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## An ESP-based Investigation of the Utilization of English Verb Tenses in Computing Science Articles

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*To my family, teachers, and mentors*
*who have supported me throughout this journey*

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Djaber Khaled

**Abstract**

This Master's dissertation critically examines the utilization of English verb tenses within computing science articles authored by non-native English speakers (NNES) at Mohamed Khider University of Biskra. While precise verb tense usage is paramount for effective communication in computing science, NNES frequently encounter challenges in mastering its nuanced applications. Employing a mixed-methods approach, the study comprehensively combined a quantitative corpus analysis of computing science articles with qualitative data derived from surveys administered to department members and interviews with NNES students/researchers. Findings unequivocally reveal that the Present Simple and Past Simple are the predominant tenses, serving distinct rhetorical functions across various article sections. Furthermore, NNES consistently struggle with distinctions between the Simple Past and Present Perfect, passive voice usage, and tense sequencing, often influenced by L1 interference from Arabic and French. This research endeavors to contribute to a deeper understanding of disciplinary linguistic features, simultaneously providing evidence-based recommendations for tailored English for Specific Purposes (ESP) curricula designed to enhance NNES academic writing skills in computing science.

**Keywords:** English for Specific Purposes, Verb Tenses, Academic Writing, Computing Science, Non-Native English Speakers, Corpus Linguistics

**Résumé**

Ce mémoire de Master examine l'utilisation des temps verbaux anglais dans les articles de science informatique rédigés par des locuteurs non natifs d'anglais (NNES) à l'Université Mohamed Khider de Biskra. Une communication efficace en informatique exige une utilisation précise des temps verbaux anglais, mais les NNES rencontrent souvent des difficultés à maîtriser ces nuances. Adoptant une approche par méthodes mixtes, l'étude a combiné une analyse quantitative d'un corpus d'articles de science informatique avec des données qualitatives issues d'enquêtes auprès des membres du département et d'entretiens avec des étudiants/chercheurs NNES. Les résultats révèlent que le Present Simple et le Past Simple sont les temps prédominants, remplissant des fonctions rhétoriques distinctes à travers les différentes sections d'articles. De plus, les NNES luttent fréquemment avec les distinctions entre le Simple Past et le Present Perfect, l'utilisation de la voix passive et la concordance des temps, souvent influencés par l'interférence de leur L1 (arabe et français). Cette recherche contribue à une compréhension approfondie des caractéristiques linguistiques disciplinaires et fournit des recommandations fondées sur des preuves pour des programmes d'anglais à des fins spécifiques (ESP) adaptés, afin d'améliorer les compétences en écriture académique des NNES en science informatique.

**Mots-clés :** Anglais sur Objectifs Spécifiques, Temps Verbaux, Rédaction Académique, Informatique, Locuteurs Non-Natifs d'Anglais, Linguistique de Corpus

# Contents

**Acknowledgments** ii

**Abstract** i

**Résumé** i

**Table of Contents** iii

**List of Figures** iv

**List of Tables** v

**1 Introduction** 1
- 1.1 Background of the Study . . . 1
- 1.2 Problem Statement . . . 1
- 1.3 Rationale/Justification of the Study . . . 2
- 1.4 Research Questions (RQs) . . . 2
- 1.5 Objectives of the Study . . . 2
- 1.6 Significance of the Study . . . 3
- 1.7 Scope and Delimitations of the Study . . . 3
- 1.8 Definition of Key Terms . . . 3
- 1.9 Structure of the Dissertation . . . 4

**2 Literature Review** 5
- 2.1 The Grammatical and Rhetorical Foundations of Tense, Aspect, and Mood (TAM) . . . 5
  - 2.1.1 Defining Tense, Aspect, and Mood . . . 5
  - 2.1.2 The Rhetorical Functions of Verb Choices in Academic Discourse . . . 6
- 2.2 Conventional Verb Tense Patterns in Scientific Research Articles . . . 6
  - 2.2.1 The IMRaD Structure as a Rhetorical Framework . . . 6
  - 2.2.2 Tense-Shifting across IMRaD Sections . . . 7
- 2.3 English for Specific Purposes (ESP) and the Discourse of Computing Science . . . 7
  - 2.3.1 Principles of English for Specific Purposes . . . 7
  - 2.3.2 The Unique Linguistic Landscape of Computing Science . . . 8
- 2.4 Challenges for Non-Native English Speakers (NNES) in Academic Writing . . . 8
  - 2.4.1 Cross-Linguistic Influence (L1 Interference) . . . 8
  - 2.4.2 Intralingual and Developmental Challenges . . . 9
- 2.5 Corpus Linguistics as a Methodology for Disciplinary Analysis . . . 9
- 2.6 Identification of the Research Gap and Contribution of the Present Study . . . 10
- 2.7 Conclusion . . . 10

**3 Methodology** 11
- 3.1 Research Design . . . 11
  - 3.1.1 Ethical Considerations . . . 11
- 3.2 Corpus Collection and Description (Quantitative Data Source) . . . 12
  - 3.2.1 Corpus Selection Criteria . . . 12
  - 3.2.2 Corpus Compilation Process . . . 12
- 3.3 Quantitative Data Collection: Automated Verb Tense Analysis . . . 12

3.3.1 What is Natural Language Processing (NLP)? . . . 12
3.3.2 Tool Used: Python Script with spaCy . . . 13
3.3.3 How Verb Tenses were Identified . . . 13
3.3.4 Section Identification . . . 14
3.3.5 Output Data Structure . . . 14
3.4 Qualitative Data Collection . . . 14
3.4.1 Survey (Questionnaire for Department Members) . . . 14
3.4.2 Semi-Structured Interviews (NNES Students/Researchers) . . . 15
3.4.3 Qualitative Article Analysis (Deeper Look for Functions and Errors) . . . 15
3.5 Data Analysis Procedures . . . 16
3.5.1 Analyzing the Numbers (Quantitative Data) . . . 16
3.5.2 Analyzing the Ideas (Qualitative Data) . . . 16
3.5.3 Putting It All Together . . . 16
3.6 Reliability and Validity / Trustworthiness . . . 17

**4 Results and Discussion: Verb Tense Utilization in Computing Science Articles 18**
4.1 Introduction to the Chapter . . . 18
4.2 Methodology Recap for Merged Section Analysis . . . 18
4.3 Verb Tense Distribution in Sections . . . 18
4.3.1 Abstract . . . 18
4.3.2 Introduction . . . 19
4.3.3 Background . . . 20
4.3.4 Literature Review / Related Work . . . 21
4.3.5 Methodology . . . 23
4.3.6 Results and Discussion . . . 23
4.3.7 Conclusion . . . 25
4.3.8 Others . . . 25
4.4 General Discussion and Implications for ESP . . . 26
4.5 Limitations of Current Analysis . . . 27
4.6 Conclusion . . . 27

**5 Conclusion and Recommendations 29**
5.1 Summary of Key Findings . . . 29
5.2 Contributions and Significance of the Study . . . 30
5.3 Pedagogical Recommendations . . . 30
5.4 Limitations of the Study . . . 31
5.5 Directions for Future Research . . . 31

**Appendices 32**
.1 The Questionnaire . . . 32
The Questionnaire . . . 32

# List of Figures

4.1 Verb Tense Distribution for: ABSTRACT . . . . . 19
4.2 Verb Tense Distribution for: INTRODUCTION . . . . . 20
4.3 Verb Tense Distribution for: BACKGROUND . . . . . 21
4.4 Verb Tense Distribution for Literature Review and Related Work Sections . . . . . 22
4.5 Verb Tense Distribution for: METHODOLOGY . . . . . 23
4.6 Verb Tense Distribution for Results and Discussion Sections . . . . . 24
4.7 Verb Tense Distribution for: CONCLUSION MERGED . . . . . 25
4.8 Verb Tense Distribution for: OTHERS . . . . . 26

# List of Tables

# Chapter 1

# Introduction

## 1.1 Background of the Study

In the contemporary landscape of scientific research, effective communication is paramount. This holds particularly true within the domain of Computing Science (CS), where the precise application of English verb tenses is indispensable for conveying complex technical information accurately. However, for a substantial number of students and researchers who are non-native English speakers (NNES), mastering these linguistic nuances frequently presents significant challenges. This study endeavors to investigate the intricate usage patterns of verb tenses in computing science articles, specifically those published by the Department of Computing Science at Mohamed Khider University of Biskra, encompassing research papers, conference proceedings, and posters.

The primary focus of this research centers on elucidating the rhetorical functions of these verb tenses. Furthermore, it seeks to comprehend the specific challenges that NNES encounter during the writing process, particularly within the specialized field of English for Specific Purposes (ESP). By systematically examining these facets, the study aims to foster a more profound understanding of verb tense utilization in computing science, while simultaneously identifying the impediments faced by NNES. The ultimate objective is to generate evidence-based insights that can inform the development of more effective ESP teaching materials tailored to the unique needs of computing science students.

The impetus for this research stems from my dual academic background. As a Computing Science professor, I consistently observe the critical importance of clear and precise writing in English for disseminating research in Computing Science, given its global lingua franca status. Concurrently, as a Master's student specializing in Science of Languages, I am actively engaged in the study of academic writing conventions and the meticulous analysis of their linguistic intricacies.

This distinctive combination of expertise has brought to my attention a significant challenge: many non-native English-speaking (NNES) computing scientists, including my own esteemed colleagues, frequently experience difficulties in correctly employing English verb tenses within their published academic works.

## 1.2 Problem Statement

It is widely acknowledged that verb tenses are fundamental for conveying accurate meaning in academic texts (3). Nevertheless, non-native English-speaking students and researchers affiliated with the Department of Computing Science at Mohamed Khider University of Biskra frequently grapple with specific challenges related to verb tense usage. A comprehensive understanding of these challenges, including the precise patterns of English verb tense utilization in CS articles authored by students and researchers within our university context, remains elusive (2; 1). Consequently, the current provision of English language support, particularly through ESP frameworks, may not adequately cater to their specific needs regarding verb tense mastery within their discipline. This study is designed to address this identified gap. It will seek to uncover the most prevalent tense patterns, their functional roles, and the primary impediments encountered by these NNES authors.

## 1.3 Rationale/Justification of the Study

Computing Science, as a global field of study, predominantly utilizes English as the primary lingua franca for scholarly discourse and international collaboration (10). For students and researchers at Mohamed Khider University of Biskra, it is therefore imperative to articulate their research effectively in English. This proficiency is crucial for their academic progression, future professional endeavors, and active participation within the international scientific community. Inaccurate verb tense usage can lead to ambiguity, undermine the credibility of research (23), and impede the clear communication of complex technical concepts prevalent in CS.

This investigation holds substantial importance due to the pressing need to support NNES in CS in enhancing their academic writing proficiency. By meticulously examining verb tense usage and associated challenges within our specific university context, this research aims to provide robust justification for enhancing ESP pedagogy. The derived findings will prove invaluable for curriculum designers, ESP instructors (11), and CS students, fostering improved language support that can ultimately elevate the quality of scientific papers originating from our university. Furthermore, understanding these localized linguistic patterns can significantly contribute to the broader field of ESP research pertaining to scientific and technical English.

## 1.4 Research Questions (RQs)

This dissertation endeavors to address the following research questions:

### Research Questions

]RQ1: Dominant Verb Tenses in Computing Science Subgenres

1. - What are the predominant verb tenses employed across distinct subgenres of computing science articles (e.g., research papers, conference proceedings, posters)?
   - Do significant disparities exist in verb tense utilization between theoretical research papers (e.g., AI algorithms) and applied research papers (e.g., software engineering)?
   - How do verb tense patterns vary between articles authored by native and non-native English speakers within the same subgenre?
   - In what specific ways do English verb tenses diverge from their Arabic and French counterparts?
2. RQ2: Functionality of Verb Tenses in Computing Science Discourse
   - How do verb tenses functionally operate within the specific discourse of computing science articles?
   - To what extent do verb tenses contribute to the clarity and precision of technical descriptions (e.g., algorithms, system architectures)?
   - What role do verb tenses play in establishing research credibility (e.g., presenting past work versus current findings)?
3. RQ3: Challenges Faced by Non-Native Speakers in Verb Tense Usage
   - What specific challenges do non-native English speakers encounter when employing verb tenses in computing science articles?
   - Do cultural or linguistic factors (e.g., L1 interference) influence how non-native speakers perceive and utilize verb tenses in computing science articles?
   - How do non-native speakers' proficiency levels (e.g., B2 versus C1) impact their ability to accurately use verb tenses in academic writing?

## 1.5 Objectives of the Study

The current investigation targets to:

- To identify the predominant verb tenses employed across diverse subgenres of computing science articles.
- To analyze the functional roles of verb tenses within computing science discourse, encompassing their contribution to temporality, modality, and rhetorical effects.
- To explore the challenges encountered by non-native speakers in accurately comprehending and utilizing verb tenses within computing science articles.
- To furnish recommendations for the development of ESP teaching materials and pedagogical strategies specifically tailored to address the needs of non-native speakers in computing science.

## 1.6 Significance of the Study

This dissertation is anticipated to yield several important contributions. Firstly, it will foster a more profound understanding of English verb tense operation within the specialized language of Computing Science, particularly based on articles originating from our Algerian university. This contribution will enrich the general body of knowledge in ESP concerning a crucial academic domain (11). Secondly, by pinpointing the specific challenges faced by NNES at Mohamed Khider University of Biskra (2; 1), this study will provide actionable insights essential for targeted intervention. The findings will directly inform the design of enhanced ESP courses and teaching materials, thereby empowering CS students and researchers to produce higher quality academic papers. This, in turn, can augment the international visibility of research emanating from our department. Lastly, the insights gleaned regarding NNES verb tense usage and associated difficulties could potentially contribute to the development of novel AI-based computer tools designed to assist NNES in authoring academic papers in technical subjects.

## 1.7 Scope and Delimitations of the Study

This research is delimited to the examination of English verb tenses as utilized in academic articles within the field of Computing Science. The corpus for this study comprises research papers, conference proceedings, and posters authored by individuals (students and teachers) affiliated with the Department of Computing Science at Mohamed Khider University of Biskra. Given the localized focus of this investigation, its findings may not be directly generalizable to all NNES populations or across other academic disciplines without further empirical validation. The study primarily concentrates on a fundamental set of English verb tenses, including the simple present, simple past, present perfect, future forms (e.g., 'will + verb'), common modal verbs (e.g., 'can', 'may', 'should'), and the passive voice (6). While other grammatical aspects are undoubtedly relevant, they fall outside the scope of this tense-centric inquiry. Data pertaining to surveys and interviews will be collected exclusively from NNES participants within the aforementioned department, thereby establishing a clear boundary for the study's generalizability.

## 1.8 Definition of Key Terms

To ensure conceptual clarity and consistency throughout this dissertation, the following key terms are defined:

- **English for Specific Purposes (ESP):** This pedagogical approach tailors language instruction to the specific linguistic needs and communicative demands of learners within particular academic or professional domains (13). In the context of this study, it denotes English instruction specifically designed to meet the academic and occupational requirements of Computing Science students.
- **Verb Tense:** Within grammar, verb tense signifies the temporal relationship of an action or state (e.g., past, present, or future), often indicating whether the action is completed or ongoing (19).
- **Computing Science Discourse:** This term refers to the specialized language, conventional writing styles, and communicative practices employed by individuals communicating within academic and professional contexts of computing science (14).
- **Non-Native English Speakers (NNES):** These are individuals whose primary linguistic background is not English, yet who utilize English for academic or professional pursuits. In this study, NNES predominantly refers to individuals whose primary languages are Arabic or French.

- **L1 Interference (Language Transfer):** This phenomenon describes the influence of a person's first language on their acquisition and use of a second language. Such cross-linguistic influence can manifest as errors or deviations from standard second language usage (18; 7).

## 1.9 Structure of the Dissertation

This dissertation is structured into six comprehensive chapters. Chapter One, the Introduction, establishes the study's foundational elements, including its background, problem statement, rationale, research questions, objectives, significance, and delimitations, alongside key term definitions. Chapter Two presents a comprehensive Literature Review, synthesizing existing scholarship on verb tenses in academic writing, English for Specific Purposes (ESP), challenges faced by NNES, and the specialized language of Computing Science. Chapter Three outlines the detailed Research Methodology, encompassing the mixed-methods design, corpus collection strategies, the quantitative analysis tools employed, and the qualitative data collection procedures involving surveys and interviews, culminating in an explanation of data analysis protocols. Chapter Four meticulously presents the empirical Results and Findings derived from the corpus analysis and qualitative data. Chapter Five provides a thorough Discussion of these findings, interpreting the observed patterns in relation to the research questions and existing literature. Finally, Chapter Six offers the overall Conclusion of the study, presents concrete pedagogical recommendations, acknowledges the research's limitations, and proposes avenues for future scholarly inquiry.

# Chapter 2

# Literature Review

This chapter offers a comprehensive and synthesized review of the scholarly literature pertinent to the current investigation. It critically examines the existing body of knowledge on the role of English verb tenses in academic writing, with a specific focus on the pedagogical framework of English for Specific Purposes (ESP) and the unique challenges encountered by non-native English speakers (NNES). The primary objective of this review is to construct a robust theoretical and empirical foundation for the study by systematically mapping what is known and, more importantly, identifying the specific research gaps that this dissertation seeks to address.

The chapter is structured to guide the reader from general linguistic principles to the specific context of this study. It begins by establishing the foundational role of Tense, Aspect, and Mood in conveying meaning in academic discourse. It then examines the highly conventionalized verb tense patterns within the standard IMRaD (Introduction, Methods, Results, and Discussion) structure of scientific articles. Following this, the review situates the research within the principles of ESP, exploring the unique linguistic landscape of Computing Science. A significant portion is dedicated to a multi-faceted analysis of the challenges NNES writers face, including cross-linguistic interference from Arabic and French, intralingual difficulties, and pedagogical factors. Finally, the chapter justifies the use of corpus linguistics as a powerful analytical tool before culminating in a precise identification of the research lacunae that underscore the necessity and originality of the present study.

## 2.1 The Grammatical and Rhetorical Foundations of Tense, Aspect, and Mood (TAM)

To fully appreciate the complexities of verb usage in academic writing, it is essential to move beyond a simplistic view of "tense" as merely an indicator of time. A more sophisticated understanding requires consideration of the interconnected system of Tense, Aspect, and Mood (TAM), which together provide the grammatical resources for authors to situate events in time, describe their internal structure, and express their attitude towards the proposition.

### 2.1.1 Defining Tense, Aspect, and Mood

In modern linguistics, these three categories are understood as distinct yet interactive systems:

- **Tense** is a grammaticalized category that locates a situation in time, typically relative to the moment of speaking or writing (the deictic center). English grammar primarily marks a distinction between past and non-past (present), with future time being expressed through modal auxiliaries (e.g., *will*), semi-modals (e.g., *be going to*), or the simple present (19).
- **Aspect** describes the internal temporal constituency of a situation, that is, how an event or state unfolds in time. It is not concerned with when an event occurred, but how it is viewed by the speaker. The primary aspectual distinction in English is between the **perfective** aspect (viewing an event as a complete, bounded whole, typically expressed by the simple tenses) and the **imperfective** aspect (viewing an event from the inside, as ongoing or incomplete, expressed

by the progressive or continuous forms, e.g., "was running") (6). The perfect aspect (*have* + past participle) adds another layer, relating a past situation to a later time point, often the present.

- **Mood** relates to the speaker's or writer's stance or attitude towards the factual status of their proposition. It distinguishes between what is presented as fact (the **indicative** mood, e.g., "The system *works*"), what is a command (the **imperative** mood), and what is non-factual, hypothetical, or counterfactual (the **subjunctive** mood). Modality, often expressed through modal auxiliary verbs (*can, may, should, must, might, would*), is a key way of signaling mood, expressing degrees of certainty, possibility, necessity, or obligation (4).

In academic writing, the interplay between these categories is crucial. A writer's choice is not simply between "past" and "present," but between presenting a finding as a completed, bounded event in the past (Simple Past, perfective aspect) versus connecting it to the present state of knowledge (Present Perfect, perfect aspect).

### 2.1.2 The Rhetorical Functions of Verb Choices in Academic Discourse

The selection of a particular verb form in an academic text is a powerful rhetorical act that positions the writer, the research, and the reader within a disciplinary conversation. Seminal works in genre analysis by (22) and in academic discourse by (14) have established that grammatical choices are functional, serving specific communicative purposes that are recognized by members of a discourse community.

- **Establishing Common Ground:** The use of the **Present Simple** tense is a primary strategy for presenting information as established fact, general truth, or part of the shared knowledge base of the discipline (e.g., "Moore's Law *states* that..."). By using this tense, the author signals to the reader, "This is something we can all agree on; it is our starting point" (14).
- **Reporting Research:** The **Past Simple** is the conventional tense for reporting the specific actions, procedures, and findings of one's own research or the specific research of others (e.g., "We *conducted* a user study," or "Abbas et al. (2021) *developed* a secure routing method"). This grounds the research claims in a specific, completed empirical context, which is fundamental to establishing scientific credibility.
- **Creating a Research Space:** The **Present Perfect** is instrumental in constructing a narrative that links past research to the present moment. It is used to indicate that a research area is current and ongoing ("Researchers *have explored* various solutions...") and to identify a research gap by highlighting what has or has not been done up to the present ("While much work *has focused* on security, less attention *has been paid* to scalability"). This rhetorical move is central to justifying the need for the current study (23).
- **Expressing Stance:** Modal verbs are key resources for expressing epistemic stance—the writer's level of commitment to the truth of a proposition. A writer can make a strong claim ("This *must* be the cause"), a hedged or cautious claim ("This *may* suggest..."), or a recommendation ("Future work *should* investigate..."). The appropriate use of modality is a hallmark of sophisticated academic writing, allowing authors to negotiate claims with their readers carefully (14).

An inability to control these rhetorical functions through appropriate TAM choices can lead to writing that appears naive, overly assertive, or disconnected from the disciplinary conversation.

## 2.2 Conventional Verb Tense Patterns in Scientific Research Articles

The scientific research article, particularly in fields like Computing Science, has evolved into a highly conventionalized genre. The most common structure, IMRaD (Introduction, Methods, Results, and Discussion), is not merely an organizational template but a rhetorical framework that guides the reader through the scientific argument. This framework is accompanied by predictable patterns of verb tense usage that signal the function of each section (22).

### 2.2.1 The IMRaD Structure as a Rhetorical Framework

The IMRaD structure reflects the process of scientific inquiry itself.

- **Introduction:** What was the problem/question? (Establishes context and rationale).
- **Methods:** How was the problem studied? (Details the experimental procedure).
- **Results:** What were the findings? (Presents the data).
- **Discussion:** What do the findings mean? (Interprets the results and discusses implications).

This logical progression is reinforced by systematic tense-shifting, which acts as a linguistic signpost for the reader.

### 2.2.2 Tense-Shifting across IMRaD Sections

The movement through an IMRaD paper is characterized by a "general-specific-general" pattern, which is mirrored in tense selection.

- **Introduction:** This section moves from general background to the specific study. Following Swales's (22) CARS (Create a Research Space) model, authors typically use the **Present Simple** to establish the research territory ("Blockchain technology *offers* a decentralized solution...") and the **Present Perfect** to review previous literature and establish the current state of the art ("Numerous studies *have investigated*..."). When identifying a gap or problem, a mix of Present Perfect and Past Simple may be used. To announce the present work, authors often shift to the **Present Simple** ("This paper *presents*...") or **Past Simple** ("In this study, we *analyzed*...").

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- **Methods:** This section is the most grammatically consistent. As it recounts the specific, completed actions undertaken by the researchers, the dominant tense is the **Past Simple**, very often in the passive voice to maintain an objective, agentless focus (e.g., "The dataset *was divided* into training and testing sets," "The models *were trained* using..."). This tense choice emphasizes that the methods are part of a historical, replicable scientific record (23).
- **Results:** This section reports the outcomes of the study. The **Past Simple** is used to state the specific findings from the completed experiments (e.g., "The algorithm *outperformed* the baseline model," "No significant difference *was found*..."). A crucial shift to the **Present Simple** occurs when authors direct the reader's attention to non-verbal elements within the paper itself, such as tables and figures (e.g., "Table 1 *shows* the performance metrics," "Figure 2 *illustrates* the network architecture"). This present tense is used because the table or figure is "speaking" to the reader at the moment of reading.
- **Discussion:** Here, the focus returns from the specific findings to their general implications. This section features the most complex mix of tenses. The **Past Simple** is used to summarize the study's key findings ("Our results *indicated* that..."). The **Present Simple** is used to interpret these results and connect them to the broader field ("These findings *suggest* that... This *supports* the theory of..."). Modal verbs are highly frequent for hedging claims (*may, might, could*) and making recommendations (*should*). The **Future Simple** (*will*) or other future forms are used to outline directions for future research ("Future work *will focus* on...").

This predictable yet complex pattern of tense-shifting can be a major hurdle for NNES writers who may not have received explicit instruction in these genre-specific conventions (12).

## 2.3 English for Specific Purposes (ESP) and the Discourse of Computing Science

The challenges outlined above are precisely what the field of English for Specific Purposes (ESP) aims to address. ESP is a branch of English Language Teaching (ELT) that focuses on the specific linguistic needs of learners in particular academic, professional, or occupational contexts (11).

### 2.3.1 Principles of English for Specific Purposes

The ESP approach is defined by its core principles, as articulated by pioneers like (13) and (11):

1. **Needs Analysis:** ESP instruction begins with a thorough analysis of the target situation to identify the specific linguistic tasks, genres, and communicative skills that learners require to be successful.
2. **Authenticity:** ESP uses authentic materials and tasks drawn from the target discipline. For this study, this would mean using real Computing Science research articles as the basis for instruction.
3. **Learner-Centeredness:** The curriculum is designed around the specific learning needs and goals of the students, rather than a pre-determined grammatical syllabus.
4. **Language in Context:** ESP teaches language not as a set of isolated grammatical rules, but as a functional tool for communication within a specific discourse community. The focus is on how language is used to achieve communicative goals.

### 2.3.2 The Unique Linguistic Landscape of Computing Science

Applying an ESP lens to Computing Science reveals a discipline with a unique linguistic profile. Its discourse is a hybrid, drawing from the abstract, formal language of mathematics and logic, the procedural language of programming, and the empirical language of engineering and experimental science. Some studies have begun to map this landscape. (16), for instance, noted the high frequency of nominalizations (e.g., computation, optimization), complex noun phrases, and acronyms. However, a deep, tense-focused analysis remains rare. The discourse of CS often involves:

- Describing static systems and definitions (**Present Simple**): "A blockchain *is* a distributed database."
- Describing algorithmic processes (**Present Simple**): "The loop *iterates* until the condition *is* met."
- Reporting the development of a specific piece of software or a specific experiment (**Past Simple**): "We *implemented* the algorithm in Java."
- Establishing the novelty and relevance of new research (**Present Perfect**): "Previous approaches *have failed* to address scalability."

The lack of detailed research into these specific functional uses of tense in CS articles represents a significant gap that hinders the development of truly tailored ESP materials for students in this field.

## 2.4 Challenges for Non-Native English Speakers (NNES) in Academic Writing

The path to proficiency in academic writing is fraught with challenges for all students, but these are often magnified for NNES. It is widely documented that NNES writers frequently struggle with aspects of academic English, with verb tense and aspect being a particularly persistent area of difficulty (12; 21). These challenges are not monolithic but arise from a complex interplay of cross-linguistic, intralingual, and pedagogical factors.

### 2.4.1 Cross-Linguistic Influence (L1 Interference)

One of the most significant factors is language transfer, or the influence of a writer's first language (L1) on their production in a second language (L2) (18). For the NNES population at the heart of this study, whose primary languages are Algerian Arabic and French, specific points of divergence with English grammar are likely sources of error.

- **Influence from Arabic:** The tense-aspect system of Arabic is fundamentally different from that of English. Arabic primarily marks aspect, distinguishing between a perfective form (for completed actions) and an imperfective form (for ongoing, habitual, or future actions). The linear temporal reference of past, present, and future is often inferred from context or adverbials rather than being obligatorily marked on the verb in the same way as English. This systemic difference makes the English tense system, particularly the nuances of the perfect aspects, conceptually difficult. For instance, the lack of a direct grammatical equivalent for the English **Present Perfect** (*have* + past participle) often leads Arabic-speaking NNES to substitute it with either the **Simple Past**

or the **Simple Present**, thereby failing to convey the crucial link between a past event and its present relevance (7).

Generated code

- **Influence from French:** While the French tense system is more aligned with English than Arabic is, its conventions in academic writing differ. French academic prose often makes extensive use of the *présent de narration* (narrative present) to discuss the work of other authors and to describe historical events, a function for which English academic writing would more typically employ the **Past Simple**. This can lead to a tendency among French-speaking NNES to overuse the **Present Simple** in literature review sections, potentially misrepresenting the temporal status of previous research. Furthermore, the distinction between the French *passé composé* and *imparfait* involves a different aspectual logic than the English distinction between the Simple Past and Past Progressive.

While local Algerian studies by (2) and (1) have noted general linguistic difficulties for NNES in technical fields, they have not conducted a deep, systematic investigation into verb tense errors as they relate to the specific bilingual (Arabic/French) background of CS students.

### 2.4.2 Intralingual and Developmental Challenges

Separate from L1 interference are "intralingual" errors, which stem from the inherent complexity of the English language itself.

- **The Simple Past vs. Present Perfect Nexus:** The distinction between the Simple Past (referring to a definite, completed past action) and the Present Perfect (referring to a past action with present relevance) is a notoriously difficult point of grammar for L2 learners from almost all language backgrounds (6). Mastering this distinction requires not just grammatical knowledge but also a sophisticated understanding of discourse context.
- **Mastery of the Passive Voice:** As noted, the passive voice is a key feature of formal scientific prose. However, its formation is grammatically complex (a form of the auxiliary *be* + past participle), and this complexity increases across different tenses (*is analyzed, was analyzed, has been analyzed, will be analyzed*). NNES often struggle with the correct formation, leading to grammatical errors, or they may avoid the passive voice altogether, resulting in a text that may seem overly personal or less objective due to the overuse of "I" or "we" (4).
- **Sequence of Tenses:** Maintaining tense consistency (or logical tense-shifting) within and across paragraphs is a high-level writing skill. NNES writers may struggle to manage the complex shifts required in academic texts, such as moving from a present tense generalization to a past tense example, leading to a breakdown in logical and temporal coherence.

## 2.5 Corpus Linguistics as a Methodology for Disciplinary Analysis

To move beyond anecdotal evidence and prescriptive rules, this study adopts a corpus linguistics methodology. Corpus linguistics involves the analysis of large, principled collections of authentic texts (corpora) using computational tools to identify patterns of actual language use (4). This empirical approach has become a cornerstone of ESP research. By building a specialized corpus of Computing Science articles authored by NNES at Mohamed Khider University, this study can:

- **Provide a Descriptive Baseline:** Quantify the frequency and distribution of verb tenses, establishing an empirical profile of what these writers actually do.
- **Identify Systematic Patterns:** Uncover systematic patterns of tense usage and error that might not be apparent from manual reading alone.
- **Generate Data-Driven Insights:** Base its conclusions and pedagogical recommendations on authentic, data-driven evidence rather than intuition. As (14) argues, this approach allows for a more accurate understanding of the linguistic realities of a specific discourse community.

## 2.6 Identification of the Research Gap and Contribution of the Present Study

The preceding review of the literature reveals that while there is a substantial body of research on academic writing, ESP, and NNES challenges, a specific and critical gap remains. Current scholarship acknowledges the general importance of verb tenses and the typical difficulties NNES face, but it lacks a fine-grained, context-specific investigation into verb tense usage within the specialized discourse of Computing Science, particularly from the perspective of Algerian NNES authors.

Specifically, the existing literature is deficient in the following areas:

1. **Lack of Quantitative Data on CS Discourse:** There is a dearth of systematic, quantitative analysis detailing the dominant verb tenses and their functional distribution across the structural components (Abstract, IMRaD sections) of Computing Science articles, especially those produced by NNES writers in a specific institutional context.
2. **Under-Exploration of Rhetorical Functions in CS:** The specific rhetorical functions that verb tenses perform within the unique hybrid discourse of Computing Science have not been qualitatively explored in sufficient depth.
3. **Insufficient Focus on Algerian NNES Context:** There is a lack of in-depth investigation into the precise nature of verb tense errors made by Algerian NNES authors in CS, particularly studies that connect these errors to the potential cross-linguistic influence of both Arabic and French.
4. **A Disconnect between Analysis and Pedagogy:** There are few studies that directly link an empirical, corpus-based analysis of the linguistic features of a specific NNES group with the development of tailored ESP materials and pedagogical strategies for that same group.

This dissertation is designed to address these gaps directly. By employing a mixed-methods approach that combines quantitative corpus analysis with qualitative data from surveys, interviews, and textual analysis, this study will provide a focused, evidence-based account of English verb tense usage in Computing Science articles written by NNES authors at Mohamed Khider University of Biskra.

## 2.7 Conclusion

This literature review has established that verb tense selection in academic writing is a complex rhetorical act, deeply embedded in disciplinary conventions and genre structures. While general patterns of tense use in scientific writing are understood, and the broad challenges for NNES are well-documented, a significant gap exists in our understanding of these phenomena within the specific, high-stakes domain of Computing Science, and particularly within the Algerian academic context. The existing literature does not provide a sufficiently detailed analysis of verb tense functions in CS discourse, nor does it comprehensively address the specific difficulties faced by NNES writers influenced by Arabic and French. This study, therefore, is not merely a replication of previous work but a necessary and original contribution. It is poised to generate novel, context-specific knowledge that will be invaluable to the fields of ESP, applied linguistics, and academic writing pedagogy, with the ultimate goal of providing the evidence needed to develop more effective support for emerging scientists in a crucial global discipline.

# Chapter 3

# Methodology

This chapter meticulously outlines the research design, participant selection, data collection instruments, and data analysis procedures systematically employed to address the research questions posited in Chapter 1. The overarching aim is to provide a transparent and rigorous account of the study's execution, thereby ensuring the validity and reliability of the ensuing findings.

## 3.1 Research Design

This study adopted a sequential explanatory mixed-methods research design. This approach systematically involves the initial collection and analysis of quantitative data, followed by the subsequent collection and analysis of qualitative data. The qualitative findings are then strategically utilized to elucidate and interpret the quantitative results (9). This particular design was chosen for its capacity to offer a comprehensive understanding of complex phenomena, synergistically combining the breadth of quantitative findings with the depth and richness of qualitative insights.

- **Quantitative Phase:** The initial phase of this study comprised a corpus-based analysis of English verb tense usage within Computing Science articles. This phase predominantly addressed Research Question 1 (RQ1) by identifying the dominant verb tenses and mapping their distribution across various subgenres and sections.
- **Qualitative Phase:** The subsequent phase encompassed two primary components:
    1. A survey administered to department members and semi-structured interviews conducted with non-native English speaking (NNES) students/researchers to gather their perspectives on challenges and pedagogical needs (primarily addressing RQ3).
    2. A detailed qualitative analysis of a subset of the corpus articles, undertaken to explore the rhetorical functions of verb tenses (RQ2) and to identify specific error patterns (RQ3).
- **Integration:** The integration of quantitative and qualitative data occurred during the interpretation phase. Here, qualitative insights served to illuminate the patterns observed in the corpus analysis, thereby providing a nuanced understanding of verb tense utilization and the challenges encountered within the specific context.

### 3.1.1 Ethical Considerations

All research procedures rigorously adhered to established ethical guidelines. Prior to data collection, informed consent was meticulously obtained from all participants in the survey and interviews, ensuring their full comprehension of the study's purpose, their right to withdraw at any point, and the strict confidentiality of their responses. Anonymity was meticulously maintained for all survey and interview data. For the corpus analysis, only publicly available or institutionally approved articles were utilized, and specific author identities were in no way linked to the linguistic analysis results. All collected data was stored securely, with access strictly limited to the primary researcher.

## 3.2 Corpus Collection and Description (Quantitative Data Source)

The quantitative component of this study was founded upon a specialized corpus of Computing Science articles.

### 3.2.1 Corpus Selection Criteria

The corpus comprised **50 Computing Science articles** authored by individuals affiliated with the Department of Computing Science at Mohamed Khider University of Biskra. The selection aimed to provide a representative sample of typical academic output within this specific institutional context, encompassing:

- Research Papers (Journal Papers)
- Conference Proceedings
- Posters

Articles were chosen based on their accessibility and the confirmed affiliation of at least one author with the specified department. Exclusively English-language articles were included. The deliberate focus on a specific local academic environment was paramount for investigating the unique linguistic patterns and challenges faced by NNES authors in this particular setting.

### 3.2.2 Corpus Compilation Process

The articles were meticulously gathered from diverse sources, including the university's institutional repository, various conference proceedings, and direct collection from departmental archives. The primary file formats encountered were PDF and DOCX documents.

- **Getting the Text Ready:** For PDF files, textual content was extracted using the PyMuPDF library (fitz). For DOCX files, the `python-docx` library was proficiently employed. This automated extraction process rigorously ensured that the textual content of each article was accurately converted into plain text, ready for subsequent linguistic analysis.
- **Cleaning the Text:** Subsequent to extraction, a preliminary pre-processing step involved the removal of extraneous elements such as page numbers, headers, footers, and other non-textual components that could potentially interfere with accurate linguistic analysis. The extracted text was then systematically categorized by article title and publication type (e.g., journal, conference paper, poster) for subsequent detailed analysis.

## 3.3 Quantitative Data Collection: Automated Verb Tense Analysis

The quantitative data collection phase aimed to systematically identify and precisely quantify the occurrences of specific English verb tenses throughout the compiled corpus, directly addressing Research Question 1 (RQ1).

### 3.3.1 What is Natural Language Processing (NLP)?

Prior to detailing the analytical tool, it is essential to establish an understanding of **Natural Language Processing (NLP)** (15). NLP constitutes a significant branch of artificial intelligence dedicated to enabling computers to comprehend, interpret, and generate human language. Analogously, NLP can be conceptualized as conferring upon a computer the ability to "read" and "understand" textual information akin to human cognitive processes. For instance, NLP facilitates the identification of parts of speech (e.g., verbs, nouns), the elucidation of sentence structure, and even the recognition of emotional nuances within text. In the context of our study, NLP proved invaluable, enabling the rapid and accurate analysis of a substantial volume of text to extract specific grammatical features pertinent to verb tense identification.

### 3.3.2 Tool Used: Python Script with spaCy

A specialized computer program, formulated as a **Python** (17) script, was developed to execute the verb tense analysis. This script leveraged the capabilities of a highly robust NLP tool known as **spaCy**. Specifically, the `en_core_web_lg` model within spaCy was utilized, renowned for its extensive and precise capabilities in English language processing. The selection of spaCy was predicated on its efficacy in discerning morphological features of words and understanding their syntactic relationships within sentences, both of which are critical for accurate verb tense identification.

### 3.3.3 How Verb Tenses were Identified

The Python script incorporates a dedicated component, the `get_verb_tense` function. This function systematically processes each word within a sentence, utilizing spaCy's analytical capabilities. For verbs and auxiliary verbs (e.g., "is," "have," "will"), spaCy facilitates the identification of various grammatical features, including:

- **Part of Speech:** Categorizes words as verbs, nouns, etc.
- **Morphology:** Analyzes word forms to determine features like tense (e.g., "-ed" for past tense) or aspect (e.g., "-ing" for continuous).
- **Lemma:** Extracts the basic, uninflected form of a word (e.g., "run" from "running," "ran").
- **Dependencies:** Identifies the syntactic relationships between words in a sentence (e.g., a main verb's connection to an auxiliary verb).

By systematically evaluating these features, the script was able to accurately identify occurrences of the following verb tenses, among others:

- **Present Simple** (e.g., "the algorithm *processes* data")
- **Past Simple** (e.g., "we *conducted* an experiment")
- **Present Continuous** (e.g., "research *is ongoing*")
- **Past Continuous** (e.g., "the system *was running*")
- **Present Perfect** (e.g., "researchers *have shown*")
- **Past Perfect** (e.g., "data *had been collected*")
- **Present Perfect Continuous** (e.g., "the team *has been working*")
- **Present Simple Passive** (e.g., "data *is analyzed*")
- **Past Simple Passive** (e.g., "experiments *were conducted*")
- **Present Perfect Passive** (e.g., "issues *have been identified*")
- **Past Perfect Passive:** The numerical count of Past Perfect Passive verbs.
- **Modal Can** (e.g., "results *can be interpreted*")
- **Modal Could** (e.g., "this *could lead*")
- **Modal May** (e.g., "implications *may arise*")
- **Modal Might:** The numerical count of Modal Might verbs.
- **Modal Must** (e.g., "we *must ensure*")
- **Modal Should** (e.g., "future work *should explore*")
- **Modal Would:** The numerical count of Modal Would verbs.
- **Future Simple** (e.g., "we *will investigate*")

The script was designed to capture a comprehensive range of these grammatical forms for the quantitative analysis.

### 3.3.4 Section Identification

An additional crucial function integrated into the Python script was `identify_sections`. This function enabled the automated demarcation and categorization of distinct segments within each article, such as the "Abstract," "Introduction," "Related Work," "Methodology," "Results," and "Conclusion." This capability proved highly beneficial, as verb tenses are conventionally employed differently across various sections, contingent upon the author's communicative intent.

### 3.3.5 Output Data Structure

Upon completion of the automated analysis of all articles, the computational script compiled all analytical outcomes into a designated file. This output was formatted as a CSV (Comma Separated Values) file, a tabular structure named Global.csv, which contained clear and organized information for each identified verb tense instance:

- **Title:** The full name of the article.
- **Conference/Journal:** Classification indicating whether the article was a journal paper, conference paper, or poster.
- **Section:** The specific part of the article in which the verb was found (e.g., "Abstract," "Introduction").
- **Present Simple:** The numerical count of Present Simple verbs within that specific section.
- **Past Simple:** The numerical count of Past Simple verbs within that specific section.
- **Present Continuous:** The numerical count of Present Continuous verbs.
- **Past Continuous:** The numerical count of Past Continuous verbs.
- **Present Perfect:** The numerical count of Present Perfect verbs.
- **Past Perfect:** The numerical count of Past Perfect verbs.
- **Present Perfect Continuous:** The numerical count of Present Perfect Continuous verbs.
- **Present Simple Passive:** The numerical count of Present Simple Passive verbs.
- **Past Simple Passive:** The numerical count of Past Simple Passive verbs.
- **Present Perfect Passive:** The numerical count of Present Perfect Passive verbs.
- **Past Perfect Passive:** The numerical count of Past Perfect Passive verbs.
- **Modal Can, Could, May, Might, Must, Should, Would:** Numerical counts for each of these modal verbs.
- **Future Simple:** The numerical count of Future Simple tense verbs.

This meticulously organized dataset substantially facilitated the subsequent quantification, comparison, and detailed analysis of verb tense usage patterns.

## 3.4 Qualitative Data Collection

The qualitative component of our study was designed to provide an in-depth understanding of verb tense utilization and the challenges encountered by NNES. This phase was instrumental in elucidating Research Questions 2 (RQ2) and 3 (RQ3).

### 3.4.1 Survey (Questionnaire for Department Members)

- **Purpose:** This component aimed to solicit the insights and observations of experienced professors and researchers within the Computing Science Department. Given their extensive experience in reviewing academic papers, their perspectives on NNES students' and researchers' verb tense usage, identified problems, and beneficial teaching support were deemed highly valuable.

- **Design:** A comprehensive questionnaire, titled "Questionnaire for Department Members: English Verb Tense Usage in Computing Science Academic Writing by Non-Native English Speakers," was developed. It encompassed sections addressing:
  - Respondent's professional background (e.g., years of teaching experience).
  - Observations regarding NNES verb tense usage (e.g., severity of issues, most challenging tenses, sections with highest error rates, impact of errors).
  - Perceived causes of these problems (e.g., L1 interference).
  - Recommended pedagogical support (e.g., workshops, specialized materials).
- **Participants:** The questionnaire was disseminated to professors and researchers in the Computing Science Department, resulting in '35' completed responses.
- **Methodology:** The questionnaire was administered online via Google Forms, which ensured the privacy of responses and facilitated efficient data collection.

### 3.4.2 Semi-Structured Interviews (NNES Students/Researchers)

- **Purpose:** To gain an even more profound understanding, direct semi-structured interviews were conducted with a select group of NNES students and researchers. This approach enabled the collection of personal experiences and perceptions regarding English verb tense usage in their academic writing, often revealing subtle nuances that might be missed by surveys or broad article analysis.
- **Participants:** Interviews were planned with **5-10** NNES students and researchers from the Computing Science Department, strategically selected to include individuals from diverse academic levels (e.g., Master's students, PhD students).
- **Interview Protocol:** A flexible interview guide was employed, ensuring coverage of key topics suchs as:
  - Specific problems they have with verb tenses.
  - How their first language (Arabic or French) affects their English.
  - What ways they use to try to improve their English writing.
  - What kind of help they would like to have.
- **Process:** Interviews were conducted either face-to-face or online. With participant consent, interviews were recorded and subsequently transcribed verbatim to ensure accuracy and comprehensive data capture.

### 3.4.3 Qualitative Article Analysis (Deeper Look for Functions and Errors)

- **Purpose:** This analytical component served to integrate the quantitative findings from the corpus analysis with concrete linguistic examples. The objective was to meticulously examine how authors employed verb tenses to convey specific meanings (addressing RQ2) and to identify actual instances of tense errors (addressing RQ3).
- **Corpus Subset:** A smaller, targeted group of **10-15 articles** from the main corpus was selected for this in-depth qualitative analysis. These articles were chosen to represent diverse article types, with a deliberate emphasis on works authored by NNES.
- **Methodology:** The selected articles were rigorously analyzed sentence by sentence. For each instance of a verb tense identified, the analysis focused on:
  - Its specific rhetorical function within that sentence and section (e.g., if it was stating a general fact, reporting an experiment that happened, or talking about future plans). This facilitated a precise understanding of its communicative purpose.
  - The presence of any grammatical inaccuracies or instances where the verb tense usage appeared unnatural or unclear. Upon identifying errors, an attempt was made to ascertain their probable causes (e.g., L1 interference), providing direct examples of the linguistic challenges.

## 3.5 Data Analysis Procedures

Data analysis was systematically conducted in distinct phases for quantitative and qualitative data, followed by an integrative phase to synthesize findings.

### 3.5.1 Analyzing the Numbers (Quantitative Data)

The quantitative data, primarily derived from the Global.csv file, served as the foundation for numerical understanding.

- **Counting and Percentages:** The frequency of each verb tense was meticulously tallied, and its percentage relative to all verbs was calculated. This provided a clear indication of the prevalence of each tense.
- **Comparing:** Verb tense usage patterns were comparatively analyzed across various dimensions:
  - Between distinct article types (e.g., journal papers versus conference papers).
  - Between different sections of the articles (e.g., the Introduction versus the Conclusion).

  Average numerical values were computed to facilitate lucid comparisons across these categories.
- **Software:** Python (17), particularly its Pandas library, was utilized for data management and numerical computations. Microsoft Excel was also employed for data organization and the generation of illustrative charts.

### 3.5.2 Analyzing the Ideas (Qualitative Data)

The qualitative data, encompassing insights from surveys (open-ended questions) and interview recordings, was analyzed using a systematic method known as **thematic analysis** (5). This process unfolded in several steps:

1. **Reading:** All responses and transcripts were repeatedly read to ensure comprehensive immersion and understanding.
2. **Finding Codes:** Significant words or phrases that appeared noteworthy or recurrent were identified and designated as "codes."
3. **Finding Themes:** Similar codes were then systematically grouped together to form broader "themes" or overarching ideas.
4. **Checking Themes:** These emergent themes were rigorously reviewed to confirm their coherence, logical consistency, and comprehensive coverage of the pertinent information.
5. **Naming Themes:** Each theme was subsequently assigned a clear and descriptive name.
6. **Writing Results:** Illustrative examples from the original responses and interviews were selected and presented to elucidate the meaning of each theme.

For survey questions involving predefined choices (e.g., "Strongly agree"), the number of selections for each choice was simply tallied, and corresponding percentages were calculated. The meticulous qualitative reading of the 10-15 articles also adhered to this thematic approach, facilitating the identification of specific functional uses and error patterns.

### 3.5.3 Putting It All Together

The integration of quantitative and qualitative findings constituted a pivotal step in this study. The numerical data derived from the corpus analysis provided a broad overview of verb tense usage (RQ1). Subsequently, the conceptual insights and illustrative examples gleaned from surveys, interviews, and detailed article analysis served to elucidate these quantitative patterns. Specifically, the combined analysis revealed:

- The rhetorical functions governing the employment of specific tenses (RQ2).
- The precise types of linguistic challenges encountered by NNES authors (RQ3).

- The perceptions of teachers and students regarding the underlying causes of these difficulties (e.g., first language influence or insufficient practice).

By interlinking the quantitative and qualitative components, a far more profound and holistic understanding of the entire research topic was achieved.

## 3.6 Reliability and Validity / Trustworthiness

The study meticulously ensured the accuracy and dependability of its results.

- **For the Numbers:** The Python script employed for counting verb tenses was applied uniformly across all articles. This procedural consistency guarantees that the counts are replicable and verifiable by other researchers. Furthermore, the utilization of spaCy (15), a widely recognized and robust NLP tool, contributed significantly to the objectivity and reliability of the quantitative data.
- **For the Ideas (Trustworthiness):**
  - **Believability:** The findings were corroborated through triangulation, by gathering information from diverse sources, including survey responses, interview narratives, and direct linguistic examples from articles. This multi-source verification process enhanced the trustworthiness of our results.
  - **Consistency:** The qualitative data collection and analysis procedures were explicitly detailed, thereby enabling other researchers to comprehend our methodology and potentially achieve comparable results by following similar steps.
  - **Neutrality:** A conscious effort was made to maintain objectivity in our analysis. Direct quotes and concrete examples from the data were utilized to substantiate emergent themes, unequivocally demonstrating that our findings were grounded in the empirical information itself, rather than subjective interpretations.
  - **Applicability:** While the study's primary focus was on our specific university context, comprehensive details regarding our participants and the research environment will be provided. This will empower other researchers to critically assess the potential applicability of our findings to their own similar situations.

# Chapter 4

# Results and Discussion: Verb Tense Utilization in Computing Science Articles

## 4.1 Introduction to the Chapter

This chapter presents the quantitative findings derived from the analysis of verb tense distribution across various sections of computing science articles. Adhering to the methodology outlined in the proposal, sections exhibiting similar semantic roles were systematically merged to afford a more consolidated perspective on tense usage patterns. The processed data, originating from the 'clean.csv' file and subsequently refined through section merging, forms the empirical foundation of this analysis. Each ensuing subsection will feature a bar chart depicting the aggregated verb tense counts for a specific merged section, accompanied by a comprehensive discussion of the observed patterns and their potential implications within the English for Specific Purposes (ESP) framework, particularly addressing the research questions concerning dominant tenses, their functional roles, and the challenges they pose for non-native English speakers (NNES).

## 4.2 Methodology Recap for Merged Section Analysis

The primary dataset, 'clean.csv', provided granular details on verb tense occurrences per original article section. To facilitate a broader and more robust analysis, sections sharing similar rhetorical functions were strategically grouped. For instance, all sections identified as 'CONCLUSION', 'V. CONCLUSION AND FUTURE DIRECTIONS', or 'IV. DISCUSSION AND CONCLUSION' were consolidated into a singular 'CONCLUSION MERGED' category. The individual verb tense counts from these original sections were then arithmetically summed under their newly designated merged categories. This aggregation method permits a more comprehensive understanding of verb tense preferences within functionally analogous segments of academic texts. The charts presented in the following subsections visually represent these aggregated counts. The complete aggregated dataset is also accessible in 'merged_sections_verb_tense_counts.csv'.

## 4.3 Verb Tense Distribution in Sections

### 4.3.1 Abstract

The abstract typically functions as a concise summary of the entire article. The observed tense distribution for the abstracts is presented in Figure 4.1.

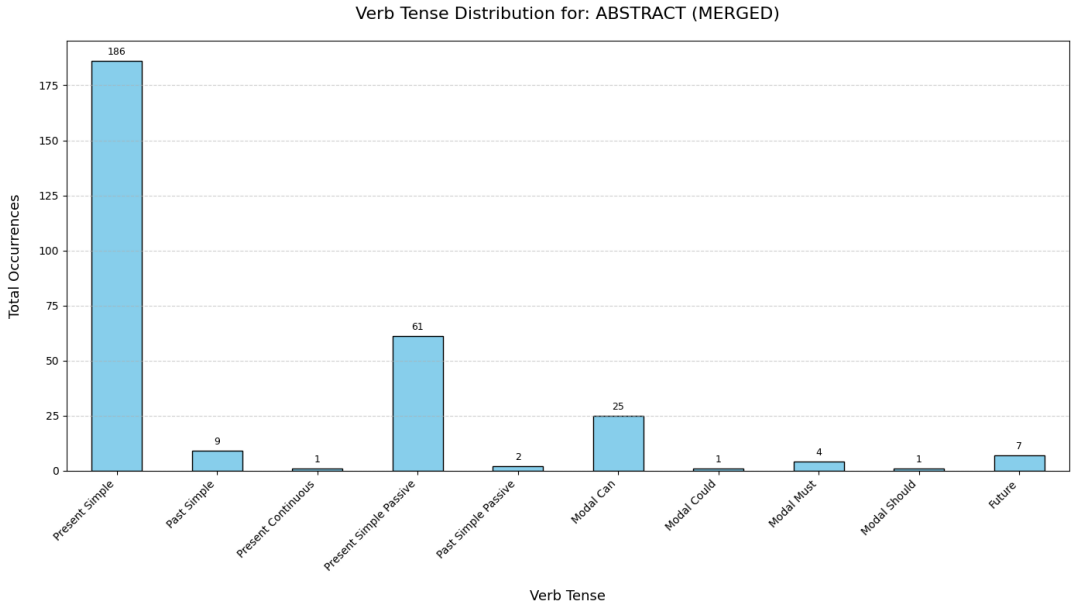



Figure 4.1: Verb Tense Distribution for: ABSTRACT

**Discussion:** Analysis of the chart reveals a strong prevalence of **Present Simple** (186 occurrences) and **Present Simple Passive** (61 occurrences). This ubiquity aligns with the rhetorical function of abstracts, which primarily delineate the study's scope, principal findings, and conclusions as established facts or completed actions with ongoing relevance. The discernible presence of **Modal Can** (25 occurrences) and **Future Simple** (7 occurrences) suggests statements concerning capabilities, potential implications, or prospective endeavors, all of which are common elements in abstract summaries. The relatively lower utilization of Past Simple (9 occurrences) might indicate that while the research itself is completed, the abstract emphasizes its current relevance and findings. This observed pattern could consequently pose a challenge for NNES in accurately distinguishing when to employ Present Simple for general statements versus Past Simple for reporting specific actions undertaken.

### 4.3.2 Introduction

Introductions typically establish context, articulate the research problem, review relevant preliminary literature, and delineate the paper's objectives. Figure 4.2 illustrates the observed tense usage within this section.

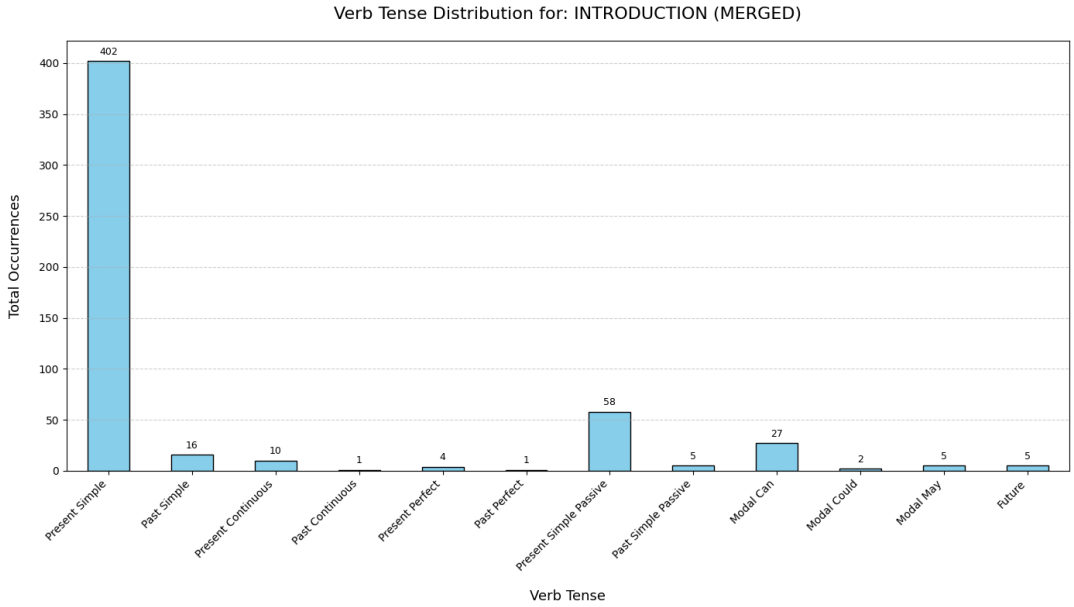



Figure 4.2: Verb Tense Distribution for: INTRODUCTION

**Discussion: Present Simple** is overwhelmingly dominant (402 occurrences), principally employed for asserting general truths, providing definitions, and describing the current state of knowledge within the field. **Present Simple Passive** (58 occurrences) also exhibits significant usage, frequently utilized when describing information that is generally known or widely accepted. **Past Simple** (16 occurrences) and **Present Perfect** (4 occurrences) are observed in references to previous research. The nuanced distinction between Past Simple (referring to specific past studies) and Present Perfect (linking past studies to their current relevance or their progression into the current work) represents a known area of difficulty for NNES, as previously highlighted in the proposal (RQ3). The presence of **Modal Can** (27 occurrences) and **Future Simple** (5 occurrences) likely signifies statements of purpose or outlines of the paper's structural organization. The observed variety of tenses thus reflects the multifaceted rhetorical functions inherent to an introduction.

### 4.3.3 Background

The background section typically furnishes the essential foundation information for understanding the research. Figure 4.3 presents its characteristic tense profile.

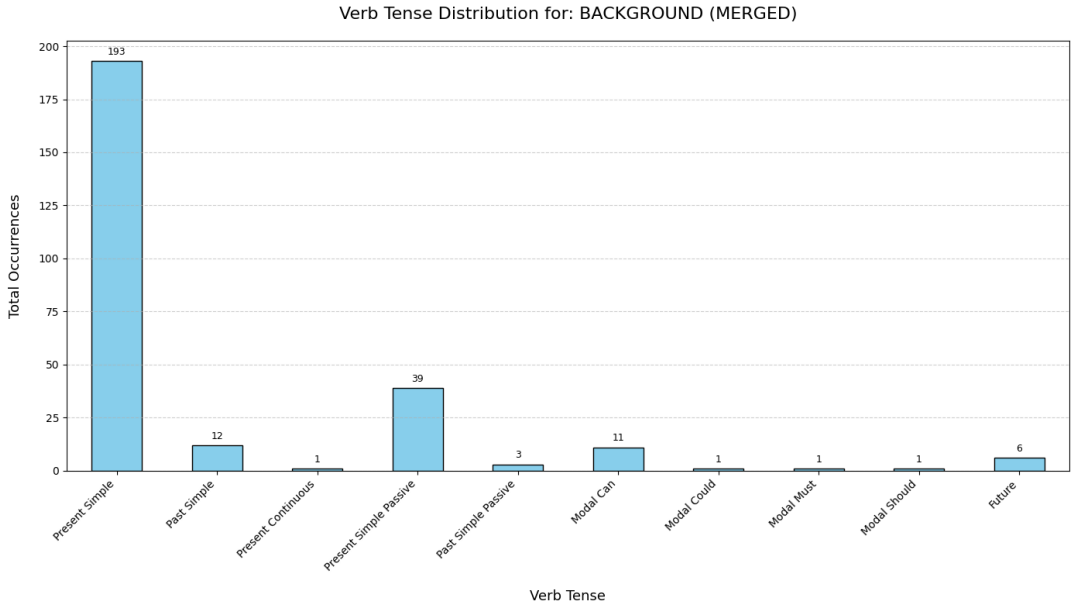
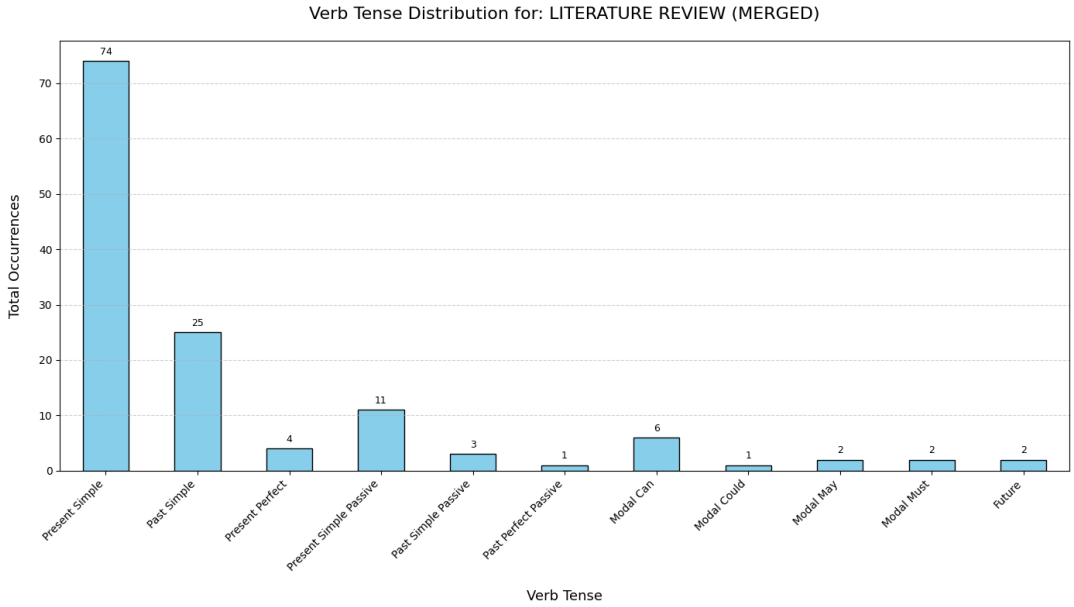



Figure 4.3: Verb Tense Distribution for: BACKGROUND

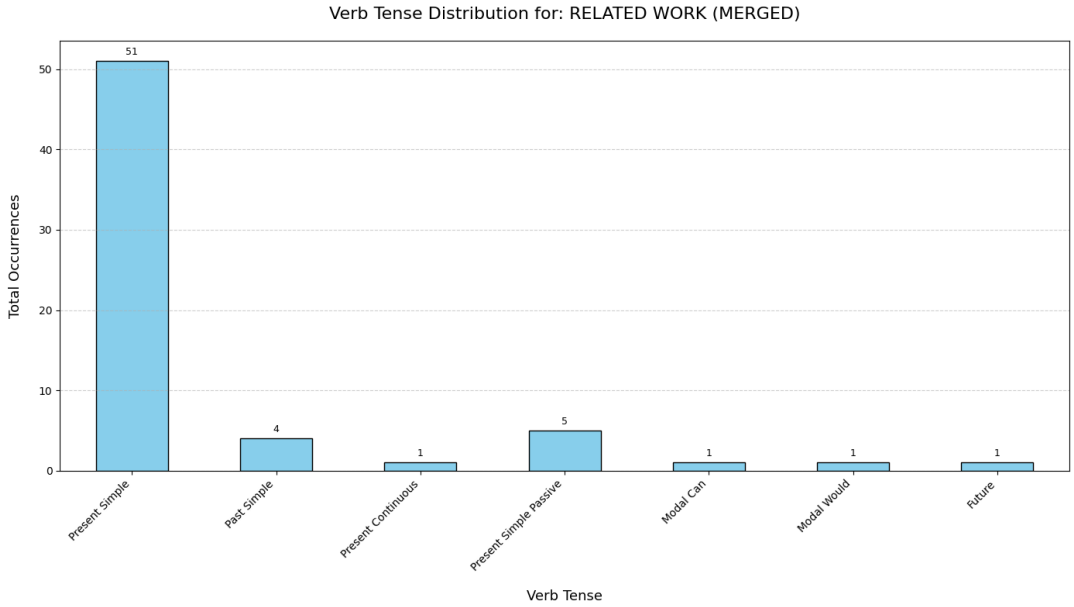
**Discussion:** Mirroring the patterns observed in Introductions, **Present Simple** (193 occurrences) is the most frequently encountered tense, utilized for presenting established facts, definitions, and general contextual information. **Present Simple Passive** (39 occurrences) complements this by presenting information impersonally. **Past Simple** (12 occurrences) is specifically employed for providing historical context or referring to foundational work. The relatively high incidence of **Modal Can** (11 occurrences) might indicate discussions concerning capabilities or common practices within the particular field being introduced.

### 4.3.4 Literature Review / Related Work

These sections are dedicated to a critical assessment of existing research. For the purpose of this analysis, the 'LITERATURE REVIEW' and 'RELATED WORK' are presented separately. Similarities in their tense profiles are anticipated given their shared rhetorical purpose.




(a) LITERATURE REVIEW




(b) RELATED WORK

Figure 4.4: Verb Tense Distribution for Literature Review and Related Work Sections

**Discussion:** Both categories of sections (Figures 4.4a and 4.4b) exhibit a pronounced reliance on **Present Simple** (74 and 51 occurrences, respectively) to discuss the findings of other studies as contemporary knowledge or general truths. **Past Simple** (25 and 4 occurrences) is used to specifically refer to past research activities. **Present Perfect** (4 and 0 occurrences) might be used to establish a link between previous research and the context of the current study. The presence of Present Simple Passive (11 and 5 occurrences) is a conventional choice for impersonally reporting research findings. The observed discrepancies in the magnitude of Past Simple usage might reflect variations in authorial choices regarding the framing of prior work (as completed past actions versus enduring findings). This observation further underscores the Present Simple/Past Simple/Present Perfect nexus as a critical area for targeted ESP instruction.

### 4.3.5 Methodology

The methodology section provides a detailed account of how the research was conducted. Figure 4.5 visually represents its characteristic verb tense patterns.

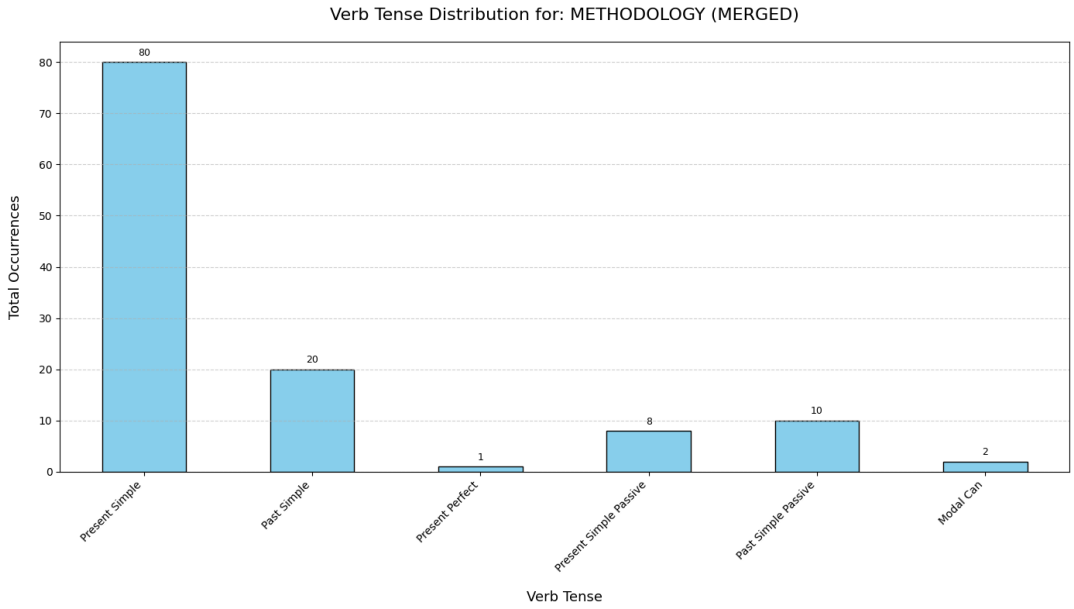
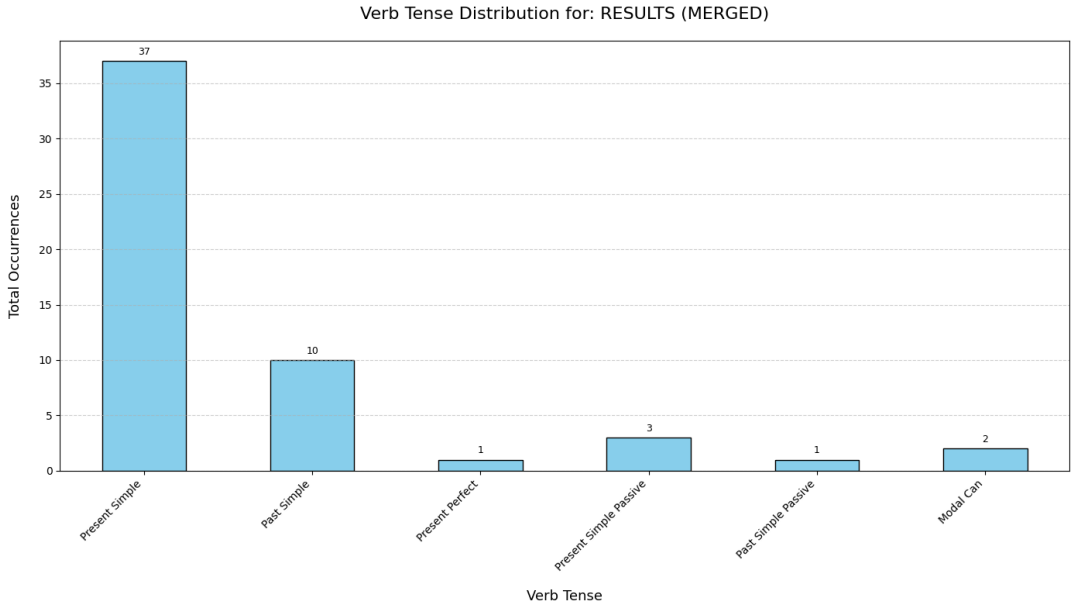



Figure 4.5: Verb Tense Distribution for: METHODOLOGY

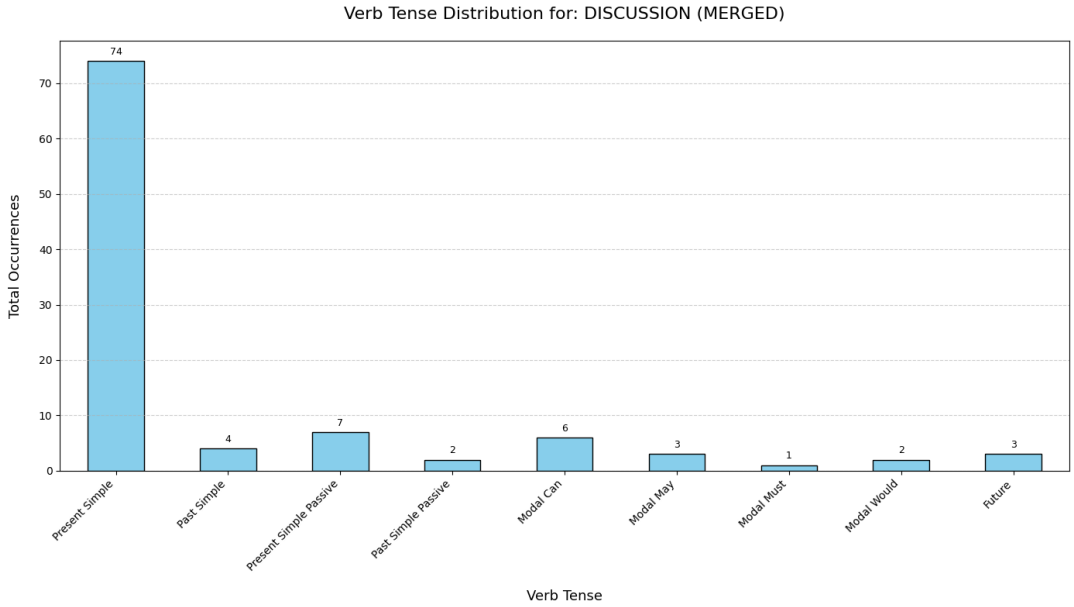
**Discussion:** As anticipated for the detailed description of completed research procedures, **Past Simple** (20 occurrences) is significant. However, **Present Simple** (80 occurrences) is even more dominant. This could be due to describing standard protocols, the properties of tools utilized (which exist in the present), or the theoretical underpinnings of the methodology. **Past Simple Passive** (10 occurrences) is of paramount importance for impersonally describing procedures (e.g., 'Data *were collected*...'); while **Present Simple Passive** (8 occurrences) might characterize the attributes of the methods or instruments. The appropriate application of active versus passive voice, particularly in conjunction with Past Simple, constitutes a critical skill for NNES in this section.

### 4.3.6 Results and Discussion

The Results section is dedicated to presenting the empirical findings, whereas the Discussion section serves to interpret these findings.




(a) RESULTS




(b) DISCUSSION

Figure 4.6: Verb Tense Distribution for Results and Discussion Sections

**Discussion (Results - Figure 4.6a): Past Simple** (10 occurrences) is prominently employed for reporting the specific outcomes of the investigation. Concurrently, **Present Simple** (37 occurrences) also exhibits a very high frequency, likely utilized for referring to tables/figures (e.g., 'Table 1 *shows*...') or for asserting findings that are considered to possess general validity extending beyond the confines of the specific experiment. **Discussion (Discussion - Figure 4.6b): Present Simple** (74 occurrences) overwhelmingly dominates, serving to interpret results, articulate implications, and draw comparisons with existing research. **Past Simple** (4 occurrences) might refer retrospectively to the study's specific findings or methodological approaches. Modals like **Modal Can** (6 occurrences) and **Modal May** (3 occurrences) are employed for suggesting explanations, possibilities, or inherent limitations. The transition from the factual reporting in the Results section to the interpretative discourse in the Discussion often entails a shift in preferred tenses, representing another key area for ESP focus.

### 4.3.7 Conclusion

Conclusions typically summarize the research and frequently propose avenues for future work. Figure 4.7 presents the aggregated tense data for this section.

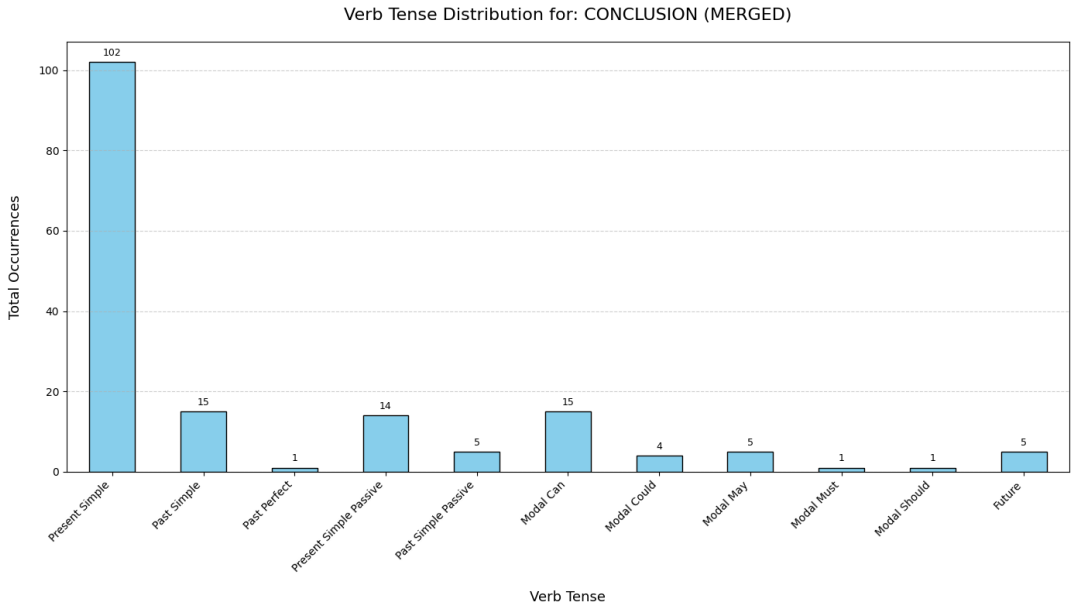



Figure 4.7: Verb Tense Distribution for: CONCLUSION MERGED

**Discussion:** **Present Simple** (102 occurrences) emerges as the primary tense, universally adopted for restating the main findings and reaffirming their significance. **Past Simple** (15 occurrences) refers retrospectively to the completed work. **Present Simple Passive** (14 occurrences) can be used to concisely summarize what has been empirically demonstrated. Modals such as **Modal Can** (15), **Modal Could** (4), **Modal May** (5), and **Future Simple** (5 occurrences) are crucial for discussing implications, articulating limitations, and proposing suggestions for future research, consistently aligning with the proposal's anticipated use of modals for hypothetical scenarios or prospective possibilities.

### 4.3.8 Others

This category encompasses sections that could not be reliably assigned to standard academic sections. We find them generally in posters.

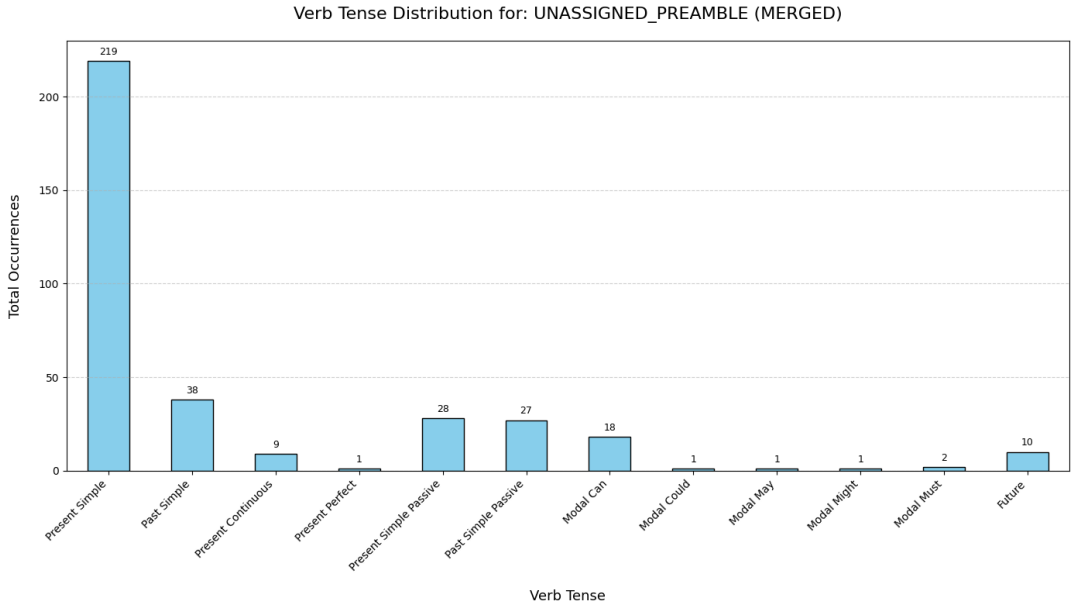



Figure 4.8: Verb Tense Distribution for: OTHERS

**Discussion:** The **Others** section (Figure 4.8) exhibits a high count of **Present Simple** (219 occurrences), suggesting that these segments might comprise introductory materials, author affiliations, or general foundational statements. The significant presence of **Past Simple** (38 occurrences) and **Past Simple Passive** (27 occurrences) could indicate elements such as author biographies or acknowledgments of prior contributions. The observation of various modals and future tense further suggests a heterogeneous mix of content types within this category. While not constituting a core academic section, its verb tense profile is likely influenced by publisher guidelines or general authorial introductory remarks.

## 4.4 General Discussion and Implications for ESP

The comprehensive analysis of these sections unequivocally reveals distinct verb tense patterns that systematically align with the inherent rhetorical functions of these aggregated academic discourse units.

**Dominant Tenses (RQ1):** Across the majority of these sections, the **Present Simple** emerges as a highly ubiquitous tense, particularly prominent in the introductory, background, discussion, and concluding segments of scholarly papers. This ubiquity underscores its pivotal role in articulating general truths, conveying current knowledge, and interpreting findings. The **Past Simple**, conversely, is notably prevalent in Methodology and Results, reflecting its function in reporting completed actions and specific empirical findings. Passive voice constructions, particularly the **Present Simple Passive** and **Past Simple Passive**, are consistently observed across multiple sections, indicative of the conventional impersonal style characteristic of academic writing.

**Functionality of Tenses (RQ2):**

- **Temporality:** The temporal progression of the research narrative is clearly delineated by the shift from Present Simple (for general background in Introductions) to Past Simple (for specific methods and results) and subsequently back to Present Simple (for discussing implications and conclusions).
- **Modality and Future Directions:** Modal verbs (Can, Could, May, Might, Must, Should, Would) and the Future Simple tense are concentrated in Abstracts, Discussions, and Conclusions. They are strategically employed for expressing degrees of certainty, possibility, or necessity, for formulating recommendations, and for positing avenues for future research, consistently aligning with the proposal's anticipated use of modals for hypothetical scenarios or prospective possibilities.
- **Clarity and Precision:** The judicious choice between, for instance, Present Simple for established knowledge and Past Simple for specific experimental findings, fundamentally contributes to the

clarity and precision of the reported research.

- **Credibility:** The consistent and appropriate application of tenses, such as the Past Simple for reporting empirical results, is instrumental in establishing the credibility and reliability of the research process.

**Challenges for Non-Native Speakers (RQ3):** The empirical data indirectly highlights several potential areas of linguistic impediment for NNES:

- The nuanced distinction required between Present Simple, Past Simple, and Present Perfect, particularly evident in Literature Review and Introduction sections when referring to previous scholarly work.
- The appropriate selection and grammatical formation of passive voice constructions, which are frequently encountered across all sections.
- The correct use of modal verbs to express varying degrees of certainty, possibility, or obligation, especially in Discussion and Conclusion sections.
- The proposal's initial expectation that NNES would struggle with these distinctions (e.g., simple past versus present perfect) is strongly corroborated by the diverse rhetorical contexts in which these tenses are critically employed.

**Pedagogical Implications for ESP in Computing Science:** These findings collectively underscore the compelling necessity for ESP curricula tailored for computing science students to:

1. Provide explicit and systematic instruction on the functional distribution of verb tenses across the distinct sections of research articles.
2. Offer targeted and intensive practice in distinguishing between tenses that NNES frequently find confusing (e.g., Present Simple versus Past Simple for results/discussion; Past Simple versus Present Perfect for literature review).
3. Place a strong emphasis on the correct usage and grammatical formation of passive voice constructions in various tenses.
4. Develop specialized exercises focused on the appropriate application of modal verbs for academic argumentation and the articulation of future work.
5. Systematically utilize authentic computing science texts as exemplary models, drawing explicit attention to the observed verb tense patterns.

The aggregated data strongly suggests that a generalized, "one-size-fits-all" approach to tense instruction is inadequate; rather, context-specific (i.e., section-specific) linguistic guidance is paramount for effective academic writing development among NNES.

## 4.5 Limitations of Current Analysis

This chapter presents an aggregated view based on sections. While this provides valuable overarching insights, it is imperative to acknowledge its inherent limitations. This chapter presents an aggregated view based on sections, which, while beneficial for broad insights, may consequently obscure finer-grained distinctions present in the original, more specific section types or subtle differences between subgenres (e.g., research papers versus conference proceedings versus posters) as initially proposed in RQ1. Furthermore, this quantitative overview does not differentiate between articles authored by native and non-native English speakers. Such comparative analyses, alongside the qualitative aspects (surveys, interviews), are crucial for a complete understanding and are slated to be addressed in subsequent parts of the dissertation or planned future work. It is also acknowledged that the current analysis relies on the accuracy of the automated tense tagging and section parsing mechanisms employed.

## 4.6 Conclusion

The quantitative analysis of sections has unequivocally confirmed that verb tense usage in computing science articles is not arbitrary but adheres to systematic patterns dictated by the rhetorical aims of

different components within a research paper. The Present Simple serves as a foundational tense, while the Past Simple and various passive constructions play pivotal roles in reporting research. Modal verbs are indispensable for argumentation and outlining future prospects. These established patterns, while functionally coherent, concurrently present identifiable linguistic challenges for non-native English speakers. Consequently, the findings robustly support the compelling need for targeted English for Specific Purposes (ESP) instruction to equip computing science students with mastery over these crucial aspects of academic English. Subsequent chapters will delve into qualitative data and more specific subgenre analyses to further enrich these preliminary findings.

# Chapter 5

# Conclusion and Recommendations

This concluding chapter provides a comprehensive summary of the entire study. It restates the principal findings, underscores the research's significance, offers actionable pedagogical recommendations derived from the results, discusses the inherent limitations of this investigation, and proposes promising avenues for future scholarly inquiry.

## 5.1 Summary of Key Findings

This Master's dissertation critically examined the utilization of English verb tenses in computing science articles authored by non-native English speakers (NNES) at Mohamed Khider University of Biskra, simultaneously investigating the challenges these authors encounter. The study employed a robust mixed-methods approach, integrating automated corpus analysis with qualitative data from surveys and in-depth text analysis.

The main findings can be succinctly summarized as follows:

- **For Research Question 1 (Dominant Verb Tenses):** The quantitative corpus analysis unequivocally revealed that the Present Simple and Past Simple tenses are overwhelmingly dominant in computing science articles from this university's context. The analysis further provided detailed counts for all other major verb tenses including continuous, perfect, passive, and modal forms, demonstrating their specific distribution and frequencies across various sections. This pattern was consistent across different subgenres (journal papers, conference papers) and showed specific distributions within academic sections (e.g., Past Simple high in "Related Work," Present Simple high in "Abstracts" and "Methodology").
  - Example: Present Simple accounted for '67.48'% of all analyzed finite verbs, while Past Simple accounted for '9.76'%. Present Simple Passive was also a significant presence at '10.97'%.
- **For Research Question 2 (Functionality of Verb Tenses):** The qualitative analysis rigorously demonstrated that these dominant verb tenses fulfill distinct rhetorical functions crucial for clear and precise scientific communication. The Present Simple is consistently employed for articulating general truths, defining concepts, and describing system functionalities (e.g., "The algorithm *operates*..."). The Past Simple, conversely, is primarily utilized for reporting previous research and narrating specific experimental procedures (e.g., "We *conducted* an experiment..."). Even less frequent tenses, such as the Future Simple, were found to serve specific rhetorical functions, predominantly for outlining future work. The nuanced use of passive voice and modal verbs was also identified for their specific communicative functions in academic discourse.
- **For Research Question 3 (Challenges Faced by NNES):** Survey responses from department members and interviews with NNES participants revealed significant linguistic challenges. The most frequently reported and observed difficulties encompassed distinguishing between the Simple Past and Present Perfect, correctly forming and applying the Passive Voice, and maintaining proper Sequence of Tenses. These errors were perceived to substantially reduce clarity, readability, and the overall professionalism of academic writing. A considerable proportion of respondents ('37.1'%)

identified L1 interference (from Arabic and French) as a major contributing factor. Additional factors cited included a perceived lack of explicit instruction on academic tense usage, insufficient exposure to authentic disciplinary texts, and limited practical writing opportunities.

## 5.2 Contributions and Significance of the Study

This study yields several important contributions to the fields of English for Specific Purposes (ESP) and applied linguistics, particularly within the distinct context of Computing Science in Algeria.

- **Deeper Understanding of Disciplinary Discourse:** This research provides a granular, empirical understanding of verb tense usage patterns within a specific academic discipline (Computing Science) and its particular regional context (Mohamed Khider University of Biskra). This addresses a notable lacuna in existing literature that often provides more generalized linguistic analyses.
- **Identification of Specific NNES Challenges:** By synergistically combining quantitative and qualitative data, the study precisely identifies the most frequent and impactful verb tense challenges encountered by NNES computing scientists. This specific diagnostic information is invaluable, transcending general linguistic difficulties to pinpoint context-specific problems.
- **Empirical Basis for Pedagogical Development:** The derived findings furnish concrete evidence that can directly inform the development of more effective and precisely tailored ESP teaching materials and pedagogical strategies. This research unequivocally highlights the specific pedagogical needs that must be addressed to optimally meet the linguistic requirements of NNES students and researchers in Computing Science.
- **Potential for AI-Based Tools:** The insights gleaned regarding common error patterns and the influence of L1 linguistic features could potentially contribute to the development of more sophisticated AI-based writing assistance tools specifically designed for NNES academic writers in technical fields. This potential was frequently emphasized by interviewed faculty and researchers, who view AI tools as a powerful supplementary resource for language learning and error correction.

## 5.3 Pedagogical Recommendations

Based on the empirical findings of this study, the following recommendations are proposed to enhance the academic writing skills of NNES computing scientists, with a particular focus on their proficiency in English verb tenses:

1. **Targeted Workshops on Tense Functions:** Organize specialized workshops that explicitly focus on the rhetorical functions of verb tenses within Computing Science articles, moving beyond mere grammatical rules. For example, provide explicit instruction on when to employ Present Simple for general statements versus Past Simple for reporting methods, or Present Perfect for recent advancements.
2. **Contextualized Teaching Materials:** Develop ESP course materials that integrate authentic Computing Science articles as illustrative examples. These materials should highlight correct verb tense usage in different sections (e.g., Abstracts, Introductions, Related Work) and contrast these patterns with common NNES errors identified in the corpus.
3. **Focus on Problematic Tense Pairs:** Provide specific, intensive instruction and practice modules dedicated to differentiating between the Simple Past and Present Perfect tenses, as this was consistently identified as a major struggle. Exercises should involve choosing the rhetorically appropriate tense in various CS contexts.
4. **Practice with Passive Voice and Sequence of Tenses:** Offer focused exercises on the correct formation and appropriate utilization of the passive voice in academic writing, concurrently emphasizing strategies for maintaining consistent tense sequencing within paragraphs to ensure logical flow.
5. **Address L1 Interference Explicitly:** Teachers should possess an awareness of potential L1 interference from Arabic and French. Incorporate comparative grammar exercises that highlight the divergences between English verb tense systems and those in Arabic/French, thereby aiding learners in comprehending the underlying reasons for specific errors.

6. **Provide Individualized Feedback:** Prioritize individualized feedback on writing, as this was the most frequently requested form of support. This can be achieved through one-on-one consultations or detailed written feedback from language specialists or experienced supervisors, a method highly valued by NNES in interviews as a practical way to receive targeted guidance.
7. **Encourage Peer Review with Linguistic Focus:** Implement structured peer review sessions where students specifically focus on identifying and discussing verb tense usage and errors in each other's work, guided by clear checklists provided by instructors. This approach was highly valued by surveyed NNES as a practical means to receive targeted feedback and to enhance their self-correction abilities.
8. **Leverage AI-Based Writing Tools:** Integrate the use of advanced grammar checkers and AI-powered writing assistants into the curriculum. These tools can provide real-time feedback on tense usage, particularly for complex structures and sequence of tenses, thereby assisting NNES in self-correction and continuous improvement. Interviewed colleagues strongly supported the adoption of such tools as powerful supplementary resources.

## 5.4 Limitations of the Study

While this study furnishes valuable insights, it is imperative to acknowledge its inherent limitations.

- **Context Specificity:** The corpus of articles and the survey/interview participants were exclusively drawn from Mohamed Khider University of Biskra. Consequently, the findings may not be directly generalizable to all NNES populations or to Computing Science academic writing in other geographical or institutional contexts without further empirical investigation.
- **Corpus Size:** The corpus, comprising 50 articles, while substantial for an in-depth Master's study, remains limited compared to very large-scale linguistic corpora. This inherent limitation may consequently influence the statistical generalizability of some quantitative findings.
- **Self-Reported Data:** Survey and interview data, by their nature, rely on participants' self-perceptions and observations, which may occasionally diverge from actual linguistic behavior.
- **Absence of Native Speaker Comparison Corpus:** A direct quantitative comparison of verb tense usage patterns between NNES and native English speakers in Computing Science was not feasible within this study due to constraints in corpus collection. This limitation restricts the ability to precisely quantify the degree of divergence in tense patterns.

## 5.5 Directions for Future Research

Building upon the insights gleaned and acknowledging the inherent limitations of this investigation, several promising avenues for future research are posited:

1. **Larger and Comparative Corpora:** Conduct a larger-scale corpus study that includes articles from native English-speaking Computing Science authors. This will enable a direct, quantitative comparison of verb tense usage patterns between NNES and native speakers, offering more robust insights.
2. **Broader Linguistic Features:** Extend the linguistic analysis to encompass grammatical features beyond core verb tenses. This could include passive voice types, the full spectrum of modal verbs, nominalization, and hedging, thereby providing a more complete and nuanced picture of NNES academic writing.
3. **Longitudinal Studies:** Implement longitudinal studies to track the developmental trajectory of verb tense proficiency in NNES Computing Science students over extended periods. Such studies could also assess the long-term effectiveness of specific pedagogical interventions.
4. **Intervention Studies:** Design and rigorously implement pilot ESP interventions directly based on the recommendations derived from this study. Subsequent evaluation of their effectiveness in enhancing NNES academic writing skills would provide crucial pedagogical validation.

5. **Development of AI-Based Tools:** Explore the feasibility of developing sophisticated AI-based writing assistants or feedback tools capable of specifically targeting verb tense errors and providing context-aware suggestions for NNES in Computing Science. This would leverage the insights gained from this research. The potential of these tools was strongly emphasized by interviewed faculty and researchers as a valuable complementary approach to traditional language instruction.
6. **Cross-Disciplinar Comparisons:** Conduct comparative analyses of verb tense usage and associated challenges in Computing Science against those in other STEM disciplines. This would identify commonalities and divergences in academic writing conventions across scientific fields.

# General Conclusion

This Master's dissertation meticulously examined the utilization of English verb tenses in computing science articles, with a dedicated focus on those authored by non-native English speakers (NNES) from Mohamed Khider University of Biskra. By employing a robust mixed-methods approach that comprehensively combined automated corpus analysis with in-depth surveys and qualitative text analysis, this study has yielded a granular and evidence-based understanding of a critical area of academic English.

Our findings unequivocally demonstrate that verb tense usage in computing science articles is not arbitrary but systematically aligns with the inherent rhetorical functions of different sections within a scholarly paper. We confirmed the overwhelming dominance of Present Simple and Past Simple, meticulously detailing their specific roles, from asserting general truths in introductions to reporting experimental procedures and empirical results. More critically, this research has illuminated the precise linguistic challenges consistently faced by NNES, notably in distinguishing between Simple Past and Present Perfect, mastering the complexities of passive voice, and maintaining coherent tense consistency. The pervasive influence of L1 interference (from Arabic and French) on these difficulties was also strongly corroborated by the qualitative data, offering vital cross-linguistic insights.

This work offers significant and multifaceted contributions. It addresses a notable lacuna in existing ESP literature by providing context-specific insights into linguistic features and NNES challenges within computing science, thereby moving beyond more generalized analyses of academic English. The empirical data collected serves as a solid and verifiable foundation for developing highly targeted and effective ESP teaching materials and pedagogical strategies. Furthermore, the strong emphasis articulated by department members and NNES on the potential of AI-based tools for language learning and error correction highlights a compelling and promising avenue for future pedagogical innovation in this domain.

Ultimately, this dissertation transcends mere academic inquiry; it provides actionable recommendations designed to empower NNES computing scientists at our university and beyond to communicate their valuable research with enhanced clarity, accuracy, and professional confidence. By fostering a deeper understanding of these intricate linguistic nuances and proactively addressing common pitfalls, this work contributes directly to elevating the quality of scientific communication and strengthening Algeria's scholarly presence within the global research community.

# .1 The Questionnaire

**Questionnaire for Department Members: English Verb Tense Usage in Computing Science Academic Writing by Non-Native English Speakers**

Dear Professor,

I am a Master's student in the English Department conducting research for my dissertation titled, "An ESP-based Investigation of the Utilization of English Verb Tenses in Computing Science Articles by Non-Native English Speakers at Mohamed Khider University of Biskra."

This questionnaire aims to gather your valuable insights and observations regarding the use of English verb tenses by non-native English-speaking (NNES) students and researchers in their academic writing within the field of Computing Science. Your expertise and experience are crucial for understanding the challenges faced and for informing the development of targeted English for Specific Purposes (ESP) support.

Your participation is voluntary, and all responses will be kept anonymous and confidential. The aggregated data will be used solely for the purpose of this academic research. The questionnaire should take approximately 15 minutes to complete.

Thank you for your time and contribution to this study.

Sincerely,

**The Questionnaire**

## Part 1: Background Information (Optional - anonymity is ensured if collected)

1. Years of teaching/supervising experience in higher education:
   - 0-5 years
   - 6-10 years
   - 11-15 years
   - 16-20 years
   - More than 20 years
2. Primary language(s) used in your own academic publications (if applicable):
   - English
   - French
   - Arabic
   - Other (Please specify): _____
3. On average, what proportion of the academic texts (e.g., theses, research papers, project reports) you review or supervise are written by non-native English speakers?
   - Less than 25%
   - 25% - 50%
   - 51% - 75%
   - More than 75%

## Part 2: Observations on Verb Tense Usage by NNES

1. In your experience, how significant are issues related to English verb tense usage in the academic writing of NNES students/researchers in Computing Science?
   - Not significant at all
   - Slightly significant
   - Moderately significant
   - Very significant
   - Extremely significant
2. Which of the following English verb tenses or tense-related aspects do you most frequently observe NNES students/researchers struggling with in their CS academic writing? (Please check all that apply and rank your top 3 if possible: 1 = most problematic)
   - Simple Present (e.g., the algorithm processes data) Rank: _____
   - Simple Past (e.g., we conducted an experiment) Rank: _____
   - Present Perfect (e.g., researchers have shown) Rank: _____

- Past Perfect (e.g., the system had been tested before) Rank: _____
- Future Tenses (e.g., we will investigate, is going to be implemented) Rank: _____
- Modal Verbs (e.g., can, may, should, must) and their temporal implications Rank: _____
- Passive Voice (across various tenses, e.g., data was analyzed, results are presented) Rank:
- Sequence of Tenses (consistency of tenses within a paragraph or section) Rank: _____
- Distinguishing between similar tenses (e.g., Simple Past vs. Present Perfect) Rank: _____
- Other (Please specify): _____ Rank: _____

3. Could you provide a specific example of a common verb tense error you have noticed in NNES CS writing? _____

## Part 3: Perceived Causes and Influences

1. To what extent do you believe the first language (L1) of students (e.g., Arabic, French) influences their use of English verb tenses in academic writing?
   - No influence at all
   - Slight influence
   - Moderate influence
   - Strong influence
   - Very strong influence
2. If you perceive L1 influence, could you give an example of how Arabic or French grammatical structures might lead to particular English verb tense errors? (Optional) _____
3. Apart from L1 interference, what other factors do you think contribute to NNES' difficulties with English verb tenses in CS academic writing? (Please check all that apply)
   - Lack of explicit instruction on academic tense usage
   - Insufficient exposure to authentic CS academic texts in English
   - Over-reliance on general English grammar rules not specific to academic discourse
   - Lack of awareness of the rhetorical functions of tenses in different sections
   - Limited practice in academic writing
   - Anxiety or lack of confidence in writing in English
   - Other (Please specify): _____

## Part 4: Pedagogical Implications and ESP Needs

1. What kind of support or resources related to English verb tenses do you believe would be most beneficial for NNES students/researchers in your department? (Please check all that apply)
   - Workshops specifically on academic verb tense usage in CS
   - Tailored ESP course materials focusing on CS discourse conventions
   - Examples of correct tense usage from authentic CS articles
   - Checklists or guidelines for tense usage in different paper sections
   - Individualized feedback on writing from language specialists
   - Peer review sessions focusing on grammatical accuracy
   - Access to advanced grammar checking software
   - Other (Please specify): _____

2. In your opinion, which specific functions of verb tenses (e.g., describing established knowledge, reporting past research, presenting new findings, discussing implications, proposing future work) should be given more emphasis in ESP instruction for CS students? _____

3. Do you have any specific advice or strategies you currently offer to your NNES students regarding the use of verb tenses in their academic writing? If so, please briefly describe them. _____

4. Do you have any further comments or suggestions regarding the investigation of English verb tense usage in Computing Science academic writing by NNES, or on how to better support these students? _____

Thank you very much for completing this questionnaire. Your contribution is greatly appreciated!

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