, to ascertain the generalizability of the challenges identified among STEM PhD researchers. Subsequent studies should consider employing mixed-methods approaches,

integrating quantitative data with qualitative insights, to yield a more comprehensive understanding of the linguistic, cultural, and institutional barriers faced by non-native English-speaking researchers in conducting and publishing scientific work. Furthermore, it would be beneficial to investigate the efficacy of targeted pedagogical interventions such as genre-based writing instruction, academic writing workshops, and structured mentorship programs in improving researchers' academic writing proficiency and publication outcomes. Additional research might also explore the role of institutional support mechanisms, including language training and editorial assistance, in facilitating research productivity and international collaboration. By addressing these avenues, future scholarship can contribute to the development of evidence-based strategies and policies that more effectively support the academic and professional advancement of STEM researchers operating in English as a second or foreign language.

9. Conclusion

This phenomenological study aimed to explore the lived experiences of PhD researchers in STEM disciplines at BBA University regarding the challenges they face in conducting and publishing scientific research in English. Through in-depth semi-structured interviews with 21 participants, the research sought to capture the meanings and perceptions these researchers assign to their experiences, focusing on how language barriers, resource limitations, and institutional factors impact their academic work. Grounded in phenomenology, this study emphasized bracketing researchers' preconceptions to authentically understand participants' perspectives. The literature review provided a theoretical foundation on academic publishing challenges for non-native English speakers in STEM disciplines, highlighting gaps specific to the Algerian context. The methodology chapter detailed the qualitative design and thematic analysis used to identify core themes from participants' narratives.

Findings revealed significant linguistic and systemic obstacles that hinder effective research communication and publication in English. Participants shared rich insights into their struggles with academic writing, peer review processes, and institutional support. The discussion interpreted these findings within the broader academic and cultural context, underscoring the need for targeted interventions such as enhanced language training, mentorship, and policy reforms.

In conclusion, this purely qualitative study contributed to a deeper understanding of the complex challenges faced by STEM PhD researchers at BBA University when conducting and publishing scientific research in English. The findings highlighted the need for university stakeholders, administrators and

supervisors to implement supportive measures that create a more conductive environment and encourage further investigations to design effective tailored solutions for non-native English-speaking researchers.

GENRAL CONCLUSION

In summary, this thesis has offered an in-depth and nuanced examination of the linguistic and institutional challenges encountered by STEM PhD researchers at BBA University in their pursuit of conducting and disseminating scientific research in English. Through a qualitative lens, the study has revealed how language barriers, unfamiliarity with international publication norms, and limited institutional support collectively impede the academic development and publication achievements of non-native English-speaking scholars. At the same time, the research has brought to light the determination and resourcefulness demonstrated by these researchers, who actively seek mentorship and engage in targeted language development as means of overcoming these obstacles. The findings presented here not only address a significant gap in the literature regarding the Algerian higher education context, but also provide actionable recommendations for universities to establish comprehensive support systems and specialized training in academic writing. Looking ahead, it is imperative that future research further investigates the effectiveness of such interventions and explores their broader impact on research productivity and international collaboration. By prioritizing the development of robust linguistic and scholarly communication skills, academic institutions can empower their researchers to participate more fully in the global scientific discourse, thereby elevating both individual and institutional academic standing.

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APPENDICES

Appendix A: Teachers' Semi-Structured Interview

Title of Study: Investigating the Challenges Facing Algerian PhD Researchers in Conducting and Publishing Scientific Research in English: The Case of STEM PhD Researchers at BBA University.

Part One:

1- Can you tell me about what motivated you to pursue a PhD in your STEM field, and how your journey has been so far?

2- Can you describe your overall experience conducting research in English during your PhD?

Part Two:

3- Have you encountered difficulties while reading scientific articles in English? Could you share a specific instance that was particularly challenging?

4- What specific challenges do you encounter in the process of conducting research within your field of study, particularly when working in English?

5- How do these challenges affect your confidence or motivation as a researcher?

6- How do you usually cope with difficulties in academic writing in English?

7- How accessible are English-language academic resources for your research? Could you describe your typical experience finding and using them?

Part Three:

8- Have you previously published any research in English? If so, what challenges did you encounter throughout the publication process?

9- Do you think STEM PhD students in Algeria face more difficulties than students in other fields when it comes to publishing in English? Why or why not?

10- Have you noticed any patterns in the kind of feedback you receive from reviewers or supervisors regarding your English?

11- Have you had any experiences working with international collaborators or journals? How did language play a role?

12- To what extent do language difficulties influence your choice of journal or conference?

13- Do you think mastering English is a barrier or a gateway for Algerian researchers in STEM? Why?

14- If you could design a support system or program to help PhD researchers write in English, what would it look like?

Appendix B: Teachers' Information Sheet and Consent Form

Title of Study: Investigating the Challenges Facing Algerian PhD Researchers in Conducting and Publishing Scientific Research in English: The Case of STEM PhD Researchers at BBA University.

Research team:

Dounia BEDDIAF & Amina MANARI & Zoubida ABDOUNE

[Department of English Language, BBA University] **Supervisor:**

Dr. Afaf DJITI

Dear Research Participant,

You are invited to participate in a research study that aims to explore the challenges faced by Algerian PhD researchers in STEM fields, specifically regarding conducting and publishing scientific research in English. The study involves an interview where you will be asked a series of questions regarding your experiences and perceptions of these challenges.

Procedures: The interview will be conducted in a one-on-one setting and will take approximately 20-30 minutes. The interview will be audio-recorded for the purpose of transcription and analysis. Your name will not be used in any publications or reports. All data collected will be kept confidential, and the audio recordings will be destroyed once the research is completed.

Voluntary Participation: Participation in this study is completely voluntary. You have the right to refuse to participate in the study, and you have the right to withdraw from the study at any time without penalty.

Risks and Benefits: There are no known risks associated with participating in this study. However, the benefits of participating include contributing to research on the challenges faced by PhD researchers, and potentially gaining insights into your own experiences and perceptions regarding conducting and publishing research.

Confidentiality: All information collected in this study will be kept confidential. Any identifying information such as your name will not be used in any reports or publications. The audio recordings will be securely stored and only accessible to the research team.

Contact Information: If you have any questions or concerns regarding the study or the interview process, please contact the investigators via this email: dounia.beddiaf@univ-bba.dz or amina.manari@univ-bba.dz orzoubida.abdoune@univ-bba.dz

Consent: By signing this form, you confirm that you have read and understood the information provided in this form and that you agree to participate in the study. You also confirm that you understand that participation is voluntary, and that you have the right to withdraw from the study at any time.

Participant's Signature : _____ Date : _____

Investigator's Signature : _____ Date : _____

Appendix C: Example of a Teacher's Interview Transcript.

R: First of all, Sir how are you doing?

S: Fine, thank you.

S: Fine, thank you.

R: So our research is about the challenges faced by STEM PhD students when conducting research and publishing in English. Our sample is PhD students in STEM fields. Let's start with part one about your academic background and research experience. Can you tell me about what motivated you to pursue a PhD in your STEM field, and how your journey has been so far?

S: Before beginning the story of my PhD in my research field, the journey began with my bachelor's degree in Computer Science. The bachelor's degree was very awesome, full of challenges and problem-solving in CS. My ambition in programming and problem-solving pushed me to look forward beyond the basics seen in the university. I looked for other sub-fields of CS, and here is where I dreamed of completing my studies further in the field. Fortunately, after many attempts to get a PhD in many universities, I started my PhD in 2018 at University of Bordj Bou Arreridj. Honestly, it wasn't an easy mission due to many factors like the Covid epidemic and Hirak's manifestation between 2019-2021.

R: Can you describe your overall experience conducting research in English during your PhD?

S: My experience conducting research in English during my PhD was both enriching and challenging. The majority of journals published by many editions like Springer, Wiley, etc. are publishing papers and articles in English, hence, I have to use English in my research in order to publish my works as well as for papers to be accessible to a larger audience. Furthermore, all resources needed for my research are written in English which require translation to read it, therefore, reading the original writing language reduces my mission significantly. Fortunately, my English wasn't too bad and I didn't recognize any difficulties in reading or writing in English.

R: Moving to part two, which focuses on the challenges and difficulties you face when conducting research in English. Have you encountered difficulties while reading scientific articles in English? Could you share a specific instance that was particularly challenging?

S: Despite my given level of English, I have encountered some difficulties regarding reading scientific articles. For instance, writers explain their approaches in a lot of details using many tenses in the same paragraph. Despite that the field is purely technical and even if it is theoretical, it requires some explanation. Due to this problem, I couldn't complete reading some articles of many pages, say more than 30 pages! In order to overcome this problem, I went to English classes in order to sharpen my understanding of tenses in English. Fortunately, the class helped me even in enhancing my English speaking and writing skills. Furthermore, I searched for a new way to read and understand such articles. For a given article, I did many reads - in every attempt I tried to do some schemes that describe the specific purpose of a given point and re-assemble the scheme in just one that explains the general purpose of the approach in the last attempt.

R: What specific challenges do you encounter in the process of conducting research within your field of study, particularly when working in English?

S: The most significant challenge for any PhD student is how to defend the details of the proposed approach. For me, this was a little bit difficult. During my PhD, it was the first time that I wrote a long document in English, it was very difficult to write all details. As you know, maybe the biggest text that we wrote in English was about 8-12 lines. In my field of research, the smallest document was about 20 pages - every page contained mathematical proofs, demonstration explanations of the proposed method and even related works. Furthermore, the second challenge of writing my document is how to keep the paragraphs coherent between them with the same level of writing. Another challenge for me in writing in English is how to answer the reviewers' comments and reviews and give them the essentials of their comments with respect to my work as well as give them additional arguments - more paragraphs - to answer their reviews, each reviewer with its point of view regarding my article(s).

R: How do these challenges affect your confidence or motivation as a researcher?

S: Actually, we cannot say that these challenges affect our confidence as researchers because this is part of our job. However, for newly recruited PhD students, it must be a big problem that may harm the scheduling of such thesis. On one hand, instead of looking for new ideas to publish and fix them or to plan the future steps of the thesis, students must enhance their English level and enhance their grammar skills

and of course this will affect the timeline of such thesis. On the other hand, it is easy to say the fast growth of many domains such as computer science. Any delay in publishing your work makes the ideas obsolete.

R: How do you usually cope with difficulties in academic writing in English?

S: There are multiple solutions to overcome such difficult problems in academic writing. There are many articles that talk about how to write your scientific article properly. These articles are very important for any new PhD student. For students who are doing their writing, they may use tools to correct the articles namely, PaperPal, QuillBot. These are AI tools that help students significantly to reformulate and/or correct their articles. Personally, I used them to gain time and publish as soon as possible. At this point exactly, I would like to recommend to concerned institutions to organize workshops on how to write papers and articles and even reports for students of all levels in order to provide them the good skills that help them to produce excellent documents.

R: How accessible are English-language academic resources for your research? Could you describe your typical experience finding and using them?

S: Several resources may be cited in this part. Starting from the software tools, I used free tools to do any programming and writing tasks. Some other software that require payment, I used my professional email from University of Bordj Bou Arreridj. I suggest strongly all students request their professional emails from their universities and exploit all solutions that could be obtained free using these emails. Regarding the needed articles in my research, I faced some problems due to the prices of such articles because they are for sale by editors online. Fortunately, the university gave us a tool called SNDL where we subscribe in the university's library to use prepaid articles from many journals and editors. For writing purposes, I used software called Overleaf, a famous online text editor for LaTeX scripts designed especially for collaborative writing. Unfortunately, it is no more free, just a specific space - 2 collaborators per project. It will be very important to find a solution for the last problem because it is a very useful tool for students to gain time and space as well as for supervisors to edit every student's work straightforwardly.

R: Now let's move to part three, which focuses on publication experiences and your perspectives on English in STEM research. Have you previously published any research in English? If so, what challenges did you encounter throughout the publication process?

S: Absolutely! In fact, I published 4 papers, two articles and 2 conference papers. All the four documents were written in English. The conferences, they were accepted since the first submissions. In fact, the reviewers stated some problems related to the domain specifications instead of the presentation of the content. For one article, it was submitted to a foreign journal called WIREs published by the editor Wiley in New York, USA. One of the reviewers mentioned too many mistakes related to the content in addition to the domain-related reviews. In fact, this article was prepared in my first year of PhD studies so, it was very challenging to me to create a document of 30 pages with long paragraphs in English! Fortunately, after 1 year and a month, it was accepted and I defended my thesis with it. Due to the efforts done in that article, the last one was very easy to me since I enhanced my English level and took the same reviews into consideration for its enhancement.

R: Do you think STEM PhD students in Algeria face more difficulties than students in other fields when it comes to publishing in English? Why or why not?

S: Personally, I don't think that STEM PhD students face any kind of difficulties. In fact, it is a regular task. Nowadays, all technical and engineering documentations are provided in English. The indexed journals are all in English and they don't support any other languages.

R: Have you noticed any patterns in the kind of feedback you receive from reviewers or supervisors regarding your English?

S: Reading and writing in English in my PhD wasn't a very difficult task for me despite the challenges that I stated already. However, it doesn't prevent that I received some reviews about my writing. For my supervisor, he was very satisfied about my English. He was telling me that he didn't see any big mistakes and errors in my writings - papers - he just enriched the works by his own point of view and additional explanations. Moreover, we worked with a Canadian co-supervisor, he told us that he worked with many Arabs and he had seen many errors in their writing however, he was never tired of reading our works and that made him very satisfied about our works and he was able to enrich the works too. All of this made my PhD journey using English language a great experience in my life.

R: Have you had any experiences working with international collaborators or journals? How did language play a role?

S: Yes, I worked with a Canadian professor from the Harbin Institute of Technology, Shenzhen, China. I already stated his experience of working with us.

R: To what extent do language difficulties influence your choice of journal or conference?

S: As I mentioned before, I didn't face any big difficulties in the choice of journal. In fact, my supervisor corrected any errors and enhanced any part of my works. The co-supervisor worked too much with us and his feedback on the content - domain-related or content writing - was very helpful. Hence, the process of finding journal or conference was very straightforward for us.

R: Do you think mastering English is a barrier or a gateway for Algerian researchers in STEM? Why?

S: Absolutely yes. English language is the most used language by the majority of countries all around the world. Even in Europe, they use it instead of their native language. Here in Algeria, the international conferences accept mostly all papers written in English. Even the authors prefer English. In fact, English is an easy to use language due to its simple syntax. Furthermore, according to recent studies, 17% of population in the world use English. Hence, it's an obligation for any Algerian researcher to study and use English in his researches. Of course, this is mandatory for STEM researchers than other fields as I stated before.

R: If you could design a support system or program to help PhD researchers write in English, what would it look like?

S: In my opinion, there should be a community of PhD students and English professors that collaborate for, firstly, learning English - at least, technical English for STEM fields - since it is very challenging for students. This can be achieved by creating online applications like social media pages or even university clubs in the literature faculties, these faculties focus on creating workshops on how to learn English and/or how to write coherent papers for STEM PhD students in collaboration with STEM professionals. Secondly, the collaboration between STEM professionals and English professors that can guarantee such English level tests without the need for official exams from the University administration. By this last solution, students will have a detailed report on their point of failures in reading/writing in English and have the opportunity to do these tests without the need for any additional costs from private English schools. Another solution may be proposed regarding the reviewing of written papers before doing the

submission to the journals. In fact, STEM PhD students must also focus on publishing some works in international conferences that take place here in Algeria.

R: That's all, thank you for your answers, they were very interesting and very rich with information. Thank you so much and we really appreciate your participation.

S: Thank you, I wish you the best of luck with your research.

Résumé

Cette étude porte sur les défis rencontrés par les doctorants en sciences, technologie, ingénierie et mathématiques (STEM) à l'Université de Bordj Bou Arreridj lors de la conduite et de la publication de leurs recherches scientifiques en anglais. L'objectif est d'identifier les difficultés spécifiques auxquelles ces chercheurs font face dans la rédaction et la publication, d'évaluer l'impact de ces obstacles sur leur progression et succès en recherche, et d'examiner les stratégies employées pour surmonter ces défis. La méthodologie adoptée est purement qualitative, basée sur des entretiens semi-structurés approfondis avec 21 doctorants en STEM, suivis d'une analyse thématique des données. Les résultats indiquent que les chercheurs rencontrent des obstacles linguistiques et académiques importantes dues à une maîtrise insuffisante de l'anglais et des normes internationales de publication, ce qui affecte la qualité et la diffusion de leurs travaux. L'étude souligne la nécessité d'un soutien académique renforcé pour développer les compétences en écriture scientifique en anglais des chercheurs algériens. Cette recherche met en évidence l'importance cruciale de la rédaction scientifique académique pour la communication internationale et recommande la mise en place de programmes pédagogiques adaptés afin d'aider les chercheurs à dépasser les obstacles linguistiques et culturels, contribuant ainsi à valoriser la recherche scientifique algérienne à l'échelle mondiale.

Mots-clés : doctorants STEM, défis linguistiques, rédaction scientifique, publication académique, soutien académique.

ملخص

تركّز هذه الدّراسة على التّحديات التي يواجهها طلبة الدّكتوراه في العلوم والتكنولوجيا والهندسة والرياضيات في جامعة برج بوعريريج عند إجراء بحوثهم العلميّة ونشرها باللّغة الإنجليزية. تهدف الدّراسة إلى تحديد الصّعوبات المحدّدة التي يواجهها هؤلاء الباحثون في الكتابة والنّشر، وتقييم تأثير هذه العقبات على تقدّمهم البحثي ونجاحهم، ودراسة الاستراتيجيات المستخدمة للتغلب على هذه التّحديات. تعتمد المنهجيّة المتّبعة على منهجية نوعية بحتة، حيث أُجريت مقابلات شبه منظمة ومتعمقة مع 21 طالب دكتوراه في التّخصصات المذكورة، تلاها تحليل موضوعي للبيانات المجمّعة، حيث أظهرت النتائج أن الباحثين يواجهون عوائق لغوية وأكاديمية كبيرة ناجمة عن ضعف إتقان اللّغة الإنجليزية وعدم الإلمام بمعايير النّشر الدّولية، مما يؤثر سلبًا على جودة أبحاثهم وفرص نشرها. تُبرز الدّراسة الحاجة الملحّة إلى تعزيز الدّعم الأكاديمي لتطوير مهارات الكتابة العلمية باللّغة الإنجليزية لدى الباحثين الجزائريين. كما تؤكد على الدّور الحيوي للكتابة العلميّة الأكاديمية كوسيلة فعّالة للتواصل الدّولي، وتوصي بإدخال برامج تعليميّة متخصّصة تهدف إلى تمكين الباحثين من تجاوز الحواجز اللّغوية والثّقافية، مما يسهم في رفع مكانة البحث العلمي الجزائري على المستوى العالمي.

الكلمات المفتاحية: طلبة الدكتوراه في العلوم والتكنولوجيا والهندسة والرياضيات، التحديات اللغوية، الكتابة العلمية، النشر الأكاديمي، الدعم الأكاديمي.