AN ANALYSIS OF RHETORICAL STRUCTURES IN ENGLISH LANGUAGE TEACHING RESEARCH ARTICLE INTRODUCTION WRITTEN BY HUMAN AUTHORS AND CHAT GPT

NATDANAI LOONLAWAN

MASTER OF ARTS

IN

ENGLISH FOR PROFESSIONAL DEVELOPMENT

SCHOOL OF LIBERAL ARTS

MAE FAH LUANG UNIVERSITY

2024

©COPYRIGHT BY MAE FAH LUANG UNIVERSITY

AN ANALYSIS OF RHETORICAL STRUCTURES IN ENGLISH LANGUAGE TEACHING RESEARCH ARTICLE INTRODUCTION WRITTEN BY HUMAN AUTHORS AND CHAT GPT

NATDANAI LOONLAWAN

THIS THESIS IS A PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS
IN
ENGLISH FOR PROFESSIONAL DEVELOPMENT

SCHOOL OF LIBERAL ARTS
MAE FAH LUANG UNIVERSITY
2024
©COPYRIGHT BY MAE FAH LUANG UNIVERSITY

THESIS APPROVAL

MAE FAH LUANG UNIVERSITY

FOR

MASTER OF ARTS

IN ENGLISH FOR PROFESSIONAL DEVELOPMENT

Thesis Title: An Analysis of Rhetorical Structures in English Language Teaching Research Article Introduction Written by Human Authors and Chat GPT

Author: Natdanai Loonlawan

Examination Committee:

Associate Professor Issra Pramoolsook, Ph. D.	Chairperson
Phirunkhana Phichiensathien, Ph. D.	Member
Assistant Professor Sasima Charubusp, Ph. D.	Member
Bhornsawan Inpin, Ph. D.	Member

Advisors:

P Phichiensathien .....Advisor

(Phirunkhana Phichiensathien, Ph. D.)

Dean:

.....

(Associate Professor Sorabud Rungrojsuwan, Ph. D.)

ACKNOWLEDGEMENTS

This thesis would not have been possible without the guidance, support, and encouragement of many individuals to whom I am deeply grateful.

First and foremost, I would like to express my profound gratitude to my thesis advisor, Arjan Dr.Phirunkhana Phichiensathien, for her invaluable guidance, insightful feedback, and unwavering support throughout this research journey. Her expertise in genre analysis and patience have been instrumental in shaping my understanding and refining my work. I am deeply thankful to Miss Alfonsa Vina Kanasya for serving as the inter-coder in this research. She took the time to complete training in genre analysis and carefully analyzed the research article introductions. Her dedication and hard work were essential to ensuring the accuracy of this study.

I extend my sincere appreciation to Mae Fah Luang University and the lecturers of the School of Liberal Arts for their academic support and for providing me with valuable knowledge and resources throughout my studies. Their dedication to teaching and research has greatly contributed to my learning experience and the success of this thesis.

I am also thankful to my friends and colleagues for their encouragement, helpful discussions, and motivation along the way. Their support has made this journey successful and meaningful.

Natdanai Loonlawan

Thesis Title An Analysis of Rhetorical Structures in English Language Teaching Research Article Introduction Written by Human Authors and Chat GPT

Author Natdanai Loonlawan

Degree Master of Arts (English for Professional for Professional Development)

Advisor Phirunkhana Phichiensathien, Ph. D.

ABSTRACT

This study analyzed the proficiency of one of the most famous generative AI tools (ChatGPT-4o) in generating research article introductions (RAIs) within the field of English Language Teaching (ELT). Using Swales' Creating a Research Space (CARS) model, the study compared the rhetorical structures of RAIs written by human authors and the ChatGPT-4o. The study used a qualitative design combining genre-based content analysis and rhetorical comparison. It analyzed two sets of 14 Research Article Introductions (RAIs): one from Scopus-indexed ELT journals and one generated by ChatGPT-4o using the same article titles. Through the qualitative research method approach, content analysis identified the moves and steps in both human author and ChatGPT-generated RAIs, followed by qualitative comparison. The results revealed that while ChatGPT adhered to the established rhetorical structure, it overemphasized Move 2 (establishing a niche) and exhibited nuances in Moves 2 and 3 compared to human-written RAIs.

Keywords: Generative AI Tool, ChatGPT, Rhetorical Structure, Research Article Introduction (RAI), English Language Teaching (ELT), Swales' CARS Model

TABLE OF CONTENTS

CHAPTER	Page
1 INTRODUCTION	**1**
1.1 Background of the Study	1
1.2 Statement of Problem	4
1.3 Research Objectives	6
1.4 Research Questions	6
1.5 Significance of the Study	6
1.6 Scope and Limitation of the Study	7
1.7 Definition of Terms	8
2 LITURATURE REVIEW	**10**
2.1 Artificial Intelligence (AI)	10
2.2 Generative Artificial Intelligence	11
2.3 Generative AI Tools	13
2.4 ChatGPT	20
2.5 The Concept of Rhetorical Structures in Genre Analysis	25
2.6 The CARS Model Used in this Study	37
2.7 Discipline in Academic Research Article Introductions (ELT)	39
2.8 Related Studies	41
2.9 Conceptual Framework	43
2.10 Summary	46
3 METHODOLOGY	**48**
3.1 Research Design	48
3.2 Datasets and Corpora	48
3.3 Research Instruments	54
3.4 Data Analysis	57
3.5. Research Procedure	61

TABLE OF CONTENTS

CHAPTER	Page
4 RESEARCH RESULTS	**63**
4.1 The Moves and Steps Employed in the RAIs	63
4.2 Similarities and Differences in the Rhetorical Structures	77
4.3 Similarities and Differences in the Frequency of Moves and Steps	83
5 CONCLUSION AND DISCUSSION	**86**
5.1 Conclusion	86
5.2 Discussion of the Findings	88
5.3 Implications	91
5.4 Limitation of the Study	95
5.5. Recommendations for Further Research	95
REFERENCES	97
APPENDICES	109
APPENDIX A List of the Research Articles Used for Move and Step Analysis in the Study	109
APPENDIX B The Examples of the Genre Analysis Results	112
CURRICULUM VITAE	125

LIST OF TABLES

Table	Page
2.1 The List of Available Generative AI Tools	14
2.2 The Elements of ChatGPT's Prompt for Academic Writing	22
2.3 The Integrated CARS Model, Explanations, and Common Lexical Bundles in RAIs	29
2.4 The Integrated CARS Model	39
3.1 The List of Research Articles Found According to the Criteria	50
3.2 The Titles and Details of the RAIs from Human Authors and ChatGPT	52
3.3 The Elements and Explanations of the Prompt for RAIs	55
3.4 Analysis Form	56
3.5 Guidelines to Interpret the Strength of Agreement	60
4.1 The Moves and Steps in the Human Author Corpus	65
4.2 The Moves and Steps in the ChatGPT Corpus	66
4.3 The Frequency and Percentage of the Moves and Steps in the Human Author and ChatGPT Corpora	76
4.4 The Rhetorical Structures of the Moves and Steps in the Human Author Corpus According to the CARS Model	78
4.5 The Frequency of the Rhetorical Structures in the Human Author Corpus	79
4.6 The Organization of the Moves and Steps in the ChatGPT Corpus According to the CARS Model	80
4.7 The Frequency of the Rhetorical Structures in the ChatGPT Corpus	81

LIST OF FIGURES

Figure	Page
2.1 The Foundation of Generative AI Systems	12
2.2 Swales’ (1981) Genre-analysis Model for RAIs	35
2.3 Swales’ (1990) CARS Model for RAIs	36
2.4 Swales' (2004) Modified CARS Model for RAIs	37
2.5 Conceptual Framework	46
3.1 Research Procedure of this Study	62

ABBREVIATIONS AND SYMBOLS

AI	Artificial Intelligence
AGI	Artificial General Intelligence
ANI	Artificial Narrow Intelligence
ANN	Artificial Neural Network
ASI	Artificial Super Intelligence
CALL	Computer-assisted Language Learning
CARS	Creating a Research Space
EFL	English as a Foreign Language
ELT	English Language Teaching
ES	Expert System
ESL	English as a Second Language
ESP	English for Specific Purposes
Gen-AI	Generative Artificial Intelligence
GPT	Generative Pretrained Transformer
IMRD	Introduction, Method, Results, and Discussion
LLM	Large Language Model
ML	Machine Learning
NLP	Natural Language Processing
NR	New Rhetoric
RAI	Research Article Introduction
SFL	Systemic-functional Linguistics
SPSS	Statistical Package for Social Sciences
UNESCO	The United Nations Educational, Scientific and Cultural Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Generative artificial intelligence (Gen-AI) has emerged as a significant figure in the sub-field of artificial intelligence (AI). Generative AI focuses on the development of intelligent systems designed to create original and innovative content. Essentially, "generative" refers to the act of generating or producing, suggesting that generative AI has the ability to generate or create content (Kalota, 2024). Gen-AI encompasses generative AI tools such as ChatGPT, Bard AI, and Microsoft Bing Chat. Among all the generative AI tools, ChatGPT is the most popular and is superior in its capability to generate effective and creative texts compared to other generative AI tools (Iorliam & Ingio, 2024; Meyer et al., 2024).

The emergence of ChatGPT in late 2022 caused substantial interest in the field of Gen-AI. Developed by OpenAI, ChatGPT has been widely acknowledged for its proficiency in producing coherent and contextually relevant responses across diverse disciplines, including academic research and writing (Gill & Kaur, 2023; Kalota, 2024). As ChatGPT and other generative AI tools are progressively integrated into academic contexts, understanding its competencies and limitations becomes crucial. Some publications and educational entities endorse using ChatGPT to enhance text readability and coherence (Lingard, 2023; Rahman et al., 2023; Sabzalieva & Valentini, 2023). In order to use ChatGPT effectively and properly, users must understand the technology's strengths and limitations. As explored in existing literature covering aspects such as grammar structure, plagiarism, biases, and content accuracy (Ariyaratne et al., 2023; Gao et al., 2023; Motoki et al., 2023).

In the realm of academic research and writing, ChatGPT has shown competence in crafting research article introductions (RAIs), an essential academic genre. Alkhaqani (2023) affirmed ChatGPT's effectiveness in this regard, highlighting its role in assisting with RAI creation, emphasizing its role in clearly articulating research objectives and underscoring study significance. ChatGPT contributes to structuring

ideas and crafting a clear, compelling thesis statement, facilitating reader's comprehension. This claim is supported by Ariyaratne (2023) and Rahman (2023), who compared ChatGPT-generated different sections in scientific research articles with those written by human authors. Both studies provided positive evaluations of ChatGPT's proficiency in composing RAIs. Rahman (2023) highlighted ChatGPT's potential in assisting with identifying research gaps, generating possible research questions, and formulating hypotheses. However, researchers are cautioned against relying solely on ChatGPT, as it may not always produce accurate or specific research questions, problem statements, research gaps, or hypotheses.

One of the important aspects in writing RAIs and other textual genres is the rhetorical structure. Rustipa et al. (2023) defined rhetorical structure as the overall organization of a text, progressing through stages, known as moves in the context of genre analysis. Each move employs specific techniques, referred to as steps, to achieve its intended purpose and contribute to the text's overall meaning. A useful linguistic tool called the Creating a Research Space (CARS) model, introduced by Swales (1990, 2004), was designed to examine the rhetorical structures of research article introductions (RAIs). Swales' CARS model outlines the rhetorical structure of RAIs in three moves. Move 1, establishing a territory, introduces the topic with a gradual shift from general to specific information, communicating the research goal. Move 2, establishing a niche, highlights the research gap and significance, addressing weaknesses in prior studies. In RAIs, move 2 explains the problems related to the research topic. Move 3, occupying the niche or presenting the current work, outlines how the research addresses identified needs, encompassing research questions, hypotheses, methods, findings, significance, and structure. This structuring approach guides the crafting of RAIs, offering a clear framework for effective communication.

The CARS (Create A Research Space) model is a widely recognized framework for structuring research article introductions. However, there are other models and approaches that have been explored for this purpose. For instance, Nwogu's model (1997) structures research articles into four sections (IMRD), with the introduction comprising three moves: background information, reviewing related research, and presenting new research. Similarly, Hyland's (2000) abstract model includes five

moves: Introduction, Purpose, Method, Product, and Conclusion. These alternatives highlight the broad application of genre analysis in academic writing.

Despite these models, this study adopted Swales' CARS model (1990, 2004) for its detailed structure and adaptability. The model organizes introductions into three main moves—establishing a territory, establishing a niche, and occupying the niche—with clear steps that enhance coherence (Del Saz Rubio, 2011; Pandey, 2022; Samraj, 2002). Additionally, its ongoing refinement makes it a versatile tool across disciplines (Lu et al., 2021; Zainuddin & Shaari, 2017). Given these strengths, the CARS model was the most suitable choice for this study.

Swales' RAI rhetorical structure is widely used across academic fields, including English language teaching (ELT). In ELT, studies by Rochma et al. (2020) and Rahman et al. (2017) found a consistent M1-M2-M3 pattern, following Swales' CARS model (1990, 2004). Regarding ChatGPT, it had been proven capable of generating RAIs effectively (Alkhaqani, 2023; Rahman et al., 2023). While ChatGPT showed potential advantages to the process of academic research and writing, further investigation was needed to understand its specific writing capabilities, especially in aligning with the standard human authors' structure for RAIs. This understanding was crucial for properly and effectively incorporating ChatGPT into academic practices (Liao et al., 2023, Tarchi et al., 2024, Zhao et al., 2024).

The current research aimed to examine the proficiency of ChatGPT in generating RAIs, a genre characterized by distinct communicative objectives and contexts, utilizing Swales' CARS model (1990, 2004). The study's outcomes uncovered the similarities and differences in the rhetorical structures of RAIs between human authors and ChatGPT, examining whether the ChatGPT adhered to the established human standard in the rhetorical structure of RAIs. The findings of this study offered readers valuable insights for evaluating and adjusting rhetorical structures in AI-generated RAIs according to their unique needs and contexts.

1.2 Statement of Problem

Gen-AI and ChatGPT have immense influence on academic research and writing positively and negatively. The impact of ChatGPT on academic writing raises significant concerns about ethical implications and regulatory frameworks for using the created content. Meyer (2023) highlighted ambiguity in distinguishing between personal input and potential plagiarism with AI-generated text, causing academic publications such as Elsevier, Springer-Nature, and Taylor & Francis to publish guidelines. These guidelines allow authors to improve the readability of their texts by ChatGPT, but they ban them from being listed as an author or co-author (Rahman et al., 2023).

Furthermore, ChatGPT have a major issue of occasionally presenting inaccurate data, often known as hallucinations (Meyer et al., 2023). Despite their ability to help discover relevant studies for literature reviews, sometimes may create incorrect or wrong publications. This weakness, which stems from their training to generate text based on existing data, poses risks, particularly in critical fields such as health, where accuracy is essential. Relying on the outputs of these tools for treatment plans may result in misdiagnoses and unsuitable therapies, harming patients. As a result, any usage of large language models (LLMs) such as ChatGPT should require rigorous examination of the results to assure accuracy. As the positive and negative impact of ChatGPT in academia continues to grow, it is imperative that research and understanding of these tools evolve to keep pace with their increasing utilization.

A comprehensive understanding of generative AI tools' capabilities in the domain of academic research and writing is still lacking. There remains a notable gap in the area of rhetorical structures that enable generative AI, such as ChatGPT to effectively convey essential concepts and ideas on diverse subjects. This gap is particularly evident in its proficiency to employ coherent, logically and clearly structured writing (Herbold et al., 2023). An investigation by Xiao and Zhi (2023) revealed that English as a Foreign Language (EFL) students, in academic writing tasks, utilize ChatGPT beyond mere idea generation and grammar checks. The students employ the technology to enhance the logical coherence of their sentences and essays, as well as to translate and structure their thoughts into written expressions. These

circumstances indicate the potential of generative AI tools like ChatGPT to suggest structures for research and academic writing (Liao et al.; 2023, Tarchi et al., 2024; Zhao et al., 2024).

This aspect of academic writing can be referred to as rhetorical structure. Rhetorical structure, as mentioned in the introduction section, refers to the overall structure or organizational pattern of a text, progressing through stages, each contributing to the overall meaning of the text. These stages are termed moves in the context of genre analysis (Rustipa et al., 2023; Swales, 1990). By being aware of the possible mistakes and limitations of ChatGPT's writing capabilities in this area, users can more effectively compare its rhetorical structures to the human established standard, as outlined in Swales' CARS model (1990, 2004). This awareness allows users to leverage ChatGPT as a valuable tool for creating texts that communicate meaning coherently and logically.

Accordingly, this study aimed to address the existing lack of understanding in the literature concerning rhetorical structures by analyzing the generated content of ChatGPT-4o and comparing it with human authors' rhetorical structures. The chosen genre for this investigation was RAIs due to their unique and essential role in providing readers with context to comprehend the research purpose and an overview of research articles (Gao & Pramoolsook, 2023). Additionally, the focus was on RAIs in English Language Teaching (ELT), which mainly adhered to the standard structure according to Swales' CARS model (Rahman et al., 2017; Rochma et al., 2020; Swales, 1990, 2004). This decision was also influenced by the fact that previous studies mainly examined ChatGPT's writing ability in scientific research articles, with limited exploration in ELT and other disciplines (Ariyaratne, 2023; Gao et al., 2022; Rahman, 2023). Understanding ChatGPT's effectiveness across different disciplines was considered crucial and valuable to the literature on the generative AI tool and its integration in academic research and writing.

1.3 Research Objectives

This study intended to achieve the following research objectives:

1.3.1 To identify the moves and steps employed in RAIs written by human authors and ChatGPT in English language teaching.

1.3.2 To determine similarities and differences of RAIs written by human authors and ChatGPT in the rhetorical structures in English language teaching.

1.4 Research Questions

This purpose of this study was to answer the following research questions:

1.4.1 What are the moves and steps employed in RAIs written by human authors and ChatGPT in English language teaching?

1.4.2 What are the similarities and differences of RAIs written by human authors and ChatGPT in the rhetorical structures in English language teaching?

1.5 Significance of the Study

The United Nations Educational, Scientific and Cultural Organization (UNESCO) emphasized that users of ChatGPT must be aware of the technology's capabilities and limitations to effectively and safely incorporate and evaluate these tools in academic tasks (Sabzalieva & Valentini, 2023). This study aimed to expand understanding and awareness of ChatGPT by exploring their potential impacts and benefits in academia. The study's significance is as follows.

The research uncovered ChatGPT's limitations and strengths in providing or communicating specific contexts and ideas, offering valuable insights into its functionality for improved applications. In particular, readers became aware of the rhetorical structures of RAIs created by ChatGPT and were able to make informed decisions on whether to adopt the RAIs in their academic papers.

1.5.1 This study provided readers with the resources they needed to examine and modify the rhetorical structures found in ChatGPT-generated research

introductions to suit their own needs and settings. By offering insights into the development of these responses, individuals were able to assess and adapt ChatGPT's communication style to better align with their specific requirements and context-specific needs.

1.5.2 This study confirmed ChatGPT's rhetorical competencies, particularly in the creation of RAIs and their structures. As a result, academics, academic writing educators, and students were able to extract practical, authentic examples of rhetorical structures from the output of ChatGPT. This research affirmed the technology's capability to execute academic writing tasks and offered valuable educational resources for enhancing rhetorical structures, particularly when integrating technologies like ChatGPT into the academic writing process (Liao et al., 2023; Zhao et al., 2024).

1.6 Scope and Limitation of the Study

The aim of this study was to analyze Research Article Introductions (RAIs) in English Language Teaching (ELT). Specifically, the objective was to compare RAIs produced by human authors with those generated by ChatGPT. The rationale behind this was because of the potential of ChatGPT to serve as a beneficial learning companion, assisting EFL and ESL students in acquiring proficiency in English, improving academic writing skills, and completing language-related tasks (Nguyen, 2023; Xiao & Zhi, 2023). The primary aim of this research was to contribute new insights to the field of ELT and to enhance the learning experiences of EFL and ESL students.

The study focused on analyzing the rhetorical structures in RAIs written by both human authors and ChatGPT. A total of 28 RAIs were selected for analysis—14 written by human authors published in reputable ELT journals and 14 generated by ChatGPT in response to the same research prompts. The analysis applied Swales' (1990, 2004) Create a Research Space (CARS) model to identify and compare the rhetorical moves and steps used in each RAI. The content, accuracy, citations, and other linguistic features did not influence the study's findings, as the emphasis was placed solely on rhetorical organization and structure.

There were multiple generative AI tools available at the time, but ChatGPT was considered as the most popular and creative option (Iorliam & Ingio, 2024). Therefore, this study selected ChatGPT as the representative of generative AI tools for comparative purposes.

Due to the fact that ChatGPT is a constantly evolving tool, it is expected that more advanced versions will be released in the future. For the purpose of this research, the researcher used ChatGPT-4o, which was the latest and most advanced version at the time of the study (Günay et al., 2024; Nguyen et al., 2024; OpenAI, 2024.; Sabaner et al., 2024). In this study, the term ChatGPT hereafter also refered to ChatGPT-4o, the latest and most advanced version at the time the study was conducted.

1.7 Definition of Terms

The terms below are listed and defined due to their specific and frequent usage in the study.

1.7.1 Rhetorical structure refers to the overall structure or organizational pattern of a text, progressing through stages, each contributing to the overall meaning of the text. These stages are termed moves in the context of genre analysis (Rustipa et al., 2023). According to Swales (1990, 2004), rhetorical structure in research article introductions commonly consists of three moves: Move 1 (Establishing a Territory) introduces the topic, moving from general to specific to set the research goal. Move 2 (Establishing a Niche) identifies research gaps and highlights the study's significance. Move 3 (Occupying the Niche) presents the current research, including objectives, methods, findings, and structure.

1.7.2 Research article introduction (RAI) is the essential opening section of a research article that provides an overview of the entire article, providing the research purposes, questions, or gaps and establishing the tone for the entire investigation (Gao & Pramoolsook, 2023).

1.7.3 Human authors, in this study, refer to individuals who write or create research articles, or to be more specific research article introductions (RAIs), based on their own intellectual input, creativity, and understanding, as opposed to ChatGPT or other generative AI tools, which generate text using algorithms and pre-existing data.

The distinction between human and AI authorship is becoming increasingly relevant as generative AI tools like ChatGPT are capable of producing human-like text (Iorliam & Ingio, 2024).

1.7.4 CARS model refers to the Creating a Research Space, a rhetorical strategy model that help academic writers write effective RAIs (Dabamona et al., 2022; Swales, 1990).

1.7.5 ChatGPT is a generative AI tool developed by OpenAI, designed to generate human-like responses to text prompts (Deng & Lin, 2023; Hadi et al., 2023). As a large language model (LLM), ChatGPT creates original content rather than merely predicting outcomes, with outputs spanning text, code, images, audio, and video (Kalota, 2024). It comes in multiple versions, including a free version (ChatGPT-3.5) and a premium edition (ChatGPT-4.0 and ChatGPT-4o). The latter offers enhanced intelligence and the ability to process both text and images, making it more versatile than its predecessors (Deng & Lin, 2023; Meyer et al., 2023; OpenAI, 2024.; Sabaner et al., 2024).

1.7.6 English language teaching is a branch of applied linguistics, focuses on second language teaching and learning, bridging theory and practice through research (Aronoff & Rees-Miller, 2003; Dendrinos, 2014). In ELT research, Research Article Introductions (RAIs) establish a study's purpose and significance. Swales' CARS model (1990) structures RAIs into three moves: establishing a research territory, identifying a gap, and presenting the study. This framework remains dominant despite some variations (Rahman et al., 2017; Rochma, 2020). With AI tools like ChatGPT, research now examines how well AI-generated RAIs align with human-authored structures, raising questions about their effectiveness in ELT writing (Alkhaqani, 2023; Rahman et al., 2023)

CHAPTER 2

LITERATURE REVIEW

This chapter provides an in-depth review of previous research on artificial intelligence (AI) that supports the performances of generative AI tools. It seeks to explain and reinforce readers' understanding of AI and ChatGPT by delving into its fundamental definitions, key concepts, benefits, limitations, and impact on academic writing, particularly RAIs.

In addition, this chapter delves into previous studies focused on the concept of RAIs and the rhetorical structures, particularly in the field of ELT, that support authors in writing coherent and clear RAIs. The concepts and tools employed in this study are the CARS model created and developed by John Swales (1990, 2004).

2.1 Artificial Intelligence (AI)

The term artificial intelligence (AI) refers to a study and development of computer systems capable of executing tasks that normally require human-like cognitive capacities, such as language comprehension, learning, problem solving, and decision-making (Nelson et al., 2020). As a study, AI is a multidisciplinary field that draws upon computer science, computer engineering, philosophy, psychology, mathematics (including statistics), neuroscience, linguistics, and biology. For the development of computer systems, AI aims to mimic cognitive functions that humans associate with their own thinking processes. These systems use data, algorithms, and computational power to simulate human-like decision-making and problem-solving (Jarrahi, 2018). In the field of AI, there are several subfields. The major subfields are machine learning (ML), natural language processing (NLP), expert systems (ES), computer vision, and robotics (Arias, 2021).

In the further explanation, AI as the machine and computer system development can be categorized in three levels: artificial narrow intelligence (ANI), artificial general intelligence (AGI), and artificial super intelligence (ASI) (Aljaber & Almushaili, 2022).

2.1.1 Artificial Narrow Intelligence (ANI)

Artificial narrow intelligence, also called weak AI or arrow AI, is the most attainable form of artificial intelligence created by human authors. It focuses on specific tasks and goals. Examples of this level of AI are facial recognition and Google search (Aljaber & Almushaili, 2022).

2.1.2 Artificial General Intelligence (AGI)

Artificial general intelligence, also referred to as strong AI or deep AI, is a type of AI that seeks to imitate human intelligence. AGI can learn from repeating tasks and help with problem-solving. In essence, Deep AI has the ability to understand and think similar to humans. The examples of AGI are ChatGPT-3.5 and ChatGPT-4 (natural language generation, natural language understanding, learning and adaptation, planning and decision-making) (Aljaber & Almushaili, 2022; Latif et al., 2023).

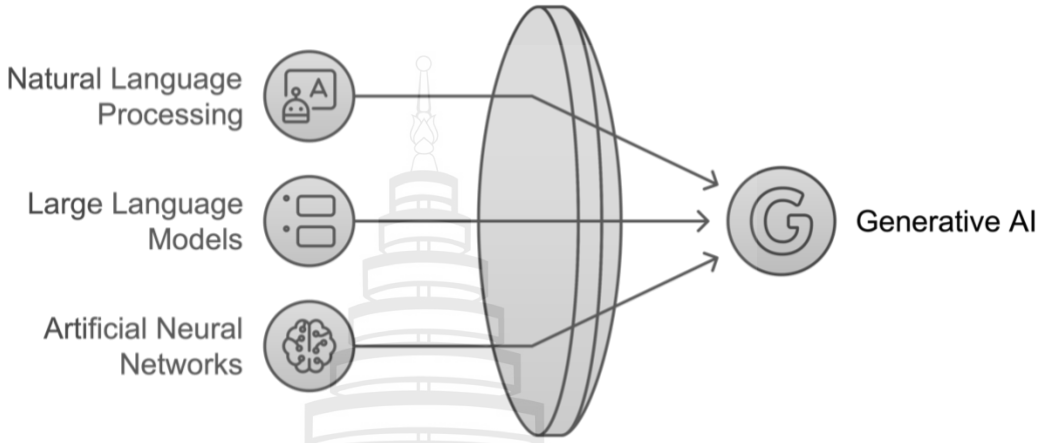
2.1.3. Artificial Super Intelligence (ASI)

Artificial super intelligence is a speculative concept suggesting that machines could achieve self-awareness and surpass human intelligence. This idea is mainly found in science fiction. It suggests that in the future, super intelligent AI might understand human intelligence and even develop its own beliefs and ideologies. This represents the pinnacle of AI development, where machines not only mimic human emotions and intelligence but also excel beyond them, forming their own opinions and ideologies (Aljaber & Almushaili, 2022).

2.2 Generative Artificial Intelligence

As part of the artificial general intelligence, generative artificial intelligence (Gen-AI) refers to the field of artificial intelligence that focuses on the creation of intelligent systems capable of generating new and original content. Essentially, “generative” refers to the act of generating or producing, suggesting that generative AI has the ability to generate or create content (Kalota, 2024). Gen-AI encompasses generative AI tools such as ChatGPT, Gemini, Microsoft Bing Chat, which have the ability to generate several forms of content, code, images, text, and videos. The emergence of ChatGPT in late 2022 caused substantial interest in the field of Gen-AI.

Figure 2.1 illustrates the foundation of generative AI systems, highlighting the importance of understanding related concepts such as natural language processing (NLP), large language models (LLMs), and artificial neural networks (ANN) to comprehend technologies like ChatGPT and other generative AI tools (Kalota, 2024).



Source Kolota (2024)

Figure 2.1 The Foundation of Generative AI Systems

2.2.1 Natural Language Processing (NLP)

Natural language processing (NLP) focuses on creating and applying computer programs to process or produce human language. Its primary objective is to analyze, comprehend, and generate human languages, ultimately allowing computers to interpret and interact with human communication naturally. Computers utilize NLP for three primary objectives: (1) facilitating communication with humans, (2) enhancing learning capabilities, and (3) advancing scientific knowledge (Kalota, 2024).

2.2.2 Large Language Models (LLMs)

Large language models (LLMs) are a subset of AI that have emerged as effective tools for many different linguistic and text-based tasks, including NLP, text generation, question answering, and machine translation (Hadi et al., 2023). The training process involves feeding the model with large amounts of text data and adjusting the model's parameters to minimize the error between the predicted and actual outputs.

In the process of text generating, LLMs assist in predicting the subsequent probable words in a generated text, assisting in suggesting completions for generated

emails or text messages. It utilizes probability to predict the potential words that may come after in a sentence. For instance, when a phrase begins with the pronoun “they,” it is much more probable that the subsequent word will be “are” rather than “is” (Kalota, 2024).

LLMs have been employed in diverse domains, including academia, for tasks like NLP, machine translation, and question answering. They have been used to analyze large datasets of academic papers, identify research trends, and summarize scientific papers (Brown et al., 2020). LLMs such as ChatGPT and Gemini have demonstrated remarkable performance in comprehending, producing, and reasoning with language. They exhibit a more extensive level of intelligence when compared to early LLMs classified as ANI. Therefore, many researchers consider these LLMs (ChatGPT-3.5 and ChatGPT-4) to be initial versions of AGI (Latif et al., 2023).

2.2.3 Artificial Neural Networks (ANN)

Artificial neural networks (ANN) imitate the neuronal structure of human brains, employing processes such as learning, memory, and generalization. By comprehending complex relationships in data, individuals are able to develop advanced machine learning systems, commonly referred to as deep learning (Kalota, 2024).

2.3 Generative AI Tools

Generative AI tools are machine learning models that produce original data instead of just predicting outcomes. These tools can generate various types of data, including audio, code, images, text, and videos (Kalota, 2024). For example, ChatGPT gained significant attention following its public release in November 2022 (Kalota, 2024). Additionally, many other generative AI tools are available for similar applications. Iorliam and Ingio (2024) categorized the available generative AI tools, within year 2023-2024, into three tiers based on their popularity as presented in Table 2.1.

Table 2.1 The list of available generative AI tools

Tier	Gen-AI Tool	Pros and Cons
Tier 1: High Popularity	**ChatGPT (ChatGPT-3.5, ChatGPT-4, and ChatGPT-4o):** This tool is widely used for tasks such as text generation, translation, and answering queries, with over 180 million registered users, making it the top choice.	**Pros:** - It generates responses that closely resemble human responses - It can be customized for particular tasks - It accommodates input sequences of different lengths **Cons:** - ChatGPT needs extensive pretraining data - It may cause high computing costs. - It relies on older data and doesn't provide results beyond 2021.
	Google's Bard (later renamed Gemini): This tool is gaining popularity rapidly due to its features for uploading images, real-time data processing, multilingual support, and connection with Google Search (Gemini Apps' Release Updates & Improvements, 2024).	**Pros:** - It is synchronized with Google search for up-to-date results. - It generates diverse text formats such as poems, code, scripts, music, email and letters.

Table 2.1 (continued)

Tier	Gen-AI Tool	Pros and Cons
	Microsoft Bing Chat: This tool integrates with Bing Search and serves over 100 million users as of March 2023.	- This AI adapts to differe conversations and produce realistic responses. **Cons:** - It occasionally produces repetitive results. - It may contain errors or inconsistencies. - It is limited in its ability generate long-form article **Pros:** - Its responses are highly accurate. - It provides sources for its responses. - It is capable of generating images within the chat box alongside text. **Cons:** - There is a limit of 30 responses per session for generation. - It takes long time to response. - It generally gives shorter responses with fewer details.

Table 2.1 (continued)

Tier	Gen-AI Tool	Pros and Cons
Tier 2: Moderate Popularity	**Perplexity AI:** This AI tool prioritizes accuracy and offers a "GPT-4 co-pilot mode" for collaborative writing. It has around 2 million active users as of April 2023.	**Pros:** - It provides the sources it utilizes for answering questions. - It delivers clear and concise responses to input questions or queries. **Cons:** - Its accuracy is not consistent. - The prompt or Input text must be precise and clear for generating accurate answers.
	ChatSonic: This tool is renowned for creative writing and diverse output formats, with a user-friendly interface and affordable pricing.	**Pros:** - It provides numerous advanced AI functionalities. - It is capable of generating images based on text prompts, not restricted to text only. **Cons:** - It is accessible mainly in English. - The free version restricts users to 10,000 words in total.

Table 2.1 (continued)

Tier	Gen-AI Tool	Pros and Cons
	Jasper AI: It is favored by marketing experts for its capability to produce different marketing copy styles and enhance content for search engine optimization. It boasts approximately 100,000 users	**Pros:** - It has great versatility - It has easy-to-use interface. - It produces content rapidly. **Cons:** - It is available with only a seven-day trial. - The users must subscribe to the Boss mode or a higher tier to access the chatbot, which can be costly. - The information it provides is inconsistent.
Tier 3: Lower Popularity	**YouChat:** It is a new platform specializing in developing AI companions. Despite having fewer users, it has helpful features like customizable personalities and emotional intelligence.	**Pros:** - It is simple to use. - It shows references. **Cons:** - Occasionally presents outdated or irrelevant links for certain queries.
	HuggingFace: This AI is mainly employed by developers and researchers because it's open-source and provides access to a variety of pre-trained language models.	**Pros:** - It produces up-to-date responses. - It is simple to use.

Table 2.1 (continued)

Tier	Gen-AI Tool	Pros and Cons
		Cons: - The training data was updated until 2021. - Its reliability is diminished due to its restricted training data.
	Quora's Poe: It is designed specifically for poem composition; hence it is used less frequently than other tools	**Pros:** - It offers a unified platform for accessing various AI tools. - It enables users to create content using multiple AI models and compare them. - Users can create a single account and access approximately five different chatbots. **Cons:** - Due to the use of Multiple AI models on one platform, the outputs can be complicated. - Some included models or tools need to be paid to use.

Source Iorliam and Ingio (2024)

Among all the generative AI tools, ChatGPT is the most popular and is superior in its capability to generate effective and creative texts compared to other generative AI tools. This claim is supported by a handful of comparative analysis on the existing generative AI tools. According to the comparative study of Iorliam and Ingio (2024), ChatGPT is the most famous and creative generative AI tool. Ahmed et al. (2023) compared ChatGPT and Google's Bard, concluding that ChatGPT surpasses Bard in its ability to generate compelling text. Kiryakova and Angelova (2023) showed that ChatGPT is widely used in learning activities, offering support to professors. Noy and Zhang (2023) investigated how ChatGPT influences productivity in mid-level professional writing tasks. In an online experiment, 444 college-educated professionals were given writing tasks, with half using ChatGPT. Results show that ChatGPT substantially boosts productivity, reducing time taken by 0.8 SDs and improving output quality by 0.4 SDs on average. In other words, college-educated professionals can accomplish tasks more efficiently and in less time with the assistance of ChatGPT. Moreover, ChatGPT-4o has been labeled as the most advanced version and has demonstrated superior performance compared to ChatGPT 3.5 and 4.0 across various domains (Openai, 2024).

For instance, a comparative study on generative AI tools by Nguyen et al. (2024) evaluated the performance of three generative AI tools—GPT-4, GPT-4o, and Gemini Advanced—in interpreting electrocardiogram (ECG) data, comparing their accuracy to that of cardiologists and emergency medicine specialists. The study found that GPT-4o emerged as the best-performing AI model, achieving a 60% accuracy rate on more challenging ECG questions, while both GPT-4 and Gemini performed lower overall, with GPT-4 scoring only 51.25%. This research investigates the effectiveness of generative AI tools like ChatGPT-4o, ChatGPT-3.5, and Google Gemini in assisting radiology researchers with biostatistical analyses and coding tasks. In the same way, the study by Günay et al. (2024) involved two experiments: one assessing the models' ability to suggest appropriate biostatistical tests and second evaluating their capacity to produce Python code for deep learning applications. Results indicated that ChatGPT-4o outperformed the other models in providing correct statistical answers and generating functional code, although all models encountered some runtime errors. In conclusion, among the available generative AI tools, ChatGPT-4o manifested as the

most superior and popular option. Based on the existing literature mentioned above, this study chose to employ ChatGPT-4o as the representative for the generative AI tools to be analyzed and compared with human authors.

2.4 ChatGPT

ChatGPT or Generative Pretrained Transformers (GPT), developed by OpenAI, is a generative AI tool that employs AI technologies to generate a response from a given input. It is trained to interpret instructions within a prompt and provide comprehensive feedback. In simpler terms, ChatGPT operates as a chatbot that integrates artificial neural networks (ANN), natural language processing (NLP), and large language models (LLM) to interact effectively with users. The term transformers mean that ChatGPT accepts input and produces or transforms output in a variety of formats (Kalota, 2024). For example, it can take a given prompt and produce a written essay, email, image, or audio.

Open AI provided several versions of ChatGPT. The first is the basic version utilizing model version 3.5. The second is the premium edition or ChatGPT plus, currently operating with models like ChatGPT-4.0 and ChatGPT-4o. The significant additional features of the premium versions (ChatGPT 4.0 and 4o), apart from being smarter than ChatGPT-3.5, is its capability to accept image inputs and generate image outputs (Meyer et al., 2023; OpenAI, 2024).

It is useful for NLP tasks like question-answering, summarization, and language translation. ChatGPT has also been used in academic writing for literature reviews, research abstracts, and RAIs. However, it faces challenges and limitations, such as the risk of plagiarism and inaccurate or misleading information (Ariyaratne et al., 2023; Da Silva, 2023; O'Connor, 2023). It is not recommended for students to use ChatGPT to generate written tasks, such as essays, and submit them as their original work. Some scholars also opposed its inclusion as an author or co-author due to its potential to mislead, cause ambiguity, and do not have a legal personality to the possible errors (Bhatia, 2023; O'Connor, 2023).

Despite these challenges, many scholars see AI technology like ChatGPT as having potential advantages. The ability of ChatGPT in generating human-like text, answering questions, and summarizing information is considered to be a valuable asset for researchers and academics in diverse disciplines (Mondal & Mondal, 2023). The academic community should adopt ChatGPT to enhance data collection, academic writing, learning, and teaching (Eke, 2023; Sabzalieva & Valentini, 2023). Rather than prohibiting ChatGPT, individuals should develop responsible usage. Some academics argued that ChatGPT could be used to craft academic article components, such as abstract and introduction sections, by drawing on pre-existing data (Dwivedi et al., 2023; Gao et al., 2022; Kutela et al., 2023; Rahman et al., 2023).

2.4.1 Prompt Engineering for Academic Writing

In order to operate ChatGPT, the users need to provide proper prompts for the tasks. A prompt refers to a specific instruction or question provided to a language model like ChatGPT to direct its responses and achieve the desired outcome. In natural language processing, prompting is a fundamental aspect and is becoming increasingly significant in the fast-growing field of artificial intelligence. Prompt engineering, a newly emerging discipline, focuses on designing and optimizing prompts to enhance the performance of large language models, especially in natural language processing tasks (Giray, 2023).However, while prompt engineering aims to refine prompts for optimal results, Sanmarchi et al. (2023) advised that there is no single or perfect method for crafting prompts. Users should remain cautious, flexible, and adapt their prompts to achieve the best possible outcomes from generative AI tools.

In academic writing, developing prompt engineering skills allows writers to adapt to the evolving field of artificial intelligence and utilize large language models (LLMs) to improve their writing process. By applying prompt engineering strategies, researchers and scholars can discover new opportunities for research and the sharing of knowledge. According to Glary (2023), effective prompts for academic writing tasks include the specific elements as shown in Table 2.2.

Table 2.2 The Elements of ChatGPT's Prompt for Academic Writing

Elements	Explanations
Instruction	A particular assignment or command that controls the behavior of the model and points it in the direction of the desired result.
Context	External data or extra information that gives the model context and background knowledge to produce more precise and relevant responses.
Input data	The information or query that the users want the model to analyze and respond to. It serves as the central idea of the prompt and powers the model's comprehension of the assignment.
Output indicator	Specifies the intended output's type or format. It aids in forming the response by indicating whether we require a brief response, a paragraph, or any other particular format.

Source Glary (2023)

In research writing, a handful of researchers attempted to craft ChatGPT's prompts for different sections in research articles. In the study of Gao et al. (2023), the ability of ChatGPT in writing the research abstract section was investigated. This is the prompt used in the study: "Please write a scientific abstract for the article [title] in the style of [journal] at [link]" (Gao et al., 2023, p. 4).

In addition to the research abstract section, the RAI section was also used to test the writing ability of ChatGPT. Kutela et al. (2023) conducted research to examine ChatGPT's proficiency in generating RAIs. The study employed the following prompt: "I want you to develop an introduction section of a manuscript for publication. I will give you a number of titles then I want you to give me the introduction section of the paper. You need to adopt a persona of a highly skilled writer in traffic safety. In your writeup, include the actual citations, actual references, and actual traffic safety statistics. The first title is 'Title of the paper'" (Kutela et al., 2023, p. 4).

In a study conducted by Rahman et al. (2023), an alternative prompt for RAIs was formulated and utilized. The provided prompt is as follows:

"Write an introduction for the article titled "Adoption of Artificial Intelligence (AI) in in higher education". Provide the sub-sections: background, problem statement, research gaps" (Rahman et al., 2023, p. 5).

Sikander et al. (2023) conducted a study in which they developed and implemented an alternative prompt for RAIs. The prompt they provided is as follows: "Write an introduction section including background, research gap, and aim for a scientific journal with the aim" (Sikander et al., 2023, p.6).

In this study, the researcher chose the prompt from the study of Kutela et al. (2023) because it provided the essential elements for academic writing specified by Glary (2023). This prompt consisted of instruction, context, input data, and output indicator.

2.4.2 The Impact of ChatGPT on Academic Writing

The first issue surrounding ChatGPT's impact on academic writing is the ethical and regulatory framework for utilizing its generated content. With AI-generated content, distinguishing between personal input and potential plagiarism becomes ambiguous. Several academic journals have provided guidelines on the inclusion of text from large language models (LLMs) in published works and whether ChatGPT should be credited as an author (Meyer et al., 2023). Elsevier, Springer-Nature, and Taylor & Francis issued guidelines for the use of generative AI tool in the texts to be published. According to the guidelines, authors are able to use generative AI tools to improve the readability of their texts. However, generative AI tools cannot be listed as an author or co-author (Rahman et al., 2023).

Generative AI tools, such as ChatGPT, also represent a serious issue of occasionally providing misleading information, known as hallucination. For example, when asked to find relevant papers for a literature review, ChatGPT sometimes provided incorrect references. When correct references were given, they were not always relevant to the given topics (Meyer et al., 2023). This suggests that, while these chatbots can appropriately format responses, they may not always be accurate due to their training to build text depending on cues. Such difficulties limit the utility of LLM chatbots, particularly in key sectors like medicine, where accuracy is essential. Relying on the

outputs of these chatbots for treatment plans may result in misdiagnoses and poor treatments, potentially injuring patients. As a result, any use of LLMs should involve a thorough examination of their results to verify accuracy.

Apart from the already mentioned concerns, LLMs also benefit academics from various backgrounds, particularly non-native English speakers, by functioning as writing and editing tools to improve academic writing quality. Over time, software-based editing tools have grown dramatically, from basic spelling checks in document editors like Microsoft Word to commercially available online services like Grammarly, Scribbr, and QuillBot. These tools include a variety of capabilities for correcting grammatical problems and improving writing clarity. However, they typically rely on predetermined assessments of the writing sample and give a report based on these assessments (Meyer et al., 2023). In comparison to traditional editing tools LLMs or generative AI tools provide greater assessment flexibility by using prompts. For example, users can prompt LLMs with questions like “Can you explain the grammatical mistakes you've identified?” to receive extensive explanations for discovered errors. These explanations give users additional information to assess the accuracy of the generated reports. Creative prompts have been used to improve numerous areas of writing, such as grammar, readability, tone, and intent (Meyer et al., 2023).

Generative AI tools, like ChatGPT, is increasingly incorporated into the realms of academic research and writing. Furthermore, this technology is gaining prominence in English language education, specifically in the realm of teaching and learning the skills related to academic writing in English. As an illustration, some publications, researchers, and organizations not only permit but also recommend authors to employ ChatGPT for enhancing the overall clarity and readability of their written content (Lingard, 2023; Rahman et al., 2023; Sabzalieva & Valentini, 2023). An investigative inquiry conducted by Xiao and Zhi (2023) revealed that, in academic writing assignments, EFL learners employ ChatGPT not only for obtaining ideas or for grammar and spell checking. These students also utilize ChatGPT to enhance the logical flow and coherence of their sentences and essays. Furthermore, the students use ChatGPT to articulate their ideas in written form.

While the impact and application of ChatGPT for academic purposes is increasing, both in terms of quantity and versatility, the research and comprehension of

ChatGPT must evolve to match the progressive usage. One of which is the study of rhetorical structures of the content or texts produced by ChatGPT. Rustipa (2023) explained that rhetorical structure is about how a text is organized, moving through different parts, with each part adding to the overall meaning of the text. ChatGPT is a powerful chatbot that goes beyond concise responses, providing extensive and comprehensive texts. Moreover, these texts display coherence, logical flow, and a well-organized structure (Herbold et al., 2023). However, this assertion of effectiveness has not gained sufficient attention and supporting evidence.

2.5 The Concept of Rhetorical Structures in Genre Analysis

Genre analysis is a method used to study the structure and function of different types of texts within specific contexts. It is primarily concerned with understanding how texts are constructed and how they function within particular social and cultural settings. There are three main schools of genre analysis: the New Rhetoric (NR), English for Specific Purposes (ESP), and Systemic Functional Linguistics (SFL) (Phichiensathien, 2016). The New Rhetoric (NR) views genre as a social construct, emphasizing the role of community and context in shaping how genres are used and understood. It considers genre knowledge to be embedded in the social practices of communities (Johns, 2008; Johns et al., 2006). For instance, in this school, research articles are analyzed in terms of how they reflect the norms and expectations of academic communities (Hyon, 1996).

English for Specific Purposes (ESP) is concerned with the linguistic features of texts and how these features serve specific communicative purposes. It often involves analyzing the structure of texts to identify common patterns or "moves" that fulfill particular functions (Hyon, 1996; Johns et al., 2006). As an example, Swales (1990, 2004) analyzed the structure of research article introductions, identifying typical moves such as establishing a research territory and presenting the research. The last school, Systemic Functional Linguistics (SFL), also known as the Sydney School, integrates genre analysis with a functional theory of language. It emphasizes the social semiotic aspects of language, viewing genres as tools for achieving specific social purposes

(Hyon, 1996; Rose, 2015). In this school, educational texts are analyzed to understand how they are structured to achieve pedagogical goals, such as teaching specific content or skills (Rose, 2015).

Genre analysis provides valuable insights into how texts function within different contexts and communities. The NR focuses on the social aspects of genre, ESP emphasizes linguistic features and communicative purposes, and SFL integrates genre with a functional view of language. Each school offers unique perspectives and methodologies for understanding and teaching genres. In this study, the researcher selected the school of English for Specific Purposes (ESP), as it focuses on linguistic features and rhetorical structures of texts, examining how these elements serve specific communicative purposes. This aligns with the study's objective of analyzing the rhetorical structures of research article introductions.

In terms of rhetorical structures, Rustipa (2023) defined the term rhetorical structure as the overall structure or organizational pattern of a text, progressing through stages, each contributing to the overall meaning of the text. These stages are termed moves in the context of genre analysis and each move has several techniques or rhetorical strategies to achieve the intend of the move. In genre analysis, the rhetorical strategies are called steps.

In the realm of the ESP school of genre analysis, Swales (1990) explained that genre analysis involves examining how language is utilized in a particular context. The purpose of genre analysis, according to Henry and Roseberry (2001), is to identify the strategies, sequence, structure, and language features of a genre and to comprehend why expert users choose those features to accomplish their communication goals. Swales (1990) employed genre analysis to investigate generic patterns in introductions of research articles. Consequently, the analysis model of Swales was used to analyze different text genres. Swales employed genre analysis to categorize RAIs into distinct sections or moves, each further divided into steps. Alharbi (2021) defines a move as a unit of speech or writing that assists the writer in expressing their ideas in a coherent and logical manner. A step is a subcomponent of a move that has a specific communication function related to the intent of the move (Li et al., 2020).

The examples of moves and steps can be seen in the pioneering study of Swales. Swales developed his genre analysis model, which he named the Creating a Research

Space (CARS) model (1990). Later, he further developed his model in 2004. The model consists of 3 moves and 13 steps, as shown in Figure 2.2. Move 1, also known as establishing a territory, serves as an introduction to the topic and provides the general background of the study. This move typically starts with a broad generalization about the topic and gradually becomes more specific. In RAIs, this move communicates the goal of the research topic. The purpose of move 2 is to demonstrate the research gap and the importance of the current work. It consists of steps that highlight the weaknesses of previous studies or the lack of research in the field and describe how the current work will address these gaps. Move two communicates problems of the research topic in RAIs. Move 3 is occupying the niche or presenting the current work. This move shows how the work addresses the need outlined in move 2. It describes the research's intent. It may include presenting research questions or hypotheses, defining terms, summarizing methods, stating findings, describing the significance of the work, and indicating its structure. This move communicates the solution and criteria for evaluation of the research area.

In addition to the CARS model of Swales (1990, 2004), there are alternative genre analysis frameworks available for RAIs and other sections in research articles. For instance, Nwogu's model (1997) serves as a guideline for structuring the four sections of research articles (IMRD). While the introduction section in both models shares three similar moves, Swales' model provides distinct steps to achieve the intent of the moves. In Nwogu's model (1997), move 1 involves presenting background information, move 2 entails reviewing related research, and move 3 involves presenting new research. As for research abstract section, Hyland’s (2000) also used genre analysis to develop a five-move framework to write effective research abstracts which includes: (1) Introduction, (2) Purpose, (3) Method, (4) Product and (5) Conclusion. These alternatives and frameworks show that genre analysis is wildly used in academic research writing.

Among all the available models, this study chose to use the CARS models of Swales (1990, 2004) for several reasons. First, the CARS model is praised for its detailed structure, which includes three main moves: establishing a territory, establishing a niche, and occupying the niche. These moves are further divided into specific steps that help in crafting a coherent introduction (Del Saz Rubio, 2011;

Pandey, 2022; Samraj, 2002). Second, over the years, the CARS model has been adapted and revised to fit various disciplines and contexts. This adaptability makes it a versatile tool for academic writing across different fields (Lu et al., 2021; Zainuddin & Shaari, 2017). With these qualities, the CARS model was the suitable tool for this study due to its comprehensive and adaptable structure.

In the process of analyzing rhetorical structures of texts, the moves and steps used in the texts need to be identified first and then observe the sequence or structure of their occurrences in RAIs. Identifying the moves and steps revolves recognizing the commonly used lexical bundles at each step within RAIs. Lexical bundles refer to combinations of three or more words that commonly appear in a language or specific register. Examples include expressions like [*p*]*lay an important role in the*, *in the context of, it was found that the, little is known about the*, and *the purpose of the present study was to*. Lexical bundles make language more predictable to the hearer/reader. For example, *little is known about the* signals gap in the study area (Cortes, 2013, p. 39-40).

In RAIs and rhetorical structure, lexical bundles can signal the onset of rhetorical moves and steps (Cortes, 2013). Table 2.3 will explain the further details of the CARS model and the examples of lexical bundles that are commonly used in RAIs to realize the moves and steps.

Table 2.3 The Integrated CARS Model, Explanations, and Common Lexical Bundles in RAIs

Moves	Steps	Examples/ Lexical Bundles
Move 1: Establishing a territory This move signifies the study's importance within the established research field (Rahman et al., 2017).	**Step 1: Claiming relevance of field** This step emphasizes the importance and significance of the chosen topic in the research field (Rahman et al., 2017).	Human resource researchers and managers have long maintained that the human resource function *plays an important role* in firm performance (Barney & Wright, 1998, p. 31).
	Step 2: Making topic generalizations This step signifies the gradual transition from broader concepts to the specific field of study (Rahman et al., 2017).	The effect of the microbiota and its metabolic activities require special consideration when viewed *in the context of* pig production in which efficient animal growth is a primary objective (Cortes, 2013, p.38).
	Step 3: Reviewing items of previous literature This step involves reviewing and referencing previous literature relevant to the study (Rahman et al., 2017).	*Many studies reviewed that* students can establish their motivation with many factors in order to achieve the English language (Phichiensathien, 2017, p. 139).

Table 2.3 (continued)

Moves	Steps	Examples/ Lexical Bundles
Move 2: Establishing a niche This move connects Move 1 (previous studies in the field) to move 3 (current research). This move signifies the need for the research that is presented (Kanoksilapatham, 2007).	Step 1A: Indicating a gap This step identifies gaps, limitations, or weaknesses in prior research, thereby justifying the rationale for conducting a new study either directly or indirectly (Rahman et al., 2017).	Analyses of learners' cognitive processes involved in the production of speech acts *are still lacking* (Ren, 2013, p. 1).
	Step 1B: Adding to what is known This step involves following a specific research direction or continuing a tradition of previously pursued research (Rahman et al., 2017).	*Many previous research show* that motivation can help students achieve their learning, so that *the present study will enlarge* the application with Thai students in an online course. (Phichiensathien, 2017, p. 140)

Table 2.3 (continued)

Moves	Steps	Examples/ Lexical Bundles
	Step 2: Presenting positive justification Step 2 illustrates the research's necessity or provide positive reasons for the reported study, often following the identification of a research gap (Rahman et al., 2017).	When designed and executed with caution, particularly in combination with other data collection methods, the RVR *can provide researchers with* added in-depth insights into participants' pragmatic knowledge (Ren, 2013, p. 2).
Move 3: Occupying the niche This move is designed to describe the ongoing research, and it typically consists of seven steps (Rahman et al., 2017).	Step 1: Announcing present research descriptively and/or purposefully	*This study focuses on* motivation in the English language learning of Thai students. The goal is to determine how Thai students improve their English language. (Phichiensathien, 2017, p.117) *The objective of the study* is to guide students in Mae Fah Luang University to increase their ability in the English language learning (Phichiensathien, 2017, p.117).

Table 2.3 (continued)

Moves	Steps	Examples/ Lexical Bundles
	Step 2: Presenting research questions or hypotheses	In *pursuit* of *this goal*, we *focused on* two *research questions*: (1) What skills do students need to motivate their English learning? (2) How do students motivate the English language learning? (Phichiensathien, 2017, p.142).
		The study's primary hypotheses were that the severity of drought would correlate with increased incidence of snakebites, and could be predicted by weather patterns (Phillips et al., 2018, p.2).
	Step 3: Definitional clarifications	When *I refer to* "argumentation" *in this article*, I am signaling the process of argument (O'Halloran, 2010, p. 173).
	Step 4: Summarizing methods	*The study will use* two types of survey: The Reconnaissance Level and the Intensive Level. The Reconnaissance Level type will cover fieldwork and documentation of the history and architectural evolution of the buildings (Lintao & Erfe, 2012, p. 20).

Table 2.3 (continued)

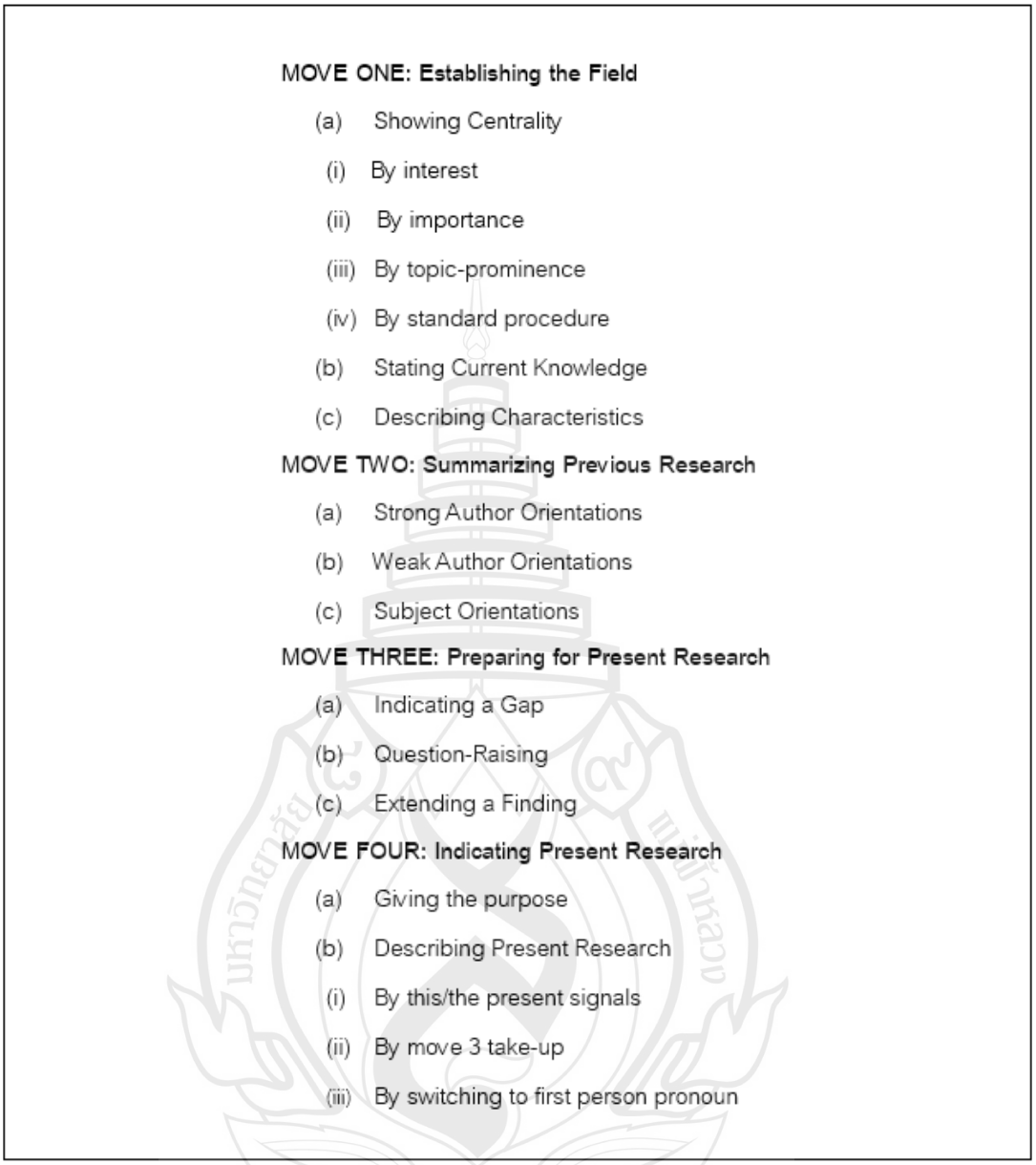
Moves	Steps	Examples/ Lexical Bundles
	Step 5: Announcing principal outcomes	In the processing, *it has been found that* the high span participants were able to retrieve the filler from their WM faster than the low span participant (Farnia & Barati, 2017, p. 492)
	Step 6: Stating the value of the present research	Perhaps the greatest *value in this current study is* that it describes the process of how learners' positional identities are constructed and reconstructed across contexts and interactions (Kayi-Aydar, 2013, p. 5)
	Step 7: Outlining the structure of the paper	*The article is structured as follows*: first, the literature on learners' cognitive processes in L2 pragmatics research is reviewed, followed by a brief overview of the validity and reliability issues of the RVRs. The methods and findings of the present investigation are then presented, followed by a discussion of the findings (Ren, 2013, p. 3).

Source Cortes (2013), Kanoksilapatham (2007), Rahman et al.(2017) and Swales, (1990, 2004)

2.5.1 Development and Revision of the CARS Model

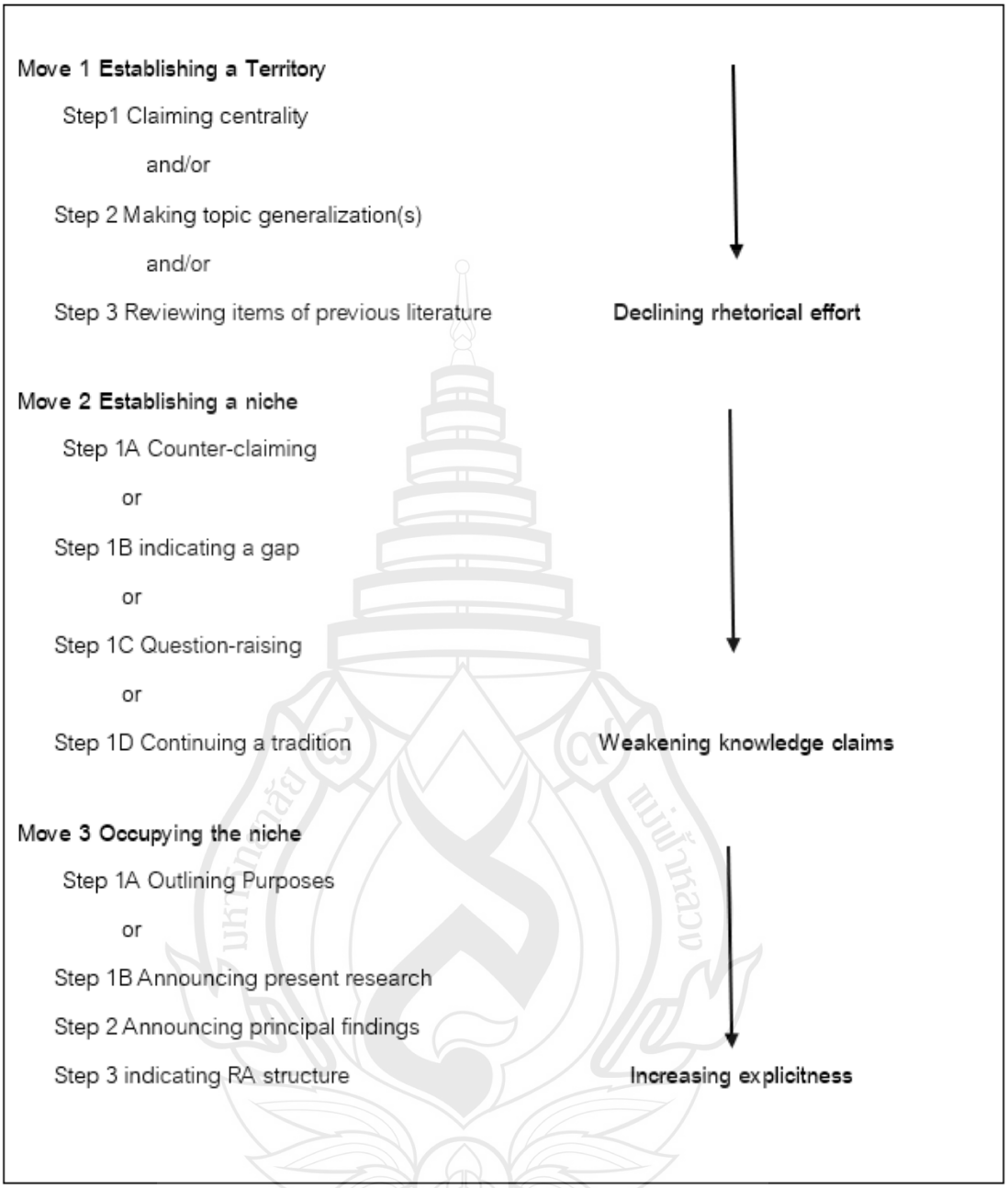
Swales (2004) described how his CARS model for RAIs was created and how it has changed over the past three decades. Swales initially developed four moves for analyzing the rhetorical organization of RAIs in 1981 as shown in Figure 2.1. The first move was to establish the field, the second to summarize previous studies, the third to set the stage for further investigation, and the fourth to present the current study. According to Laurence (1997), a major revision of the CARS model was combining move 2, which involves reviewing literature, with move 1. Apart from the combination, in the later version of the CARS model (1990), move 2 transitions to addressing research gaps and questions, and move 3 incorporates options like summarizing findings and outlining the structure of the later sections in the article. The changes are illustrated in Figure 2.2.

In addition to the CARs model (1990), Phichiensathien (2017) presented that different academic disciplines may have distinct requirements for the organization of the RAIs. For instance, in fields like software engineering, the emphasis should be on things like defining words, clarifying theoretical ideas, and reviewing previous investigations. Additionally, Phichiensathien (2017) also presented that certain steps within the CARS model can be optional in some disciplines but required in others. Moreover, in longer texts, a particular move might be repeated for clarity and effectiveness. To accommodate these variations, the 2004 CARS model was developed to offer a more flexible framework for analyzing linguistic features and rhetorical structures of RAIs (Swales, 2004). This adaptation aimed to better address the diverse needs of researchers across various academic fields. The differences between of the 1990 and 2004 CARS model are in all three moves. Move 1 and 2 and their steps were reduced in the 2004 version. In contrast, move 3 was expanded up to seven steps to accommodate the varied options of the authors in presenting their present work. The details of the revision are presented in Figure 2.2 and 2.3.



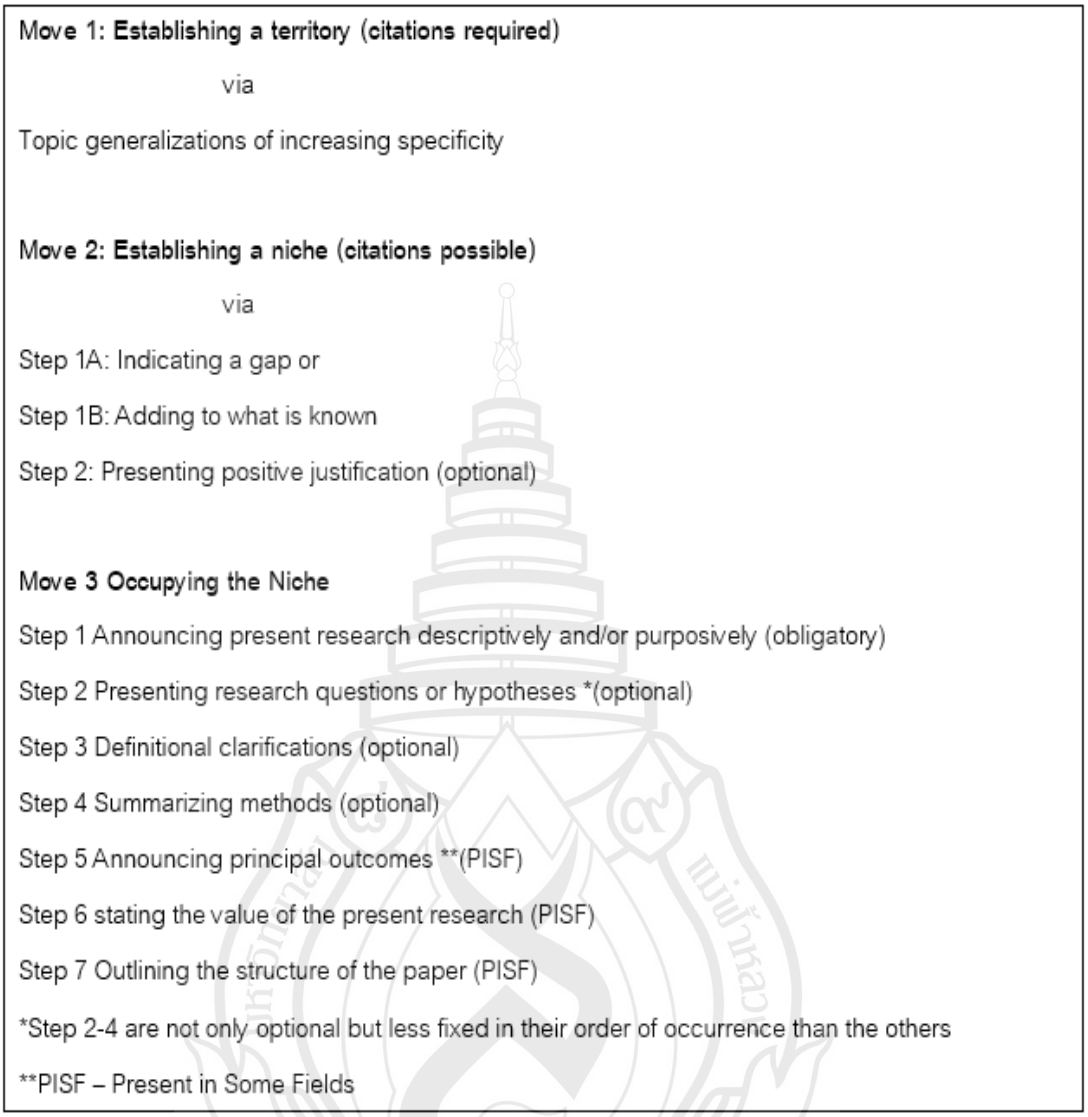
Source Nwogu (1991)

Figure 2.2 Swales' (1981) Genre-analysis Model for RAIs



Source Swales (1990)

Figure 2.3 Swales' (1990) CARS Model for RAIs



Source Swales (2004)

Figure 2.4 Swales' (2004) Modified CARS Model for RAIs

2.6 The CARS Model Used in this Study

The aim of this study was to analyze and compare RAIs written by human authors and ChatGPT to reveal how effective this generative AI technology can communicate the essential information through the moves and steps. The findings of this study can assist the users in assessing ChatGPT's ability to use rhetorical techniques and structures for impactful communication in RAIs. This study will also highlight AI's potential in academic writing and its implications for future advancements.

In order to achieve this goal, the researcher integrates both the 1990 and 2004 CARS models. These two versions are employed to encompass a wide range of potential rhetorical strategies and structures utilized by both human authors and ChatGPT. The 1990 version remains more commonly utilized compared to the 2004 version, because the research tradition that has developed around that model (Sheldon, 2011). In addition, the 2004 model was developed to accommodate the variation of steps (Swales, 2004). By including the 2004 model, it becomes possible to identify wilder range of rhetorical strategies and structures that ChatGPT could potentially employ.

The integration process of the two versions of the CARS model began with Move 1. This study selected Move 1 and its steps from the 1990 model because it offers a more detailed division of steps compared to the 2004 revision. Specifically, in the 1990 model, Move 1 includes multiple clearly defined steps, such as "claiming centrality" and "making topic generalizations," which some researchers find useful for analyzing research article introductions across various disciplines. In contrast, the 2004 model consolidates these steps into a single step, "topic generalization of increasing specificity." This simplification may overlook the nuanced strategies that writers employ to establish context and significance in their research writing (Del Saz Rubio, 2011).

For Move 2, the researcher adopted Move 2 and its steps from the 2004 revised CARS model, which removed two steps from the older version: Step 1A: Counter-claiming and Step 1C: Raising Questions. Both "counter-claiming" and "raising questions" were recognized as functionally similar to "indicating a gap." The argument is that these elements do not introduce substantially different rhetorical functions but rather serve as alternative ways to express the need for further investigation. As noted, "counter-claiming" may be interpreted as highlighting problems with existing research rather than directly identifying gaps, suggesting that the distinctions between these steps were not as clear-cut as previously thought (Swales, 2004).

Finally, for Move 3, this study selected Move 3 and its steps from the 2004 model, as it was developed to accommodate a greater variation of steps (Swales, 2004). By incorporating Move 3 and its steps from the 2004 model, it becomes possible to identify a wider range of rhetorical strategies and structures that ChatGPT could

potentially employ in move 3.The integrated CARS model used in this study is illustrated in Table 2.4.

Table 2.4 The Integrated CARS Model (Swales, 1990, 2004)

Move 1 Establishing a territory
Step 1 Claiming centrality
Step 2 Making topic generalization/s
Step 3 Reviewing items of previous literature
Move 2 Establishing a niche
Step 1A Indicating a gap or
Step 1B Adding to what is known
Step 2 Presenting positive justification (optional)
Move 3 Occupying the niche
Step 1 Announcing present research descriptively and/or purposively (obligatory)
Step 2 Presenting research questions or hypotheses *(optional)
Step 3 Definitional clarifications (optional)
Step 4 Summarizing methods (optional)
Step 5 Announcing principal outcomes **(PISF)
Step 6 Stating the value of the present research (PISF)
Step 7 Outlining the structure of the paper (PISF)
*Step 2-4 are not only optional but less fixed in their order of occurrence than others
**PISF – Present in Some Fields

Source Swales (1990, 2004)

2.7 Discipline in Academic Research Article Introductions (ELT)

English Language Teaching (ELT) is a key area within applied linguistics, which emerged in the 1940s as linguists sought to address practical language issues, particularly in military language training (Aronoff & Rees-Miller, 2003). Over time, applied linguistics expanded beyond language instruction to encompass various interdisciplinary fields such as psychology, sociology, and pedagogy. Despite this growth, second language teaching and learning remain central to the discipline. Applied

linguistics serves as a bridge between theory and practice, addressing real-world language challenges and informing ELT through empirical research and reflective teaching practices (Dendrinos, 2014). The relationship between applied linguistics and ELT is dynamic, with theoretical advancements influencing teaching methods, while classroom experiences, in turn, refine theoretical frameworks (Aronoff & Rees-Miller, 2003).

Within ELT research, Research Article Introductions (RAIs) play a crucial role in academic writing. As the opening section of a research article, an RAI sets the foundation by outlining the study's purpose, research questions, and significance (Gao & Pramoolsook, 2023). It also serves a persuasive function, guiding readers toward understanding the research's relevance and contributions (Chinaprayoon, 2016). However, writing RAIs remains a challenging task for many researchers, as it requires both rhetorical awareness and strategic organization (Jogthong, 2001, as cited in Qamariah & Wahyuni, 2017; Swales, 1990).

In order to support academic writers in structuring their RAIs, Swales (1990) introduced genre analysis, leading to the development of the CARS (Create a Research Space) model. According to this model, RAIs follow a standard three-move structure: Move 1 (M1) – establishing the research territory (providing background and context). Move 2 (M2) – identifying a research gap (highlighting issues or unanswered questions). Move 3 (M3) – occupying the niche (explaining how it addresses the identified gap).

Despite some variations in rhetorical structures, studies on ELT RAIs confirmed that the M1-M2-M3 structure remains dominant. Rahman et al. (2017) analyzed 20 ELT research article introductions using both the 1990 and 2004 versions of the CARS model and identified 18 different structures, the M1-M2-M3 framework was prevalent. Similarly, Rochma (2020) examined 73 RAIs from an ELT journal and found that the standard structure appeared 43 times, reinforcing its consistency in academic writing.

With advancements in artificial intelligence, ChatGPT has demonstrated the ability to generate RAIs (Alkhaqani, 2023; Rahman et al., 2023). This raises important questions about how well AI-generated RAIs align with human-authored rhetorical structures, particularly in ELT research. Since Swales' CARS model remains a standard

framework for structuring RAIs, evaluating ChatGPT-produced RAIs against the M1-M2-M3 structure is essential for understanding its effectiveness in academic writing.

While ChatGPT has the potential to assist researchers in drafting RAIs, further investigation is needed to determine its reliability and appropriateness for academic use. A deeper understanding of its rhetorical structures will ensure responsible integration of ChatGPT in ELT research and writing, maintaining clarity in writing.

2.8 Related Studies

Regarding the evaluation of the quality of academic texts produced by ChatGPT, several studies have been conducted to evaluate its performance across different domains. These studies have explored the effectiveness of ChatGPT in writing different sections of academic research, such as the abstract section, RAI section, and literature review.

Scholars have evaluated the competence of ChatGPT in academic research and writing. Gao (2022) evaluated 50 research abstracts regenerated by ChatGPT, finding that only 8% followed journal-specific formatting, and no plagiarism was detected. Ariyaratne (2023) compared the accuracy and quality of academic articles written by ChatGPT to those authored by humans, finding that ChatGPT created good RAIs, main body parts, and conclusions but produced factually erroneous duplicates of original articles. Alkhaqani (2023) also mentioned ChatGPT's potential to improve scientific research writing by effectively structuring RAIs, emphasizing research goals, and writing concise thesis statements. In conclusion, most researchers agreed that ChatGPT is effective with words, grammar, and coherence of texts. ChatGPT also can generate coherent and contextually fitting responses to text prompts. It can generate new research ideas and trends and develop research outlines. However, ChatGPT still requires fact-checking and content verification.

Recent studies on the use of ChatGPT in academic research and writing have mostly focused on issues such as plagiarism risks, information equity, grammar, and word choice accuracy (Ariyaratne et al., 2023; Gao et al., 2023; Kutela et al., 2023; Motoki et al., 2023; Rahman et al., 2023). However, there is a significant gap in

understanding how well ChatGPT can express and structure important information and ideas about given topics (Liao et al., 2023; Tarchi et al., 2024; Zhao et al., 2024). This gap is particularly apparent in its ability to use clear and effective writing structures in a logical and coherent manner. Despite the reaffirmation among the human authors, the generative AI tool also employed the same rhetorical structure dominantly in the RAIs.

An exploratory study conducted by Xiao and Zhi (2023) showed that, in academic writing tasks, EFL learners do not only use ChatGPT to acquire ideas or grammar and spell check. EFL students are also using ChatGPT to improve the logic and coherence of their sentences and essays. The students use ChatGPT to realize their ideas into well-structured written expressions. Additionally, a study by Herbold et al. (2023) supported the academic writing proficiency of ChatGPT. Herbold and his team presented the study of ChatGPT-generated language content, specifically focusing on argumentative essays in high-school education. The study compared the quality of human-written essays with those generated by ChatGPT, shedding light on the linguistic properties and structural differences between the two. The findings suggested that ChatGPT exhibit strong performance. Students could conveniently use ChatGPT to complete their homework. As a result, further investigation is needed to ascertain the efficacy of ChatGPT in effectively communicating provided contexts and ideas, examining the rhetorical structures it employs and their perceived success or shortcomings. This study has potential benefits for academic writers who want to learn from the authentic and accessible examples provided by ChatGPT.

In terms of the genre analysis and rhetorical structures, several studies in the field of applied linguistics have utilized Swales' CARS model to examine and compare research article introductions (RAIs). For instance, Hirano (2009) conducted a comparative analysis of research introductions in Brazilian Portuguese and English, analyzing 20 research articles. The results revealed that while English introductions closely aligned with the CARS model, Brazilian Portuguese introductions often deviated from it. In Sheldon's (2011) research, RAs from applied linguistics were examined in English and Spanish, including those written in English by Spanish speakers as a second language. The findings indicated distinct rhetorical structures: English background speakers adhered closely to the CARS model, emphasizing research centrality, presenting concise claims, and addressing gaps, while Spanish

background speakers exhibited variations from the model. Interestingly, English RAIs authored by Spanish writers showed progress in aligning with the CARS model patterns. Khan et al. (2023) compared the frequency of moves and steps used in the RAIs of English linguistics research papers published in Scopus-indexed publications and non-Scopus in 2019 and 2021. The investigation found that less experienced writers tended to use moves excessively.

Regarding to rhetorical structures in the discipline of ELT, RAIs in this field employed varied structures. However, a consistent M1-M2-M3 structure, according to Swales' CARS model, remains dominant. The first study that contributed to this comprehension is the study by Rahman et al. (2017). This research explored the rhetorical structures of RAIs in ELT, using a corpus of 20 RAIs. The study used Swales' CARS model (1990, 2004). The researcher found 18 different rhetorical structures in the RAIs. The standard structure of M1-M2-M3, according to Swales, was found repeatedly in the corpus. Another similar study was conducted by Rochma et al. (2020). The data of the study consisted 73 RAIs from the English Language Teaching Journal of an Indonesian university. The findings of the study showed that 43 RAIs of the entire corpus followed the standard structure suggested by Swales (1990, 2004).

2.9 Conceptual Framework

The conceptual framework of the study consists of three key concepts designed to investigate the similarities and differences in rhetorical structures within an academic genre, specifically RAIs produced by humans and ChatGPT-4o. The first concept delves into the understanding of ChatGPT as the most popular generative AI tool, encompassing definitions, benefits, limitations, and its influence on academic writing, specifically in the realm of rhetorical structures and RAIs. The second concept revolves around rhetorical structures in the context of genre analysis and the CARS model. The third concept focuses on RAIs in the field of ELT. The conceptual framework of the present research is illustrated in Figure 2.4.

The first concept revolves around generative AI tools. Generative AI tools, such as ChatGPT, generate new data and have numerous applications (Kalota, 2024).

ChatGPT is largely recognized as the most popular and effective tool for producing creative content. Studies have demonstrated its usefulness in increasing productivity and output quality in writing jobs (Iorliam & Ingio, 2024). ChatGPT-4o, in particular, demonstrated better performance over previous version and other generative AI tools, making it the ideal option for study and comparison with human capabilities (Günay et al., 2024; Nguyen et al., 2024; OpenAI, 2024; Sabaner et al., 2024)

ChatGPT is an AI technology that can generate human-like responses to text prompts. It started to play a role in different sections in academic research and writing such as literature reviews, abstracts, and RAIs (Dwivedi et al., 2023; Gao et al., 2022; Kutela et al., 2023; Rahman et al., 2023). Despite concerns, scholars acknowledge ChatGPT's potential benefits and emphasized responsible usage (Eke, 2023; Sabzalieva & Valentini, 2023). As ChatGPT continues to be used to enhance the logical flow and coherence of extensive and complete texts, further research is needed to understand its impact on rhetorical structures and text coherence (Herbold et al., 2023; Xiao & Zhi, 2023).

The upcoming segment explores concepts and theories surrounding RAIs and rhetorical structures. RAI plays a crucial role in academic writing by providing an overview of the study, addressing research gaps, and setting the tone for the research (Gao & Pramoolsook, 2023). It outlines the contribution of the study, gives background information, states research objectives, hypotheses, or questions to be explored (Chinaprayoon, 2016). RAIs are essential as they blend persuasive and promotional aspects of academic writing (Gao & Pramoolsook, 2023). RAI is a notable genre for its distinct communicative objectives and contexts, and ChatGPT demonstrates effective writing capabilities within this genre (Alkhaqani, 2023; Chinaprayoon, 2016). Rhetorical structures in genre analysis refer to how a text is organized to convey its meaning, unfolding in stages called moves, each employing specific techniques or strategies known as steps to achieve the intended purpose of each move (Rustipa et al., 2023).

Based on the moves and steps, Swales offered a practical tool to guide authors to write effective RAIs. The tool is called the CARS model (Swales, 1990, 2004). This tool can also be used to analyze structures of RAIs. Swales' CARS model defines three move structures, each with steps conveying communicative functions. This conceptual

framework also introduces common lexical bundles in RAIs that can be used to signify moves and steps.

The final concept explains RAIs, in applied linguistics, particularly within the discipline of ELT. RAI is a crucial section in academic research and writing, presenting an overview of the article, identifying research purposes, and setting the tone for the study (Chinaprayoon, 2016; Gao & Pramoolsook, 2023). In ELT, studies by Rahman et al. (2017) and Rochma et al. (2020) found a consistent M1-M2-M3 pattern, as outlined by Swales' CARS model (1990). This underscores the significance of understanding these structures for effective academic writing. This standard pattern led to the aims of this study. The study seeks to analyze the moves and steps employed in RAIs of ELT produced by human authors and ChatGPT, assessing the extent of similarities and differences in their rhetorical structures.

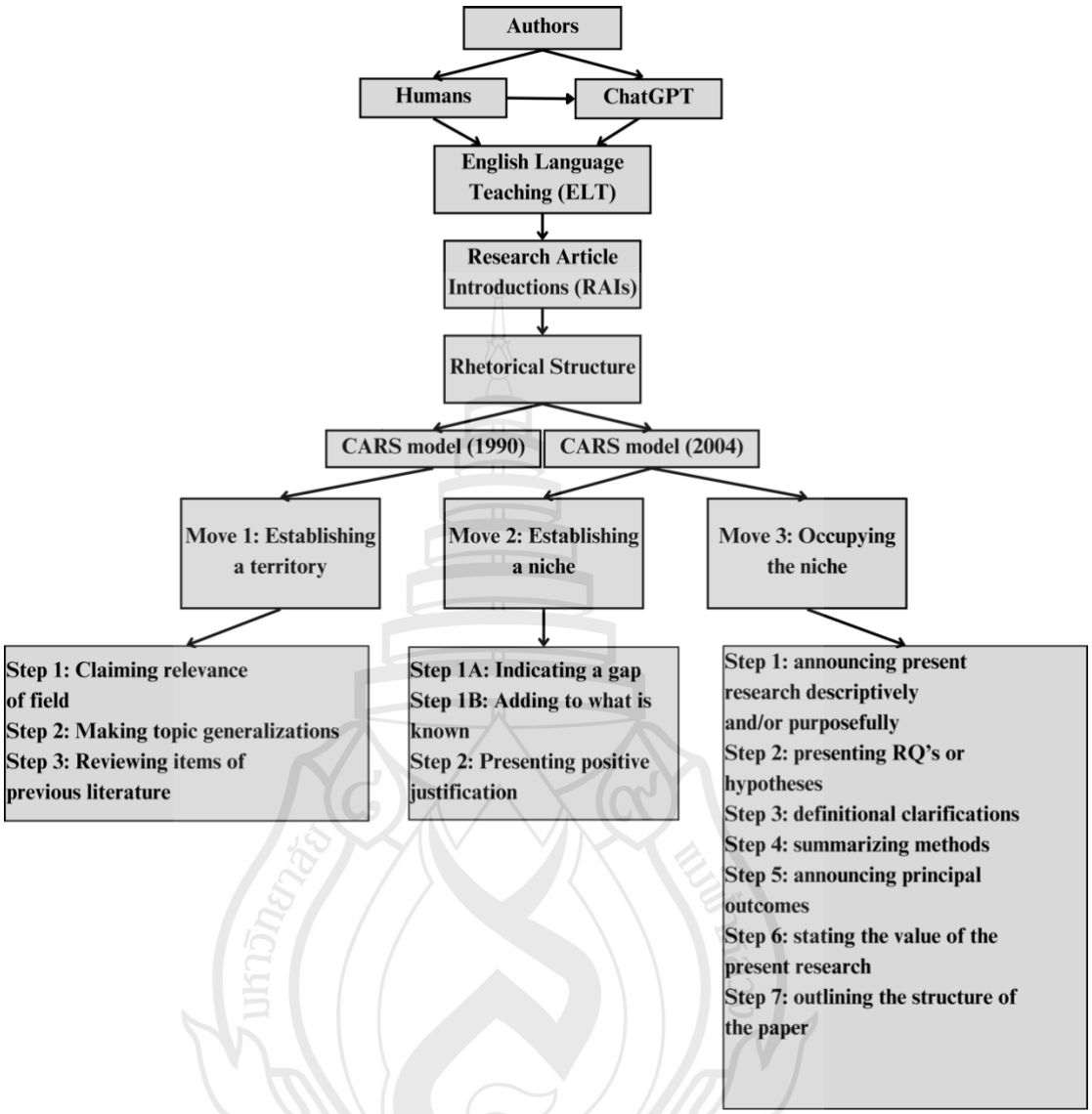


Figure 2.5 Conceptual Framework

2.10 Summary

The emergence of generative AI tools has expanded the application of AI in academic writing, despite challenges such as potential plagiarism and misleading information. Scholars recognize its advantages in generating human-like text and aiding in tasks like summarization (Meyer et al., 2023). Studies examining the proficiency of generative AI tools, such as ChatGPT, in generating sections of research articles highlight the potential applications of these tools. (Dwivedi et al., 2023; Gao et al., 2022; Kutela et al., 2023; Rahman et al., 2023). However, challenges and the necessity

for additional investigation persist, particularly in comprehending the rhetorical structures that allow ChatGPT-4o, as the most famous and proficient gen-AI tool, to generate texts that are coherent, clear, and contextually appropriate. Of all the sections in a research article (IMRD), the RAI section is one that ChatGPT can proficiently compose (Alkhaqani, 2023; Rahman et al., 2023).

RAIs play a crucial role in research articles, explaining the background, identifying gaps, and specifying the research objectives (Chinaprayoon, 2016; Gao & Pramoolsook, 2023). Genre analysis focuses at how language is used in various settings; it divided RAIs into distinct moves and steps. These moves and steps can be used as the rhetorical structures to write coherent and logical structed RAIs (Alharbi, 2021). In the discipline of ELT, RAIs have variability in rhetorical structures. Despite this diversity, the M1-M2-M3 structure, as outlined in Swales' CARS model, remains consistently prevalent (Rahman et al., 2017; Rochma et al., 2020).

Several studies have assessed ChatGPT's performance in generating academic texts, focusing on issues such as plagiarism, accuracy, and biases (Ariyaratne et al., 2023; Gao et al., 2022; Kutela et al., 2023; Motoki et al., 2023; Rahman et al., 2023). However, there is limited research on its rhetorical ability to the ability in generating coherent and contextually fitting texts to the given prompts, a prominent strength of ChatGPT and an essential aspect for reader comprehension (Ariyaratne et al., 2023; Herbold et al., 2023; Rahman et al., 2023; Xiao & Zhi, 2023).

The question revolves around the comparison of rhetorical structures employed by ChatGPT in generating coherent and logical RAIs to those written by human authors. In consideration of that, this study aims to examine whether ChatGPT adheres to the standard M1-M2-M3 structure outlined in the CARS model. The outcomes of this analysis and comparison will guide a careful decision on whether to adopt the structures proposed by ChatGPT or adhere to the conventional standard structure.

CHAPTER 3

METHODOLOGY

This chapter describes the research methodology adopted for this study, which aims to examine the writing proficiency of ChatGPT in producing research article introductions (RAIs) and compare its performance with the RAIs written by human authors. The focus is on analyzing the rhetorical structures in both the generated content and human-authored RAIs to identify similarities and differences. This chapter discusses the methodology of the study from four aspects. Firstly, the research design is presented. Secondly, the size and compilation of the corpora or text samples used in the study are to be explained. Following this, the research instruments tailored to the study's requirements are described. Finally, the data analysis scheme is outlined to provide a comprehensive overview of the research methodology and its reliability.

3.1 Research Design

In order to answer the two research questions of the study, a qualitative design was used. First, qualitative content analysis was conducted to identify the moves and steps in the RAIs from both the human authors and ChatGPT corpora (Creswell, 2017). This method involved careful coding of moves and steps from the texts according to the CARS model created and developed by Swales (1990, 2004). Next, the moves and steps found from both corpora were used to reveal the rhetorical structures employed by both authors. The rhetorical structures were compared to explore the similarities and differences. This detailed analysis provided clear insights into how effective ChatGPT follow the established structure according to Swales (1990, 2004).

3.2 Datasets and Corpora

In this study, two datasets were employed in the qualitative analysis of this study. The initial dataset comprised two corpora: one produced by human authors and the

other by ChatGPT-4o, both focusing on RAIs from the field of English language teaching. The corpus construction began with the compilation of RAIs written by human authors, employing a purposive sampling design to select documents that were appropriate to address the research questions (Fraenkel et al., 2012). Subsequently, the selected human-written RAIs were used to generate another corpus with ChatGPT-4o. After analyzing the two corpora in the initial phase, the results were quantified and presented as numerical data or percentages, to guide the subsequent qualitative analysis in the second phase.

3.2.1 Corpus Compilation

The first dataset, or corpus, used in this study comprised a total of 28 RAIs extracted from 14 research articles (human author corpus) that had been published in four distinct English Language Teaching journals: English for Specific Purposes, TESOL Quarterly, ELT Journal, and Research in the Teaching of English. These ELT journals were ranked among the top in 2008 by the Scimago Journal and Country Rank (SJR), listed in the first quartile (Q1). They were considered leading publications and were acceptable to represent human academic writing ability. In addition, the titles of the research articles were used to prompt ChatGPT-4o to regenerate 14 more RAIs (ChatGPT corpus). The following sections provide an explanation of the methods used to construct the corpora, select the journals, and collect and regenerate the RAIs.

3.2.1.1 Selection of the Human Author Corpus

Based on Boonyuen (2017), the researcher obtained a list of English language teaching journals from the Scimago Journal and Country Rank (SJR) in 2008, a year before AI writing assistants like Grammarly and Quillbot were launched for public use (Nurmayanti & Suryadi, 2023; Zinkevich & Ledeneva, 2021). The reason for this was to prevent any intervention from AI in the selected RAIs. This list included 106 results in the first quartile (Q1) journals. Among all the available journals, four of them— English for Specific Purposes, TESOL Quarterly, ELT Journal, and Research in the Teaching of English—were specific to English language teaching. These four journals were selected. In one issue, there were different text types, such as review articles, information for contributors, brief reports and summaries, and research articles. Only research articles were selected and included in this study, with a total of 82 articles taken from the selected journals, as presented in Table 3.1.

Table 3.1 The List of Research Articles Published in 2008 and Selected According to the Criteria

No.	Journals	Issue	Research Articles
1.	TESOL Quarterly	Issue 1	4 articles
		Issue 2	4 articles
		Issue 3	8 articles
		Issue 4	4 articles
2.	English for Specific Purposes	Issue 1	5 articles
		Issue 2	6 articles
		Issue 3	6 articles
		Issue 4	6 articles
3.	ELT Journal	Issue 1	8 articles
		Issue 2	8 articles
		Issue 3	6 articles
		Issue 4	7 articles
4.	Research in the Teaching of English	Issue 1	3 articles
		Issue 2	2 articles
		Issue 3	2 articles
		Issue 4	3 articles
		Total	82 articles

To select the appropriate articles from the 82 articles, the researcher applied specific criteria. The criteria are as follows:

1. According to De Araújo (2014), the introduction of each research article should not exceed 600 words. Following this guideline, out of the 82 articles assessed, 51 research articles met the specified criteria.

2. The articles had to adhere to the standard structure of empirical research, typically organized into sections such as introduction, method, results, and discussion (IMRD) (Tessuto, 2015). The reason was to ensure that the RAIs were clearly separated from other sections. Additionally, the selection process included articles that used the term “finding” instead of “result.” This distinction did not affect

the readability of the RAIs. “Results” typically referred to processed raw data from the field, while “findings” emerged from discussions of the results of investigations or research, revealing new patterns (Hürlimann, 2019). Out of the 51, 14 research articles conformed to this format. Additional information the selected articles can be studied more in Appendix A.

3.2.1.2 Regeneration of the RAIs with ChatGPT-4o

The study aimed to regenerate RAIs using ChatGPT-4o after obtaining representative RAIs. The research focuses on understanding ChatGPT-4o’s use of rhetorical structures to convey the contexts and ideas of the research articles. The prompt was to encompass essential contextual details in RAIs, following the prompt in the study of Kutela et al. (2023). During the prompting process, each research title was used as a prompt for ChatGPT-4o only once. The decision was made because ChatGPT-4o produced different responses for the same prompt. Therefore, only the first response was selected to maintain consistency.

Based on the process and criteria specified above, the corpora used in this study were 14 human-written RAIs and 14 ChatGPT-4o-generated RAIs. In total, the size of the corpus was in line with similar studies (Hirano, 2009; Mozaheb et al., 2014).

3.2.1.3 The List of RAIs Used in this Study

In the process of text compilation, the texts were selected and regenerated. As outlined above, the RAIs had to meet specific criteria to be included and represented in the human author corpus. The titles of the selected RAIs served as key elements in the prompts used to generate the ChatGPT corpus, or the second set of RAIs, using ChatGPT-4o. Table 3.2 illustrates the titles and details of the RAIs from both corpora.

Table 3.2 The Titles and Details of the RAIs from Human Author and ChatGPT corpora

No.	The Title of the Research Article	Human Author Corpus		ChatGPT Corpus	
		Word Count	Sentence Count	Word Count	Sentence Count
1.	The Psycholinguistic Dimension in Second Language Writing: Opportunities for Research and Pedagogy Using Computer Keystroke Logging	235	6	423	19
2.	Learner Outcomes for English Language Learner Low Readers in an Early Intervention	387	16	391	15
3.	Air Traffic Communication in a Second Language: Implications of Cognitive Factors for Training and Assessment	224	8	501	18
4.	Phonology in Second Language Reading: Not an Optional Extra	432	11	317	12
5.	Assessing Text Readability Using Cognitively Based Indices	244	5	602	25
6.	The Cultural and Intercultural Identities of Transnational English Teachers: Two Case Studies from the Americas	375	13	570	25

Table 3.2 (continued)

No.	The Title of the Research Article	Human Author Corpus		ChatGPT Corpus	
		Word Count	**Sentence Count**	**Word Count**	**Sentence Count**
7.	Are we encouraging patchwriting? Reconsidering the role of the pedagogical context in ESL student writers' transgressive intertextuality	478	13	498	18
8.	Reviewer stances and writer perceptions in EFL peer review training	272	7	323	14
9.	Individualized engagement with genre in academic literacy tasks Japanese Learners' Self	524	16	453	17
10.	Revisions and Peer Revisions of Their Written Compositions in English	241	6	424	16
11.	The value of English picture story books	176	5	471	18
12.	Teacher research for professional development	475	15	473	19
13.	Inter-interviewer variation in oral interview tests	567	16	423	18
14.	How rude! Teaching impoliteness in the second-language classroom	197	9	493	22
	Total	**4,827**	**146**	**6,362**	**256**

Table 3.2 presents the details of the RAIs included in the two corpora used for the genre analysis. The first column lists the numbers assigned to each RAI or text. Fourteen RAIs from 14 research papers, written by human authors, met the specified criteria. The second column shows the titles of these research papers, which were used as key elements to prompt ChatGPT-4o to produce the second corpus, referred to as the ChatGPT corpus. This corpus was then analyzed and compared with the human author corpus. Columns three and four represent the human author corpus and the ChatGPT corpus, respectively. Each of these columns is further divided into two sub-columns: the first sub-column shows the word counts of the RAIs, while the second sub-column provides the sentence counts.

3.3 Research Instruments

3.3.1 The CARS Model

To achieve the research objectives, the researcher integrated both the 1990 and 2004 versions of the CARS models. These two versions were employed to encompass a wide range of potential rhetorical structures utilized by both human authors and ChatGPT-4o. Due to the established research tradition surrounding it, the 1990 version was more frequently utilized than the 2004 version (Sheldon, 2011). However, the 2004 CARS model was included in this study as it offered flexibility in capturing variations in steps or rhetorical strategies, especially in move 3, which involves presenting the current work (Swales, 2004). This study employed three moves from the CARS model: move 1, establishing a territory (comprising 3 steps); move 2, establishing a Niche (comprising 3 steps); and move 3, occupying the niche (comprising 7 steps). The details of the CARS model can be seen in Table 2.3.

3.3.2 ChatGPT's Prompt for RAIs

The ChatGPT prompt utilized in this study was derived and adapted from the methodology presented in the research conducted by Kutela et al. (2023). Due to the different focus areas of the studies, the prompt was modified to correspond with the intent of the current study. To ensure that the modified prompt was valid and reliable, the researcher attended an online course on the complete guide to ChatGPT. The course

covered prompt engineering techniques and examples. After attending the course, the researcher modified and formulated the prompt as follows.

"I want you to develop an introduction section of a [research article] for publication. I will give you a [research title] then I want you to give me the introduction section of the paper. You need to adopt a persona of a highly skilled writer in [English Language Teaching (ELT)]. In your writeup, include the actual citations, actual references, and actual [information in ELT]. The … title is 'Title of the paper'" (Kutela et al., 2023, p. 4).

This prompt was selected for the study because it aligned with the prompt engineering guidelines for academic writing suggested by Giray (2023). To replicate the RAIs, the researcher opened a ChatGPT window and selected the model ChatGPT-4o. The prompt was entered only once, and only the first response generated by ChatGPT-4o was collected to maintain consistency. This procedure was applied to each of the 14 RAIs used in the study. While the researcher ensured the consistency and completeness of essential elements in constructing the prompt in accordance with Giray's recommendations, Sanmarchi et al. (2023) advised that there is no single or perfect method for prompt engineering. The explanations of the elements in the prompt are illustrated in Table 3.2.

Table 3.3 The Elements and Explanations of the Prompt for RAIs

Elements	**Explanations**
Instruction	I want you to develop an introduction section of a [research article] for publication.
Context	I will give you a [research title] then I want you to give me the introduction section of the paper. You need to adopt a persona of a highly skilled writer in [English Language Teaching (ELT)].
Input data	The … title is 'Title of the paper'
Output indicator	In your writeup, include the actual citations, actual references, and actual [information in ELT].

Source Giray (2023) and Kutela et al. (2023)

3.3.3 Analysis Form

To facilitate the data analysis process, the researcher provided an analysis form by organizing and presenting each RAI in a table format. The form included sections for documenting moves, steps, and lexical bundles that aided in their identification. This analysis form was adapted from a similar study of Narksonthi (2022). An example of the analysis form is provided in Table 3.4.

Table 3.4 Analysis Form

Introduction	Move	Step	Lexical Bundle
1. At a time when writing practices are increasingly centered on interaction with keyboard and screen, the research opportunities offered by computer recording of the writer's actions appear timely and relevant. 2. Observation has long been a means of exploring the writing process, and the advent of digital tools for tracking the writing event makes it possible to observe the process without the obvious intrusion of cameras or observer-researchers. 3. As a tool for gathering data on aspects of writing, computer recording (or keystroke logging) offers researchers an alternative to introspective methods such as think-aloud protocol and makesaccessible a mass of detailed information about the processes involved in producing text (Stevenson, 2005; Strömqvist, Holmqvist, Johansson, Karlsson, & Wengelin, 2006;			

Table 3.4 (Continued)

Introduction	Move	Step	Lexical Bundle
Sullivan & Lindgren, 2006; van Waes, 1991; Wengelin, 2006). 4. The aim of the present article is to evaluate contribution of computer-logging research with reference to second language (L2) writers and to consider possible applications to language teaching. 5. We present data from a longitudinal study of young L2 writers of English in Sweden in order to illustrate the types of insight offered into pausing, fluency, and revision behaviour and to connect these findings to such issues as cognitive capacity, working memory, and automaticity. 6. The relevance of this tool within language pedagogy and its potential to prompt recall and self-reflection are then considered in relation to the individualisation of teaching and the promotion of self-assessment, metacognitive awareness, and learner autonomy.			

Source Narksonthi (2022)

3.4 Data Analysis

3.4.1 Coding Scheme

In the process of analyzing the rhetorical structures of RAIs in research articles, it was essential to create and clearly defined a coding scheme. This scheme provided a framework for identifying the moves and steps within the RAIs, ensured the consistency

and reliability of the analysis, and standardized the coding process. The coding scheme was constructed and developed according to the previous studies on genre analysis of research introduction sections (Crookes, 1986; Kanoksilapatham, 2005; Peacock, 2002; Swales, 1990, 2004).

3.4.2 Data Analysis Procedure

Following the approach outlined below, all 28 research introductions were read and analyzed.

3.4.2.1 To analyze each pair of the RAIs, the coders first read the abstract of the research article to gain a thorough understanding of the study. This step helped coders better understand the contexts and information in the RAIs.

3.4.2.2 Next, the coders identified the study objectives or research questions, typically located at the end of RAIs, to ensure they understood the purpose and rationale of the RAIs.

3.4.2.3 The coders used the CARS model (Swales, 1990, 2004) to find moves and steps in the RAIs. In order to code effectively, the coders underwent a training prior to coding or analyzing phase. The details of the coder selection and training were elaborated in the following sections.

3.4.2.4 The researcher noted the instances of moves, steps, and rhetorical structures to determine their frequencies as percentages.

3.4.2.5 The researcher compared the percentages of instances of moves, steps, and rhetorical structures to reveal their similarities and differences.

3.4.3 The Validation of Data Analysis

Due to the possibility of subjectivity in genre analysis, it was essential to involve multiple coders to improve coding reliability. This study consisted of two coders, the researcher and an inter-coder. In addition to the two coders, this study also included an expert in genre analysis. The expert in genre analysis assisted as the genre analysis trainer for the two coders and also judged when disagreement occurred between the two coders. It was crucial to ensure that the two coders could reliably analyze texts using the same criteria. The subsequent section described the selection of coders and the evaluation of inter-coder reliability to validate the reliability of the coding scheme.

3.4.4 Coder Selection

Considering that certain factors, such as the background of the coders and the coding scheme, could influence how moves and steps were interpreted and how coding agreement was achieved, it was critical to choose the additional coder carefully. According to Kanoksilapatham (2005) and Peacock (2002), master's degree students or graduates in ELT or subject area specialists could be included as additional coders. However, they needed to be trained to code according to the coding scheme of the studies. In this study, there were three individuals, including two additional analysis figures aside from the researcher. The first additional coder was a university lecturer with a master's degree in English language teaching, which was the focused discipline of the current study. The role of the first coder was to undergo coding training and co-code with the researcher. The second additional figure, acting as the researcher's advisor and an expert in genre analysis, conducted the coding training and served as a mediator in case of coding discrepancies between the researcher and the first additional coder.

3.4.5 Coding Training

To ensure that the coder and inter-coder could be reliable and effective in coding, the two coders had to undergo training for genre analysis. The training involved three individuals. The first was the researcher, who served as the primary coder. The second was an additional coder. The third was a genre analysis expert who acted as the trainer and adjudicated any discrepancies between the two coders. An expert in genre analysis conducted the training. The training spanned approximately nine hours, distributed over three days with three hours each. It involved a pilot coding program utilizing RAIs extracted from four journals: English for Specific Purposes, TESOL Quarterly, ELT Journal, and Research in the Teaching of English. These articles were from the year 2007, a year prior to the publication of the RAIs used for the actual coding process, and underwent the same selection criteria as the RAIs used in the actual coding.

The training's success was affirmed when the coders were ready for actual coding, as indicated by their achieving an acceptable agreement level in the inter-rater reliability test outlined in the following section (Kappa = 0.81 - 1.00). Additionally, in cases of disagreement between the coders during the coding process, the expert or the second additional coder intervened to make a judgment.

3.4.6 Inter-rater Reliability

Due to the large number of RAIs in the corpus, the coders selected 4 research introductions (about 15% of the total) to test inter-rater reliability (Crookes, 1986). To gauge how effectively the two coders agreed with one another, the researcher employed the agreement rate, also known as percentage of agreement, in this study. The agreement rate was chosen because it is straightforward and widely used in genre analysis research (e.g., Crookes, 1986; Kanoksilapatham, 2005) to test reliability. The results of the coding were assessed with Cohen's (1960) Kappa equation to confirm their reliability. The kappa value ranged between 0 and 1, where higher values signified greater agreement, with a value of 1 representing perfect agreement. Cohen's Kappa values below 0.45 are considered poor, while values above 0.62 indicate substantial agreement, which should be the minimum target for assessments. Following Altman's (1991) guidelines, the strength of agreement was interpreted as follows:

Table 3.5 Guidelines to Interpret the Strength of Agreement

Strength of Agreement	
k < 0.20	Poor
0.21 - 0.40	Fair
0.41 - 0.60	Moderate
0.61 - 0.80	Good

Source Altman (1991)

3.4.7 Results of Coding Training and Inter-rater Reliability Test

According to the reliability affirmation procedures outlined in the previous sections, the two coders had to undergo the genre analysis training and the reliability test to determine if the two coders obtain the adequate level of agreement in analyzing the data. In the process of training, four elements were included. The four elements are first an expert in genre analysis to function as the trainer. The second was the two trainees or the potential raters. The first rater was the researcher and the second rater was a master's degree holder in applied linguistics for English language teaching. The

third element was the training materials. In this training, the training materials were RAIs taken from research papers written by human authors published in 2007, a year before the publication of the texts used for the actual analysis. The criteria for selecting the training materials were the same criteria of selecting the texts for the actual analysis. According to the criteria, fourteen RAIs of research articles were selected and used for the training. The fourth element was the allocated time. The training took 3 days, May 16, 17, and 20, 2024 and 3 hours for each day. In total, the training took 9 hours, starting from the understanding of genre analysis based on the CARS model of Swales (1990, 2004) and followed with the coding practice.

When the training was completed, the trained raters needed to be examined if the they were ready for the task by taking a pilot genre analysis separately. In the pilot analysis, according to Crookes (1986), 15% or 4 RAIs of the entire corpus (28 RAIs) were used as the analysis samples and the analysis results were used to test the agreement between the raters. Cohen's (1960) Kappa reliability test was used to assess the level of agreement. The calculation was operated in Statistical Package for Social Sciences (SPSS), a software used for statistical analysis and data management in research.

After the researcher obtained the analysis results from all the raters. The results from the first rater and the second rater had to be calculated according to Cohen's (1960) Kappa equation to confirm they are corresponding and reliable to proceed to analyze the rest of the RAIs. In the calculation process the analysis results were put in the software SPSS and then analyzed the data using Kappa equation to measure the level of agreement. The result was 0.97. According to the guideline to interpret the strength of agreement of Altman (1991), 0.97 is considered to be very strong and able to proceed to further analysis.

3.5 Research Procedure

In summary of the research methodology, this study adopted a content analysis approach also known as qualitative analysis (Creswell, 2017). The first phase focused on the content analysis, involving the compilation of the first dataset, coding, and

numerical data collection. Subsequently, the study transitioned to the second phase, where the acquired coding results served as the second dataset and guided the second phase of qualitative data analysis to reveal differences and similarities in rhetorical structures across the two corpora. The details and theories employed to realize this methodology are illustrated in Figure 3.1.

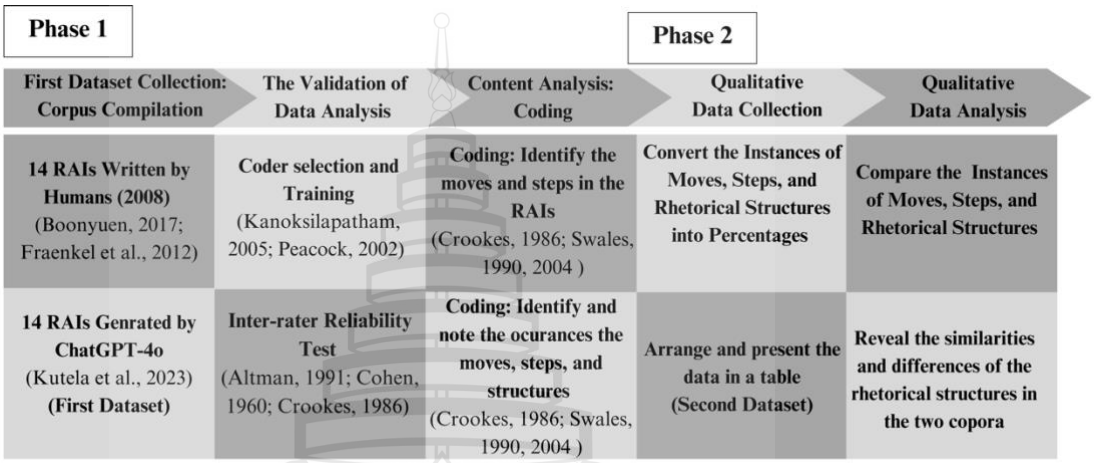


Figure 3.1 Research Procedure of this Study

CHAPTER 4

RESULTS OF THE STUDY

This chapter systematically presents the results of a genre analysis conducted on two separate corpora. It outlines the frequency of each move and step, describes their structural organization, and provides a comparative analysis of the similarities and differences in how human authors and ChatGPT employ these moves, steps, and rhetorical structures. The identified similarities and differences are categorized and presented in two key aspects. The two key aspects are rhetorical structures and the frequency of moves and steps in the identified rhetorical structures.

4.1 The Moves and Steps Employed in the RAIs

The first research question aimed to identify the number of moves and steps employed in the RAIs written by human authors and ChatGPT in English language teaching. The two corpora of research article introductions, including the human author corpus and ChatGPT corpus, were analyzed to identify moves and steps to answer this question. This section is describing the process of obtaining the answers to the first questions.

The genre analysis operated in this study was based on Swales' (1990, 2004) three moves ('Move 1: Establishing a territory', 'Move 2: Establishing a niche', and 'Move 3: Occupying the Niche). Following these three moves, each of the three can be sub-dived in several sub-moves or steps. In total, there are 13 steps under the three moves. When the terms move and step were put together to analyze and determine the sentences, the abbreviations M (Move) and S (Step) were used with numbers corresponding to The CARS model, for example, move 1 step 1 was shorten to M1S1.

Under move 1, there are three steps. They are Move 1 Sep 1 (M1S1: claiming relevance of field), move 1 step 2 (M1S2: making topic generalizations), Move 1 Step 3 (M1S3: reviewing items of previous literature). Next is move 2, and under move 2 there are three steps as well. They are Move 2 Step 1A (M1S1A: indicating a gap),

Move 2 Step 1B (M2S1B: adding to what is known), Move 2 Step 2 (M2S2: presenting positive justification). Finally move 3, there are 7 steps. They are Move 3 Step 1 (M3S1: announcing present research descriptively and/or purposefully), Move 3 Step 2 (M3S2: presenting research questions or hypotheses), Move 3 Step 3 (M3S3: Definitional clarifications), Move 3 Step 4 (M3S4: summarizing methods), Move 3 Step 5 (M3S5: Announcing principal outcomes), Move 3 Step 6 (M3S6: stating the value of the present research, and Move3 Step 7 (M3S7: Outlining the structure of the paper).

In the process of genre analysis, the two raters spent one month, May 21st – June 19th 2024, to complete the analysis on the two corpora separately. The analysis revealed that the RAIs written by ChatGPT in the theme of English language teaching can be described with 3 moves and 7 steps and by human authors can be described with 3 moves and 9 steps. Table 4.1 and 4.2 demonstrate the moves and steps that present in the two corpora.

Table 4.1 The Moves and Steps in the Human Author Corpus.

The Moves and Steps in the Human Author Corpus													
RAI	M1 S1	M1 S2	M1 S3	M2 S1 A	M2 S1 B	M2 S2	M3 S1	M3 S2	M3 S3	M3 S4	M3 S5	M3 S6	M3 S7
1		√					√						
2	√	√				√	√		√				
3		√		√			√						
4		√	√				√		√				
5	√	√					√						
6	√	√		√		√	√	√	√				
7	√	√	√	√			√						
8	√	√	√	√						√			
9	√	√	√	√				√					
10	√						√		√				
11		√	√	√			√						
12		√	√	√			√	√					
13		√	√	√			√	√					
14		√											
Total	6	13	7	8	0	2	11	4	4	1	0	0	0

Table 4.2 The Moves and Steps in ChatGPT Corpus

The Moves and Steps in the ChatGPT Corpus													
RAI	M1 S1	M1 S2	M1 S3	M2 S1 A	M2 S1 B	M2 S2	M3 S1	M3 S2	M3 S3	M3 S4	M3 S5	M3 S6	M3 S7
1	√	√		√		√	√						
2	√	√		√		√	√						
3	√	√		√		√	√						
4	√	√		√		√	√						
5	√	√		√		√	√						
6	√	√	√	√		√	√						
7		√		√		√	√						
8	√	√	√	√		√				√			
9	√	√	√	√		√							
10		√	√	√			√						
11	√	√		√		√	√						
12	√	√		√		√	√						
13	√	√	√	√		√	√						
14	√	√		√		√							
Total	12	14	5	14	0	13	8	0	0	1	0	0	0

According to Tables 4.1 and 4.2, both corpora can be described using 3 moves and 13 steps. Regarding the steps, both authors utilized the same 7 steps, though in varying quantities, with the human author corpus including two additional steps. The 7 steps were M1S1, M1S2, M1S3, M1S1A, M2S2, M3S1, and M3S4. Besides these 7 steps found in ChatGPT corpus, the human author corpus also includes two extra steps: M3S2 and M3S3. The steps that were absent from both corpora were M2S1B, M3S5, M3S6, M3S7.

In the following section, excerpts were taken from the two corpora to demonstrate how each move and step was used by the authors. As regards the examples

of the use of moves and steps, the excerpts taken and presented in this paper were labeled according to its authors and order in their corpus. The abbreviations used started with the authors, HA for human authors and ChatGPT for ChatGPT-4o. Follow the abbreviation of the authors, the abbreviation of research article introduction (RAI) and its number in its corpus are added, for example, HA RAI 1 for the first research article introduction written by human authors and ChatGPT RAI 1 for the first research article introduction written by ChatGPT. In addition to the abbreviations, the indicators of moves and steps or lexical bundles are written in bold.

The first set of excerpts taken from move 1, establishing a territory of the studies. This initial move aims to create a broad context for the research by demonstrating its importance and relevance. It involves three steps: M1S1 (Claiming centrality), M1S2 (Claiming centrality), or M1S3 (Reviewing items of previous literature).

Move 1 Step 1: Claiming relevance of field

Excerpt 1. HA RAI 5: *"Accurately predicting the difficulty of reading texts for second language (L2) learners* ***is important for*** *educators, writers, publishers, and others to ensure that texts match prospective readers' proficiency"* (Crossley et al., 2008).

Excerpt 2. HA RAI 9: *"Over the past two decades, genre* ***has become an increasingly important concept*** *in ESP and EAP research and practices (Hyland, 2004; Tardy, 2006)"* (Cheng, 2008).

Excerpt 3. ChatGPT RAI 1: *"Understanding the cognitive processes involved in L2 writing* ***is essential*** *for developing effective pedagogical strategies"* (OpenAI, 2024).

Excerpt 4. ChatGPT RAI 4: *"In the context of second language (L2) learning, phonological awareness—the ability to recognize and manipulate sounds in spoken language—****has been identified as a significant predictor*** *of reading success (Koda, 2005)"* (OpenAI, 2024).

In move 1 step 1, the author signaled their interest in the study or underscored its significance by establishing centrality. Excerpt 1 and 2 represented the use of move 1 step 1 in the human author corpus. Both excerpts from human authors used evaluative adjective "important" to emphasize the significance of their topics. Excerpt 2

emphasized the topic with the combination of present perfect tense “has become” and adverb “increasingly”. It showed that the topic was not only significant at a point of time but also gradually grew. The phrase implied that genre would continue to be relevant and possibly gained even more importance. The examples of the analysis can be seen in Appendix B.

Excerpt 3 and 4 represented the use move 1 step 1 by ChatGPT. These excerpts also highlighted the significance of the topics. The generative AI also used evaluative adjectives “essential” and “significant” to emphasize the significance of their topics.

Both human authors and ChatGPT used evaluative adjectives “important,” “essential,” and “significant” to emphasize importance of the topics. These words and how they were used in the sentences signaled their interest in the study or underscored its significance.

M1S2: Making topic generalizations

Excerpt 5. HA RAI 6: *“**In recent years**, many authors have discussed the dichotomy between the native-English-speaking teacher (NEST) and the nonnative English-speaking teacher (NNEST) in TESOL”* (Menard-Warwick, 2008).

Excerpt 6. HA RAI 13: *“**Over the last decade** or so, **there has been a proliferation of studies** that analyse speaking test discourse to validate oral assessments”* (Nakatsuhara, 2007).

Excerpt 7. ChatGPT RAI 3: ***“Historically,** English **has been designated** as the international language of aviation”* (OpenAI, 2024).

Excerpt 8. ChatGPT RAI 12: ***“Over the decades,** this approach **has evolved**, becoming integral to teacher education programs worldwide”* (OpenAI, 2024).

In move 1 step 2, the authors presented generalizations about their topics and their overall understanding of the research area. Excerpt 5 and 6 represented the use of move 1 step 2 in the human author corpus. All the three excerpts used temporal markers, phrases or adverbs “In recent years” and “Over the last decade” to provide a context for their claims. In addition, excerpt 6 used the word “there” followed by the present perfect tense of the verb “to be” to indicate the existence of the study. This tense was used to describe an action of study that began in the past and continued to the time of the study, which conveyed a sense of ongoing relevance and generalization.

Excerpt 7 and 8 represented the use move 1 step 2 ChatGPT. All the three excerpts began with temporal phrase or adverb that establish the historical context. The generative AI used time-related adverbs “Historically” and “Over the decades” to indicate that the generalizations from the past. Excerpt 7 and 8 both used the present perfect tense “has been” and “has evolved” to indicate actions that began in the past and continued to be relevant in the time the studies were conducted.

In summary, both human author and ChatGPT excerpts were effective in making generalizations within M1S2 by employing temporal markers or adverbs to establish the historical context or background of the topics. Both also used present perfect tense to indicate actions that continued to the time when the studies were conducted to show the general ideas, relevance, and influence of the topics in the studies.

M1S3: Reviewing items of previous literature

Excerpt 9. HA RAI 4: ***“In Walter (2004) I provided evidence*** *that lower-intermediate learners with L2 comprehension difficulties have difficulty with the building of mental structures”* (Walter, 2008).

Excerpt 10. HA RAI 7: ***“Currie’s (1998) case study has shown that*** *students’ copying can in part be due to instructors’ failure to explicitly articulate the conceptual activities that underpin assignments”* (Abasi & Akbari, 2008).

Excerpt 11. ChatGPT RAI 6: *“**According to Canagarajah (2012),** transnationalism in ELT involves navigating and negotiating multiple cultural frames”* (OpenAI, 2024).

Excerpt 12. ChatGPT RAI 6: ***“As noted by Kubota and Lin (2009),*** *this hybridity allows teachers to draw on a rich tapestry of cultural resources”* (OpenAI, 2024).

Move 1 step 3 involves summarizing and synthesizing relevant previous studies to demonstrate the current state of knowledge in the field. Excerpt 9 and 10 represented the use of M1S3 in the human author corpus. These excerpts used reporting verbs that indicated the type of evidence provided or conclusions reached by prior studies. These verbs were “provided evidence” and “has shown.” In these excerpts, in-text citations or integral citations were included, such as “In Walter (2004)” or “Currie’s (1998) case

study" These citations emphasized the importance of the author's contribution and grounding the claim in studies.

Excerpt 11 and 12 represented the use of M1S3 in the ChatGPT corpus. These excerpts began with reporting phrases or integral citations that attributed the information to the original authors. The phrases used here included "According to Canagarajah (2012)" and "As noted by Kubota and Lin (2009)." The verbs chosen and used in these excerpts were present tense and suggested ongoing actions rather than completed events, such as "involves navigating and negotiating" and "allows teachers to draw on."

In comparison, while both authors used integral citations, human authors' structures tended to be more varied and complex and the AI-generated sentences tend to be more direct and straight forward. In the human authors' excerpts, the integral citations guided the reader through the text, such as "In Walter (2004) I provided evidence..." and "Currie's (1998) case study has shown..." In the ChatGPT's sentences, the integral citations often served as simpler introductory phrases and were parted or separated from the main idea with a comma like "According to" and "As noted by." Secondly, while the two authors used reporting verbs, the human authors tented to use past simple tense, such as "provided" to indicate the completed events. ChatGPT tended to use present simple tense to show the ongoing events.

After establishing a territory in a study in move 1, move 2, establishing a niche, follows to identify specific areas within the literature that need further investigation. This step often involves one of three approaches: M2S1A (indicating a gap), M2S1B (adding to what is known), or M2S2 (presenting positive justification).

M2S1A: Indicating a gap

Excerpt 13. HA RAI 3: ***"However, despite*** *the strong relationship between ESP and language use in the workplace, the cognitive challenges inherent in the learner's communicative workplace environment...* ***are not often researched"*** (Farris et al., 2008).

Excerpt 14. HA RAI 6: ***"Little attention in the research literature has gone to such teachers****—especially those who do not fit neatly into the NEST/NNEST dichotomy"* (Menard-Warwick, 2008).

Excerpt 15. ChatGPT RAI 1: ***"Despite the growing interest*** *in the psycholinguistic processes underlying L2 writing****, there remains a substantial gap*** *in integrating these insights into practical pedagogical frameworks"* (OpenAI, 2024).

Excerpt 16. ChatGPT RAI 5: ***"Despite the strides made in readability*** *research,* ***there remains a notable gap*** *in applying cognitively based readability indices within ELT settings"* (OpenAI, 2024).

Move 2 step 1A focuses on indicating a gap in the existing literature. This step is crucial for establishing the relevance of new research by highlighting areas that have not been adequately explored or understood. Excerpt 13 and 14 represented the use of M2S1A in the RAIs written by human authors. The three excerpts used negative phrases, adjectives or adverbs to draw attention to areas that had been overlooked or insufficiently addressed in the research literature. The phrases included "not often researched" and "Little attention in the research literature." In addition, the conjunctive adverbs or concessive clause like "however" and "despite" were also used to signal the lack in the research area.

Excerpt 15-16 represented the use of M2S1A in the ChatGPT corpus. Each excerpt began with a concessive clause using phrases like "Despite…" to acknowledge existing progress in a given research area while signaling an unresolved gap. The examples included "Despite the growing interest…" and "Despite the strides made…." The lexical bundles in each excerpt contained verbs, adjectives, and nouns such as "remains a substantial gap" and "remains a notable gap." This combination stressed absence or deficiency within a specific focus area.

Both human author and ChatGPT excerpts used lexical bundles to indicate gaps in literature, particularly through phrases that underscore the lack or scarcity of research. Common expressions include "little attention…," "there remains a gap…," "are not often researched," which signal inadequacy in research coverage. Both sets employed concessive clauses to contrast existing knowledge with areas of deficiency. Human authors used "However, despite…" while ChatGPT frequently used "Despite…" to create similar contrasts. One slight difference between these two corpora was the more repetitive usage the lexical bundle "there remains [a gap]) …" to indicate areas lacking research.

M2S2: Presenting positive justification

Excerpt 17. HA RAI 6: ***"Nevertheless,*** *intercultural teachers* ***have much to offer*** *TESOL pedagogy"* (Menard-Warwick, 2008).

Excerpt 18. HA RAI 2: *"One early intervention, RR,* ***has demonstrated very good success rates*** *with ELLs (Ashdown & Simic, 2000; Escamilla, 1994; Neal & Kelly, 1999)"* (Kelly et al., 2008).

Excerpt 19. ChatGPT RAI 1: *"Keystroke logging, with its ability to track and analyze the writing process in real-time,* ***presents a promising tool*** *to address this gap"* (OpenAI, 2024).

Excerpt 20. ChatGPT RAI 8: *"Reconsidering the role of the pedagogical context in ESL student writers' engagement with* ***patchwriting is imperative for*** *promoting academic integrity"* (OpenAI, 2024).

Move 2 step 2 illustrates the research's necessity or provide positive reasons for the reported study. Excerpt 17 and 18 represented the use of M2S2 in the human author corpus. Both excerpts used positive phrases or positive appraisal, such as "have much to offer" and "has demonstrated very good success rates" affirmed the positive contributions of a specific intervention or role within the field or educational practice. These phrases also emphasized effectiveness or justification of the studies through perceived potential and evidence of success.

Excerpt 19-20 represented the use of M2S2 in the ChatGPT corpus. These excerpts used modal verbs such as "presents a promising tool" and "is imperative" to express possibility, necessity, or obligation.

In comparison, while both authors use phrases or lexical bundles that underscored the potential benefits or contributions of specific practices, interventions, or topics "have much to offer," "presents a promising tool," and "is imperative to investigate," ChatGPT emphasized the necessity the practices or topics. The genitive AI tool tended to use repetitive phrases that were more forceful like "is imperative."

After establishing a niche in move 2, move 3, occupying the niche, follows to describe the ongoing research, and it typically consists of seven steps. However, in this analysis, 4 steps were identified in the corpora.

M3S1: Announcing present research descriptively and/or purposefully

Excerpt 21. HA RAI 1: *"The aim of the present article is to evaluate the contribution of computer-logging research with reference to second language (L2) writers and to consider possible applications to language teaching"* (Miller et al., 2008).

Excerpt 22. HA RAI 2: *"The study examined the literacy programmatic outcomes of Grade 1 ELLs compared with their NES Grade 1 peers, who also were enrolled in RR during the 2002–2003 school year"* (Kelly et al., 2008).

Excerpt 23. ChatGPT RAI 1: *"This study aims to fill these gaps by leveraging computer keystroke logging to investigate the psycholinguistic dimensions of L2 writing"* (OpenAI, 2024).

Excerpt 24. ChatGPT RAI 2: *"This research aims to address these gaps by conducting a comprehensive analysis of learner outcomes for low-reading ELLs in early intervention programs"* (OpenAI, 2024).

Move 3, Step 1 (M3S1) involves announcing present research descriptively and/or purposively. This step is crucial as it serves to transition from the established territory and identified niche to the specific contributions of the current study. Descriptive announcement involves providing a straightforward description of the research being conducted. The example of descriptive announcement can be seen in excerpt 22 "The study examined the literacy…" Purposeful announcement states the purpose or motivation behind their research. The example of purposeful announcement can be seen in excerpt 22 "The aim of the present article is to evaluate..."

Excerpt 21 and 22 represented the use of M3S1 in the human author corpus. The three excerpts used declarative sentences to state the research purpose or objective, such as "The aim of the present article is…" and "The purpose of this article is…"

Excerpt 23 and 24 represented the use of M3S1 in ChatGPT corpus. Excerpt 23 and 24 used of declarative sentences to state the research purpose or objective like in the human author corpus, such as This study aims to…" or "This research aims to…". However, the generative AI tended to use direct reference to "gaps" that stated in move 2 like "This study aims to fill these gaps...," "This research aims to address these gaps...," and "This study aims to address these gaps..."

In comparison, the excerpts of human aurhors presented personalities, personalized objectives, or specific actions in the studies. In ChatGPT corpus, the aims were more general, superficial and speculative.

M3S2: Presenting research questions or hypotheses

Excerpt 25. HA RAI 12: ***"The following research questions were addressed in this study****: **1. What are** Turkish EFL teachers' attitudes towards classroom research? **2.** In their own view, **how does** research affect EFL teachers' instructional practices?"* (Atay, 2006).

Excerpt 26. HA RAI 13: *"Thus**, the research questions of this study are**: **1.** When the same candidate is interviewed by two different interviewers, **are there any** analytical marking categories which are especially affected by the difference in interviewer? **2.** If so, **what types** of interlocutor behavior could have influenced the mark for the analytical components?"* (Nakatsuhara, 2007).

Move 3: Step 2 focuses on presenting research questions or hypotheses. This step is essential for clearly articulating the specific inquiries that the research aims to address. Excerpt 25 and 26 represented the use of M3S2 in the human author corpus. Both excerpts used the lexical bundles, "The following research questions were addressed…" and "Thus, the research questions of this study are…" to directly signal the reader that a set of key inquiries would follow. This step was not found in ChatGPT corpus.

M3S3: Definitional clarifications

Excerpt 27. HA RAI 6: ***"I refer to** these teachers as transnational, however, because their accounts emphasize the importance for their intercultural identity development of having lived long-term in two different national contexts"* (Menard-Warwick, 2008).

Excerpt 28. HA RAI 10: *"**I considered** revision to include "both the mental process and the actual changes" (Fitzgerald, 1987, p. 483) related to students' modifications of written drafts they had previously composed in classroom settings"* (Suzuki, 2008).

Move 3, Step 3 (M3S3) focuses on definitional clarifications. This step is optional and involves providing clear definitions of key terms and concepts that are

central to the research being presented. This clarification is crucial for ensuring that readers fully understand the specific context and scope of the research. Excerpt 27 and 28 represented the use of M3S3 in the human author corpus. These excerpts used first-person pronoun “I” to establish the author's voice and perspective. The human authors also used reporting verbs like "considered" and "referred to" to introduce definitions or explanations. This step was not found in the ChatGPT corpus.

M3S4: Summarizing methods

Excerpt 29. HA RAI 8: *“**This study attempts to** fill this void **by examining** the effect of peer review training on **a group of EFL student reviewers**’ stances in their written commentary **before and after training and reporting** writers’ perceptions of and attitudes **toward such stances**”* (Min, 2008).

Excerpt 30. ChatGPT RAI 7: *“Through a mixed-methods approach, combining qualitative and quantitative data, **this study will explore** the perspectives of ESL students and instructors, **analyze** writing samples, and **evaluate** the effectiveness of different teaching interventions”* (OpenAI, 2024).

Move 3 step 4 involves summarizing methods used in the research. This step is crucial for providing readers with a clear understanding of how the study was conducted. Excerpt 29 represented M3S4 in the human author corpus. The sentence structure was declarative, directly stating the research aim “This study attempts to.” After that, the author used reporting verbs “examining” and “reporting” to describe the specific research activities. Prepositional phrases like “before and after training” and "toward such stances" are used to specify the timing and focus of the research. The excerpt also specified the sample, “a group of EFL student reviewers,” indicating the research participants, as well as particular focus areas “stances in their written commentary before and after training.” This specificity helped readers understand both the sample and the main points of the research process.

Excerpt 30 represented M3S4 in ChatGPT corpus. The excerpt started the sentence with the lexical bundle “Through a mixed-methods approach, combining qualitative and quantitative data.” This phrase served as an introduction to the research design, signaling that both qualitative and quantitative methodologies were integral. This excerpt also used a declarative sentence “This study will…” to declare the research methodology. The declarative sentence was combined with the reporting verbs like

"explore," "analyze," and 'evaluate" are used to describe the specific research activities.

In summary of the first research question, human authors used these moves a total of 146 times, while ChatGPT used them 258 times. Table 4.3 provides a detailed illustration of these 146 and 258 occurrences in the human author and ChatGPT corpora.

Table 4.3 The Frequency and Percentage of the Moves and Steps in the Human Author and ChatGPT corpora

RAIs Written by Human Authors and ChatGPT				
Move and Step	**Frequency**		**Percentage**	
	Human Authors	**ChatGPT**	**Human Authors**	**ChatGPT**
Move 1	98	104	67.1	40.3
M1S1	9	25	6.2	9.7
M1S2	50	70	34.2	27.1
M1S3	39	9	26.7	3.5
Move 2	12	115	8.2	44.6
M2S1A	10	91	6.8	35.3
M2S2	2	24	1.4	9.3
Move 3	36	39	24.7	15.1
M3S1	21	38	14.4	14.7
M3S2	6	0	4.1	0
M3S3	8	0	5.5	0
M3S4	1	1	0.7	0.4
Total	146	258	100	100

According to Table 4.3, in the human author corpus, move 1 was utilized 98 times (67.1%), move 2 was used 12 times (8.2%), and move 3 appeared 36 times (24.7%). These moves were further divided into 10 specific steps. For move 1, the 98 occurrences in the human author corpus were comprised of 9 instances of M1S1 (6.2%),

50 instances of M1S2 (34.2%), and 39 instances of M1S3 (26.7%). Move 2 was used 12 times, with a breakdown of 10 instances of M2S1A (6.8%) and 2 instances of M2S2 (1.4%). Move 3 appeared 36 times, consisting of 21 instances of M3S1 (14.4%), 6 instances of M3S2 (4.1%), 8 instances of M3S3 (5.5%), and 1 instance of M3S4 (0.7%).

In the second corpus, written by ChatGPT, ChatGPT employed a total of 258 moves and steps. According to Table 4.5, move 1 was used 104 times (40.3%), move 2 was used 115 times (44.6%), and Move 3 occurred 39 times (15.1%). These moves are further divided into 10 specific steps. The 104 instances of Move 1 in ChatGPT corpus included 25 occurrences of M1S1 (9.7%), 70 occurrences of M1S2 (27.1%), and 9 occurrences of M1S3 (3.5%). Move 2 was employed 115 times, consisting of 91 occurrences of M2S1A (35.3%) and 24 occurrences of M2S2 (9.3%). Move 3 was utilized 39 times, comprising 38 occurrences of M3S1 (14.7%) and 1 occurrence of M3S4 (0.4%).

4.2 Similarities and Differences in the Rhetorical Structures

The second research question addressed the extent to which RAIs written by human authors and those generated by ChatGPT exhibit similarities and differences in their rhetorical structures. A thorough analysis of the results from the first research question revealed a significant number of similarities and differences between the two groups of authors in the rhetorical structures.

In this section, the structures or sequences of moves and steps used by human authors and ChatGPT are presented. The results indicated that, within the human author corpus, variations in the structure of moves are evident. Different writers employed diverse approaches to writing, structuring, and presenting their research in the RAIs. Despite these variations, some RAIs shared the same overall structures. Table 4.4 outlines the moves identified in the RAIs and their structures according to the CARS model (Swales, 1990, 2004). Additionally, Table 4.4 and 4.5 displays the frequency of these structures, both in terms of quantity and percentage.

Table 4.4 The Rhetorical Structures of the Moves and Steps in the Human Author Corpus According to the CARS Model

RAIs	The rhetorical Structures in the Human Author Corpus
HA RAI-1	M1-M2-M3
HA RAI-2	M1-M2-M3
HA RAI-3	M1-M2-M1-M3
HA RAI-4	M1-M3
HA RAI-5	M1-M3-M1
HA RAI-6	M1-M2-M1-M3
HA RAI-7	M1-M2-M1-M3
HA RAI-8	M1-M2-M1-M3
HA RAI-9	M1-M2-M3
HA RAI-10	M1-M3
HA RAI-11	M1-M2-M3
HA RAI-12	M1-M2-M1-M2-M3
HA RAI-13	M1-M2-M3
HA RAI-14	M1

Source Swales (1990, 2004)

Table 4.5 The Frequency of the Rhetorical Structures in the Human Author Corpus

Rhetorical Structures	Quantity	Percentage
M1-M2-M3	5	35.7%
M1-M2-M1-M3	4	28.6%
M1-M3	2	14.3%
M1-M3-M1	1	7.1%
M1-M2-M1-M2-M3	1	7.1%
M1	1	7.1%

According to Table 4.4 and 4.5, the most common structure in the human author corpus was M1-M2-M3, which appeared five times (35.7%.). This structure aligned with the rhetorical structure suggested by Swales (1990, 2004). The second most prevalent structure was M1-M2-M1-M3, found four times in the corpus (28.6%). Aside from these two dominant patterns, other structures were also observed. The third most common structure, M1-M3, appeared twice (14.3%). The remaining structures, each found only once, included M1-M3-M1, M1-M2-M1-M2-M3, and M1 (7.1%).

In the second corpus, written by the ChatGPT, six different structures were identified. Table 4.6 outlines the specific moves found in the RAIs and their structures according to the CARS model (Swales, 1990, 2004). Additionally, Table 4.7 presents the frequency of these structures in terms of quantity and percentage.

Table 4.6 The Organization of the Moves and Steps in ChatGPT Corpus According to the CARS Model

RAIs	The rhetorical Structures in ChatGPT Corpus
ChatGPT RAI-1	M1-M2-M3
ChatGPT RAI-2	M1-M2-M3
ChatGPT RAI-3	M1-M2-M3
ChatGPT RAI-4	M1-M2
ChatGPT RAI-5	M1-M2-M1-M2
ChatGPT RAI-6	M1-M2-M3-M1-M2-M3
ChatGPT RAI-7	M1-M2-M3-M2-M3
ChatGPT RAI-8	M1-M2
ChatGPT RAI-9	M1-M2
ChatGPT RAI-10	M1-M2-M1-M3
ChatGPT RAI-11	M1-M2-M3-M1-M3
ChatGPT RAI-12	M1-M2-M3
ChatGPT RAI-13	M1-M2-M1-M2
ChatGPT RAI-14	M1-M2-M1-M2

Source Swales (1990, 2004)

Table 4.7 The Frequency of the Rhetorical Structures in ChatGPT Corpus

Rhetorical Structures	Quantity	Percentage
M1-M2-M3	4	28.6%
M1-M2	3	21.4%
M1-M2-M1-M2	3	21.4%
M1-M2-M3-M1-M2-M3	1	7.1%
M1-M2-M3-M2-M3	1	7.1%
M1-M2-M1-M3	1	7.1%
M1-M2-M3-M1-M3	1	7.1%

According to Table 4.6 and 4.7, similar to the human authors, ChatGPT predominantly used the rhetorical structure of M1-M2-M3, which appeared four times in the RAIs (28.6%). Following this, two structures—M1-M2 and M1-M2-M1-M2—each occurred three times in the corpus (21.4%). The remaining structures were each found only once, including M1-M2-M3-M1-M2-M3, M1-M2-M3-M2-M3, M1-M2-M1-M3, and M1-M2-M3-M1-M3 (7.1%).

Based on the results of the qualitative analysis, the discovered rhetorical structures revealed their similarities and differences from the two groups of authors. These similarities and differences were categorized into two distinct aspects. The two aspects were rhetorical structures and the frequency of moves and steps within the rhetorical structures. In this context, rhetorical structure refers to the overall organization, pattern, or sequence of moves used in the RAIs written by human authors and ChatGPT. This aspect covered the similarities and differences in how the two types of authors structured the sequence of moves in their RAIs. It was considered the key focus of the second research question.

The first similarity under this aspect was the adherence to the CARS model. Both human author and ChatGPT-generated RAIs followed the CARS model, utilizing three key moves: M1 (Establishing a territory), M2 (Establishing a niche), and M3 (Presenting the current work). All the sentences or ideas in the RAIs of both corpora were able to be identified with these moves and the steps under them. The second similarity was the pattern of M1-M2-M3 as the dominant rhetorical structure. Both

human author and ChatGPT-generated their RAIs using the rhetorical structure of M1-M2-M3 as the dominant structure. Human authors used the structure 5 times or 35.7% of the corpus. ChatGPT used the structure 4 times or 28.6% of the corpus. This structure aligned with Swales' CARS model, indicating the agreement of the standard format in RAIs. The third similarity was the variety in rhetorical structures. Both human authors and ChatGPT employed a variety of structures beyond the dominant M1-M2-M3, showcasing flexibility in how the RAIs were constructed. In total, there are 6 structures from the human author corpus and 7 structures in ChatGPT corpus.

In terms of the differences, there were several differences in the aspect of rhetorical structures. The first difference was the complexity in human authors' structures. Human authors demonstrated more complexity and variability in their rhetorical structures. In the RAIs by human authors, there were patterns or rhetorical structures like M1-M2-M1-M3 (used by 28.6% in the human author corpus), M1-M3-M1 (7.1%), and M1-M3 (14.3%). This manner of sequencing from M1 and skipped to M3 and then went back to M1 was found only in the human author corpus. The structures generated by ChatGPT were varied, but they consistently began with M1 and were followed by M2. This indicated that the structures of human authors had the tendency to be more complex and varied. The second difference was the cyclical rhetorical structures. AI-generated RAIs often followed a more repetitive or cyclical structures (e.g., M1-M2-M1-M2, used by 21.4% in ChatGPT corpus or M1-M2-M3-M1-M2-M3 by 7.1%), reflecting a more formulaic and less flexible approach. Human authors, on the other hand, were more complex as seen in the first difference.

In summary, both groups adhereed to Swales' CARS model, employing the three moves and shared the M1-M2-M3 structure as the most dominant pattern, with human authors using it in 35.7% of their RAIs and the ChatGPT corpus in 28.6%. Additionally, both corpora exhibited a variety of rhetorical structures, with human authors presenting six different structures and ChatGPT seven different structures, indicating flexibility in their approaches. However, differences emerged in the complexity and nature of these structures: human authors demonstrated greater variability and complexity, including unique structures like M1-M2-M1-M3 and M1-M3-M1, which suggested a more nuanced and less predictable rhetorical structures. In

contrast, the ChatGPT tended to produce more repetitive structures, such as M1-M2-M1-M2 and M1-M2-M3-M1-M2-M3, reflecting a formulaic and less flexible approach.

4.3 Similarities and Differences in the Frequency of Moves and Steps

Following the first aspect, the second aspect was the frequency of moves and steps, which referred to how often the moves and steps were employed in the rhetorical structures. This aspect translated the occurrence frequency of moves and steps in the two corpora into qualitative data. It was included to provide a deeper understanding of the emphasis placed on each move and step by human authors and ChatGPT in their rhetorical structures. By examining the frequency of moves and steps, this aspect highlighted which parts of the RAIs were prioritized by the two groups of authors.

The first similarity in this aspect was the emphasis on move 1. Both human authors and ChatGPT emphasized move 1, using it to establish the research territory, highlight significance, and review relevant literature. Move 1 was used 67.1% in human author corpus and 40.3% in ChatGPT corpus. M1S1 covered 6.2% in the human author corpus and 9.7% in the ChatGPT corpus. M1S2 was 34.2% in the human author corpus and 27.1% in the ChatGPT corpus. M1S3 was 26.7% in the human author corpus and 3.5% in ChatGPT corpus. This manner of the two authors indicated that they highlighted the importance in setting up the research context. The second similarity was the common key steps. There were some steps that both authors commonly emphasized. They are M1S2 (Making topic generalizations), which appears 50 times (34.2%) in the human authors' texts and 70 times (27.1%) in ChatGPT texts, and M3S1 (Announcing present research), appearing 21 times (14.7%) in the human authors' texts and 38 times (7.8%) in ChatGPT texts.

In terms of the differences, there were several differences in the aspect of the frequency of moves and steps in the rhetorical structures. The first difference was the overemphasis on the research gap by ChatGPT. ChatGPT overemphasized M2S1A (Indicating a gap), using it 91 times (35.3% of ChatGPT corpus) compared to 10 times (6.8% of the human author corpus), suggesting a stronger focus by the generative-AI tool on justifying the research by highlighting gaps. The second difference was the

depth of literature review (M1S3). Human authors conducted more in-depth literature reviews, using M1S3 39 times (26.7% of the human author corpus), compared to 9 times (3.5% in ChatGPT corpus). This step was less developed in AI-generated texts, which tended to be more superficial in reviewing literature. The third difference was in move 3, which involved presenting the current work. In move three, human authors included additional steps like M3S2 (presenting research questions or hypotheses, 4.1%) and M3S3 (definitional clarifications, 5.5%), which were absent in AI-generated texts. This indicated a more nuanced and varied approach in human writing. Additionally, although both authors used M3S1 at similar rates (14.4% and 14.7%), it was noticeable that the generative AI was more speculative, lacked personality or voice in executing move 3, step 1. Human authors demonstrated unique perspectives, personalized objectives, or specific actions in their studies, whereas ChatGPT's aims or goals were more general and superficial.

In summary of this section, ChatGPT overemphasized research gaps (M2S1A) and often lacked depth in literature review (M1S3) and specificity in presenting current work (M3). Human authors also introduced additional steps, such as presenting research questions and definitional clarifications, which were absent in the texts generated by ChatGPT, showing a richer, more personalized approach. Despite using similar moves, these differences highlight the human authors' tendency to convey unique perspectives and in-depth contextual understanding, contrasting with the AI's more general and superficial language.

In conclusion, this chapter presented the results of a genre analysis comparing the rhetorical structures and frequency of moves and steps in research article introductions (RAIs) written by human authors and ChatGPT. Both authors adhered to Swales' (1990, 2004) CARS model, employing three key moves - Establishing a Territory (M1), Establishing a Niche (M2), and Presenting the Current Work (M3) - along with their steps. The analysis revealed that while both groups shared dominant structures, particularly M1-M2-M3, human-authored RAIs exhibited greater complexity and variability (e.g., M1-M2-M1-M3). In contrast, ChatGPT's texts displayed more repetitive sequences (e.g., M1-M2-M1-M2). Frequency analysis showed that human authors emphasized in-depth literature reviews (M1S3) and included additional steps like research questions (M3S2) and definitional clarifications

(M3S3), which were absent in ChatGPT texts. Conversely, the AI tool overemphasized research gaps (M2S1A) and produced more generalized statements in move 3.

CHAPTER 5

CONCLUSION AND DISCUSSION

This chapter provides a detailed discussion of the research findings, examining their practical implications and acknowledging the limitations encountered during the study. It also explores how the results contribute to the existing body of knowledge in the field. The chapter concludes with recommendations for future research, suggesting possible areas for further investigation that can develop on the insights gained from this study.

5.1 Conclusion

The research in this study focused on exploring and analyzing the rhetorical structures of research article introductions (RAIs) generated by ChatGPT in comparison to those written by human authors in English language teaching (ELT). The research objectives were to examine the moves and steps employed in RAIs written by human authors and ChatGPT-4o, and to determine the extent of similarities and differences in their rhetorical structures.

In order to achieve the research objectives, this study employed a qualitative research design. The research analyzed and compared the moves and steps in RAIs using Swales' (1990, 2004) framework, the Creating a Research Space or CARS model. In the first phase, the researcher and the inter-coders identified the rhetorical moves and steps in 28 RAIs, 14 human-written and 14 generated by ChatGPT. The coding process was validated by the inter-rater reliability testing (Cohen's Kappa = 0.97). Following the content analysis, the second phase interpreted and compared the results in greater depth. In this phase, the study focused on the differences and similarities between the RAIs written by human authors and ChatGPT, exploring how each corpus utilized the moves, steps, and the rhetorical structures identified in the first phase.

Through the detailed examination of the frequency and organization of moves and steps, several significant findings emerged. First, there were similarities and

differences in how human authors and ChatGPT structured their RAIs. Both groups followed the typical sequence of move 1 (establishing a territory) - move 2 (establishing a niche) - move 3 (occupying the niche), as outlined by Swales (1990, 2004). This rhetorical structure covered 35.7% of the human author corpus and 28.6% of AI-generated RAIs. These occurrences suggested that ChatGPT can follow human authors' RAI structure in academic writing. However, ChatGPT showed a tendency toward repetitive and circular rhetorical structures, such as M1-M2-M1-M2, which appeared in 21.4% of ChatGPT corpus. In contrast, the human authors often used more varied and flexible structures, like M1-M3-M1. This insight indicated that human authors may have their own unique style of writing their RAIs or adapt their rhetorical structures to suit the specific needs of their research and audience, a flexibility that ChatGPT lacked.

The study also found differences in how often certain moves and steps appeared. For example, move 1 was common in both the human author and ChatGPT corpora, but the human authors tended to provide more detailed literature reviews (M1S3), using this step 26.7% of the corpus, compared to only 3.5% from the ChatGPT corpus. On the other hand, the AI tool focused more on highlighting research gaps (M2S1A), with this step covering 35.3% of the ChatGPT corpus, while only 6.8% appeared in human-written RAIs. This data suggested that while ChatGPT was able recognize and emphasize gaps in research, it could not provide the same level of context or depth that the human authors offered. In move 3, both human authors and ChatGPT used move 3, step 1 (M3S1) at similar rates (14.4% and 14.7%), ChatGPT tended to be more speculative and lacked a distinctive voice or opinion. Human authors presented unique perspectives, objectives, and specific actions to their work, while the aims of ChatGPT were more general.

In summary, the results revealed that while ChatGPT was able to replicate the human standard rhetorical structure for RAIs, it lacked the complexity and depth that human authors offered in their RAIs. This study highlighted the strengths and limitations of AI-generated RAIs, providing a basis for further exploration of the use of ChatGPT in academic writing and rhetorical structures, especially in writing RAIs.

5.2 Discussion of the Findings

5.2.1 Similarities and Differences in the Rhetorical Structures

The discussion of the research findings focuses on the similarities and differences of the human authors and ChatGPT in writing RAIs. These similarities and differences are based mainly on the frequency of the rhetorical moves, steps, and the rhetorical structures found in the two corpora. In addition, the discussion also covers how similar and different the two authors executed the rhetorical moves, steps, and the rhetorical structures to achieve their communicative goals in the RAIs.

One of the important findings revealed that both human authors and ChatGPT had the same dominant rhetorical structure according to Swales (1990, 2004). In the human author corpus, the dominant rhetorical structure was M1-M2-M3. This result corresponded with the previous studies on RAIs in applied linguistics and ELT research articles (Hirano, 2009; Rahman et al., 2017; Rochma et al., 2020; Sheldon, 2011). In particular, the studies by Rahman et al. (2017) and Rochma et al. (2020) examined the rhetorical structures of RAIs in ELT research articles. They found the consistent use of the M1-M2-M3 pattern, as outlined by Swales' CARS model (1990). This finding of the current study reaffirmed that the M1-M2-M3 pattern is the dominant and common rhetorical structure of RAIs in the field of English language teaching. Despite the reaffirmation among the human authors, ChatGPT also employed the same rhetorical structure dominantly in the RAIs. This behavior of ChatGPT confirmed the speculation of researchers and academics saying that generative AI tools like ChatGPT can capture common patterns and structures in the training corpus and is very good at replicating them (Liao et al., 2023; Tarchi et al., 2024; Zhao et al., 2024). Consequently, the current study confirmed the speculation in the case of research article introductions, particularly in the field of ELT.

Another significant finding was that the RAIs generated by ChatGPT displayed greater repetition in their rhetorical structures compared to those written by human authors. While both human authors and ChatGPT employed a range of rhetorical structures in their RAIs, their patterns exhibited differences. The human authors utilized six different rhetorical structures, with the dominant structure, M1-M2-M3, appearing

five times (35.7%) in the corpus. Other structures, such as M1-M2-M1-M3, M1-M3, M1-M3-M1, M1-M2-M1-M2-M3, and M1, also featured in the human author corpus at varying frequencies, reflecting a diverse and flexible approach. In contrast, the generative AI employed seven different rhetorical structures, including the dominant M1-M2-M3, which appeared four times (28.6%). Additional structures, such as M1-M2, M1-M2-M1-M2, and M1-M2-M3-M1-M2-M3 highlighted a more formulaic and cyclical approach. Notably, repetitive patterns such as M1-M2-M1-M2 (21.4%) and M1-M2-M3-M1-M2-M3 (7.1%) were more common in the AI-generated RAIs. These findings suggested that while both human authors and ChatGPT employed a variety of rhetorical structures beyond the dominant M1-M2-M3, ChatGPT's tendency toward cyclical repetition contrasted with the human authors' use of more complex and less predictable structures, such as M1-M3 (14.3%) and M1-M2-M1-M2-M3 (7.1%). This highlighted ChatGPT's repetitive tendencies compared to the nuanced and flexible rhetorical strategies of human authors.

The dominant rhetorical structure and the presence of flexible patterns in the human author corpus aligned with findings from previous studies discussed in the literature review. In the field of ELT, Rahman et al. (2017) and Rochma et al. (2020) identified a consistent use of the M1-M2-M3 pattern, adhering to Swales' CARS model (1990, 2004). Moreover, their studies highlighted additional structures within their corpora, such as M1-M3, M1-M2-M1-M3-M1-M3, and M1-M3-M1-M2-M1-M3. The findings of this study reaffirmed that RAIs in ELT, predominantly utilize the M1-M2-M3 rhetorical structure. However, the human authors also employed a range of alternative patterns, underscoring a diverse and flexible approach to writing RAIs. This reaffirmed the idea that while certain rhetorical conventions dominate, human authors still exhibit creativity and adaptability in their structuring of RAIs.

In the ChatGPT corpus, the dominant rhetorical structure followed the conventional sequence of M1-M2-M3, reflecting the established pattern in research article introductions (RAIs). However, additional rhetorical structures demonstrated a more repetitive and cyclical nature, aligning with the findings of Kanoksilapatham (2005) in her analysis of biochemistry research articles. Kanoksilapatham's study examined 60 articles, identifying 15 distinct rhetorical moves across different sections in research articles: Introduction, Methods, Results, and Discussion.

5.2.2 Differences and Similarities in the Use of Rhetorical Moves and Steps

The first aspect examined was the frequency of rhetorical move usage. ChatGPT typically generated longer RAIs and used more rhetorical moves than human authors. Across 14 RAIs, human authors used rhetorical moves 146 times, while ChatGPT used them 258 times. On average, human authors employed 10 moves per one RAI, whereas ChatGPT used 18 moves per one RAI. This phenomenon corresponded with the findings of Khan et al. (2023), who investigated the frequency of moves in RAIs from Scopus-indexed and non-Scopus-indexed linguistics journals using Swales' (1990) CARS model. Khan et al. (2023) concluded that authors from non-Scopus-indexed journals often overused rhetorical moves, attributing this pattern to a lack of experience. They noted that such overuse reduced the clarity and effectiveness of RAIs and could limit publication success in Scopus-indexed journals. The current study's findings supported Khan et al.'s (2023) conclusions. The RAIs analyzed, taken from Scopus-indexed journals, showed that human authors wrote more concise introductions and used fewer rhetorical moves compared to ChatGPT. This suggested that ChatGPT's tendency to overuse rhetorical moves reflected the patterns of less experienced authors, potentially affecting the overall coherence and readability of its RAIs.

The possibility that contributed to limited use of move 3 in the ChatGPT corpus may be found in the prompts used in this study to direct the behavior of ChatGPT. The prompt used to replicate the RAIs in this study was based on the previous studies elaborated in chapter 3 (Giray, 2023; Kutela et al., 2023). The prompt was consistently used across all 14 research topics, with the only variation being the title of each research paper. The findings revealed that RAIs from the ChatGPT corpus that included move 3 were typically associated with articles that had longer titles. Of the 14 RAIs in the ChatGPT corpus, 8 contained move 3. The average title length for these RAIs was 13 words, whereas the average title length for those that omitted move 3 was 8 words. This suggested that longer or more detailed prompts may result in more comprehensive or well-structured outputs. In the context of rhetorical structure, longer or more contextual prompts may facilitate the generation of RAIs that better align with Swales' (1990, 2004) framework.

The next aspect was in the frequencies and discrepancies in the use of particular moves and steps by the two authors. Notably, move 1 step 3 (reviewing items of

previous literature), move 2 (establishing a niche), and move 3 (occupying the niche) occurred with markedly different frequencies in the two corpora. ChatGPT used move 1 for 104 times (40.3%) and human authors used 98 times (67.1%). This particular move consists of 3 steps, step 1 claiming centrality, step 2 making topic generalization/s, and step 3 reviewing items of previous literature. While the first two steps were employed by the two authors with the similar rates, 6.2% by human authors and 9.7% by ChatGPT in M1S1 and 34.2% by humans and 27.1% in M1S2. However, the immense distance was found in M1S3. The human authors used this step 39 times (26.7%) and ChatGPT used only 9 times (3.5%). This big discrepancy indicated the human authors gave more attention to providing supports from previous studies. ChatGPT tended to be more superficial, claimed centrality, and make topic generalizations. Following this insight, the overemphasis of move 2 or establishing niches was needed to be discussed as well. In the results, ChatGPT used move 2 for 115 times (44.6%), while the human authors used only 12 times of the move (8.2%). Emphasizing the discrepancy, ChatGPT treated move 2 as the most employed move, while the human authors treated it as the least employed move. This substantial discrepancy shows that ChatGPT focused on indicating research gaps. In contrast, human authors emphasized establishing a territory and presenting the present work. Both of these moves appeared more frequently in human-written RAIS than in the AI-generated RAIs.

5.3 Implications

This section outlines practical guidelines for utilizing the generative AI to support the development of RAIs, drawing on key insights from the findings of this study. These guidelines aim to promote the careful use of ChatGPT and optimize the use of the generative AI tool to produce well-structured, coherent, and rhetorically effective RAIs that align with the established framework like the CARS model (Swales, 1990, 2004).

5.3.1 RAI Draft Generator

Previous studies highlighted in the literature review have concluded that content generated by generative AI tools can serve as initial drafts for academic writing tasks (Ariyaratne et al., 2023; Dwivedi et al., 2023). This approach allows EFL students, academic writers, and researchers to improve the readability of their texts, avoid plagiarism, and refine the AI-generated drafts (Gao et al., 2022; Herbold et al., 2023; Rahman, 2023; Eke, 2023; Sabzalieva & Valentini, 2023; Xiao & Zhi, 2023). In this study, the results confirmed that the dominant rhetorical structure for both human authors and ChatGPT was the M1-M2-M3 structure, as outlined in Swales' (1990, 2004) CARS model. In the same way with human authors, ChatGPT had tendency to follow the conventional rhetorical structure stating with move 1 (establishing a territory), followed by move 2 (establishing a niche), and ended with move 3 (occupying the niche or presenting the present work) when writing RAIs, particularly in the field of English language teaching (ELT). This finding underscored the potential of ChatGPT to support the drafting process and facilitate the production of well-structured RAIs that adhere to the established rhetorical structure according to Swales (1990, 2004).

5.3.2 RAI Draft Refinement

5.3.2.1 Avoiding Overuse of Rhetorical Moves

One of the key findings revealed that ChatGPT produced longer RAIs by overusing rhetorical moves, particularly Move 2 (establishing a niche), which appeared 115 times (44.6%) in the AI corpus compared to only 12 times (8.2%) in the human author corpus. This overuse reflects a pattern seen in less experienced authors, as noted by Khan et al. (2023), who found that authors from non-Scopus-indexed journals often employed excessive moves, negatively affecting the clarity and effectiveness of their introductions. This insight is significant for scholars, researchers, and academic writers seeking to have their articles published in high-ranking journals like those in Scopus-indexed journals.

For authors using AI-generated RAIs as a supplementary resource, a starting point, or a draft, it is crucial to review and reduce the overuse of Move 2. Excessive gap indications can make the introduction seem redundant and unfocused. Authors should focus on refining and balancing the usage of move 1 (establishing a territory) and move 3 (occupying the niche) to maintain clarity and ensure a logical flow.

5.3.2.2 Enhancing the Use of Move 3 (Step 1, Step 2, Step 3, and Step 4)

The limited use of move 3 in the ChatGPT corpus was another key finding, with move 3 appearing in only 8 RAIs (57.14%), falling below the 60% cut-off for being considered an obligatory move (Kanoksilapatham, 2005). On the other hand, move 3 was present in 13 RAIs (92.86%) from the human author corpus, indicating a greater emphasis on introducing the current research. Move 3 is essential in RAIs as it delivers a clear, focused introduction to the study being conducted. The limited occurrence of move 3 in the ChatGPT corpus suggested that ChatGPT might struggle with personalizing content to fit the specific context of the research. In order to refine RAIs, authors must ensure that move 3 is clearly and consistently presented. When using AI-generated RAIs, authors should verify that move 3 is present and explicitly links the research gap (move 2) to the study's objectives. Authors can revise the generative AI's output by incorporating specific details about the study's objectives, research questions, and unique contributions. These strategies can be referred to in the CARS model provided by Swales (1990, 2004).

According to the results of this study, RAIs in ELT commonly utilized four specific steps to present their ideas within Move 3. The first was step 1 (announcing present research descriptively and/or purposively), which human authors employed 21 times (14.4%). Step 2 (presenting research questions or hypotheses) was used 6 times (4.1%), followed by step 3 (definitional clarifications), used 8 times (5.5%). Finally, step 4 (summarizing methods) appeared less frequently (0.7%). These findings align with the study by Rahman et al. (2017), which also highlighted the prominence of these steps in RAIs. Users of ChatGPT can consider these steps and incorporate them into their RAI drafts.

5.3.2.3 Strengthening Literature Review

The results from the study also revealed a significant discrepancy in the use of move 1, step 3 (reviewing items of previous literature). Human authors used M1S3 39 times (26.7%), while ChatGPT used it only 9 times (3.5%). This difference indicated that the human authors devoted more attention to contextualizing their studies through a comprehensive review of past literature, while ChatGPT focused on claiming centrality (M1S1) and topic generalizations (M1S2). Literature reviews are essential for situating the study within existing research. Authors should pay attention to

including M1S3 (reviewing items of previous literature) in their RAI drafts. When refining AI-generated RAIs, authors should incorporate references to specific, relevant studies to demonstrate the research's scholarly grounding. This can be achieved by identifying key studies related to the research topic and summarizing them within the RAI. In the AI-generated RAIs, authors should also ensure that citations are accurate and up-to-date.

5.3.2.4 Implications for the Field and Academic Writers

The results of this study offered valuable perspectives to the ELT field by demonstrating how generative AI tools such as ChatGPT-4o can be incorporated into academic writing practices. ChatGPT offered potential benefits, such as accelerating the drafting process and aiding academic writers, especially non-native English-speaking authors in structuring their introductions. However, the results also highlighted the need for careful human intervention to ensure the rhetorical and contextual depth expected in academic writing.

For educators in ELT, these findings suggested opportunities for incorporating or integrating AI tools into teaching. Students can use AI-generated RAIs as starting points for learning rhetorical structures, developing critical evaluation skills, and refining their academic writing. This study further highlighted the significance of equipping students and researchers with the skills and knowledge to balance AI-generated outputs with their own expertise and contextual knowledge, ensuring the production of high-quality academic texts that adhere to established standards, including the CARS model for RAIs (Swales, 1990, 2004).

In summary, the study not only identified strengths and limitations in AI-generated RAIs but also provided actionable insights for careful and responsible optimization of ChatGPT in ELT. By addressing these findings, the academic community can advance its understanding of ChatGPT's role in academic writing, fostering more effective and innovative approaches to teaching and research.

5.4 Limitations of the Study

The current study encountered several limitations that may have influenced the scope, depth, and generalizability of the findings. The primary limitation of this study was the relatively limited number of RAIs included in the sample. The human author and ChatGPT corpora each consisted of 14 RAIs, totaling 28 introductions. While this sample size provided sufficient data for identifying key patterns and differences in rhetorical structures, a larger sample size would allow for a more comprehensive analysis and a stronger and more affirmative basis for generalization.

Another limitation is the design of the prompts used to direct the behavior of ChatGPT. Although the researcher ensured consistency and completeness of essential elements in constructing the prompt, following Giray (2023), Sanmarchi et al. (2023) stated that there is no single or perfect method for prompt engineering. Even one prompt can lead to different outcomes. Therefore, there is a possibility that there will be prompts that can lead to better RAIs from ChatGPT. The evidence can be seen in this study. In this study, variations in the length or complexity of the research paper titles used in the prompt were found to have the possibility to influence the inclusion of Move 3 (occupying the niche) in the AI-generated RAIs. This raised concerns about the impact of prompt design on the quality and completeness of AI-generated academic texts.

Finally, ChatGPT used in this study is subject to updates and changes. As generative AI tools are frequently updated, newer versions may have improvement in rhetorical capabilities or produce different patterns of move usage. Since this study did not account for updates of ChatGPT, the results are specific to the version used at the time of the study.

5.5 Recommendations for Further Research

Based on the limitations identified in this study, recommendations are provided to guide and suggest for future research in the related areas. One of the limitations of the current study was its relatively small size of the corpus, which included 28 RAIs

(14 from human authors and 14 from ChatGPT). Future research could enlarge the corpus by including more RAIs, ensuring a broader representation of research topics, different sections in research articles, different journals, and disciplines. This expansion would enhance the generalizability of the findings and offer a more comprehensive view of human authors and ChatGPT-generated RAIs.

One of the discovered insights was that the prompts used to generate AI-written RAIs had the possibility to influence the occurrences of certain rhetorical moves, particularly move 3. Longer or more contextual prompts resulted in more comprehensive RAIs that better aligned with Swales' (1990, 2004) CARS framework. Therefore, future research could investigate the impact of various prompt engineering strategies on the rhetorical structures of RAIs. Studies could experiment with different prompt lengths, specificity, and instructions to determine the most effective prompt design that generates well-structured and comprehensive RAIs. This kind of research would offer practical guidance for scholars and academic users seeking to utilize generative AI tools effectively in academic writing.

REFERENCES

Abasi, A. R., & Akbari, N. (2008). Are we encouraging patchwriting? Reconsidering the role of the pedagogical context in ESL student writers' transgressive intertextuality. *English for Specific Purposes*, 27(3), 267–284. https://doi.org/10.1016/j.esp.2008.02.001

Ahmed, I., Roy, A., Kajol, M. A., Hasan, U., Datta, P. P., & Reza, M. R. (2023). ChatGPT vs. Bard: A Comparative Study. *Authorea*. https://doi.org/10.22541/au.168923529.98827844/v1

Alharbi, S. H. (2021). A comparative genre-based analysis of move-step structure of RAIs in two different publication contexts. *English Language Teaching*, *14*(3), 12. https://doi.org/10.5539/elt.v14n3p12

Alhojailan, A. I. (2020). Genre analysis of Saudi universities' websites: Analysis of rhetorical moves and discursive strategies for marketization purposes. *International Journal of English Linguistics*, *10*(6), 65. https://doi.org/10.5539/ijel.v10n6p65

Aljaber, S., & Almushaili, T. (2022). Artificial intelligence. *International Journal of Engineering Research and Applications*, *12*(12), 52–57. https://doi.org/10.9790/9622-12125257

Alkhaqani, A. (2023). Can ChatGPT help researchers with scientific research writing? *Journal of Medical Research and Reviews*, *1*(2), 32. https://doi.org/10.5455/jmrr.20230626013424

Altman, D. G. (1990). Practical statistics for medical research. In *Chapman and Hall/CRC eBooks*. Chapman and Hall/CRC. https://doi.org/10.1201/9780429258589

Arias, C. R. (2021). An introduction to artificial intelligence. In *Artificial intelligence and robotics commons* (pp. 15–51). Digital Commons @ SPU. https://digitalcommons.spu.edu/works/173

Ariyaratne, S., Iyengar, K. P., Nischal, N., Babu, N. C., & Botchu, R. (2023). A comparison of ChatGPT-generated articles with human-written articles. *Skeletal Radiology*, *52*(9), 1755–1758. https://doi.org/10.1007/s00256-023-04340-5

Aronoff, M., & Rees-Miller, J. (2003). *The Handbook of Linguistics*. John Wiley & Sons.

Atay, D. (2008). Teacher research for professional development. *ELT Journal*, 62(2), 139–147. https://doi.org/10.1093/elt/ccl053

Bakhtin, M. M., Holquist, M., Emerson, C., & McGee, V. W. (1987). *Speech genres and other late essays*. https://doi.org/10.7560/720466

Barney, J. B., & Wright, P. M. (1998). On becoming a strategic partner: The role of human resources in gaining competitive advantage. *Human Resource Management*, *37*(1), 31–46. https://doi.org/10.1002/(sici)1099-050x(199821)37:1

Bhatia, P. (2023). ChatGPT for academic writing: A game changer or a disruptive tool? *Journal of Anaesthesiology Clinical Pharmacology*, *39*(1), 1. https://doi.org/10.4103/joacp.joacp_84_23

Boonyuen, T. (2017). *Analysis of textual organization of research article discussion sections in the second language writing discipline* (Master's Thesis). Thammasat University.

Brommer, S., Frick, K., Bursch, A., Crespo, M. R., & Schwerdtfeger, L. K. (2024). ChatGPT and Its Genre Competence An Exploratory Study. *Weizenbaum Journal of the Digital Society*, 4(4). https://doi.org/https://doi.org/10.34669/wi.wjds/4.4.6

Brown, T. B., Mann, B. F., Ryder, N. C., Subbiah, M., Kaplan, J., Dhariwal, P., Neelakantan, A., Shyam, P., Sastry, G., Askell, A., Agarwal, S., Herbert-Voss, A., Krueger, G., Henighan, T., Child, R., Ramesh, A., Ziegler, D. M., Wu, J. C., Winter, C., . . . Amodei, D. (2020). Language models are few-shot learners. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.2005.14165

Chinaprayoon, W. (2016). *Move analysis of introduction section in applied linguistics research articles* (Doctoral dissertation). Burapha University.

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, *20*(1), 37–46. https://doi.org/10.1177/001316446002000104

Cortes, V. (2013). The purpose of this study is to: Connecting lexical bundles and moves in research article introductions. *Journal of English for Academic Purposes*, *12*(1), 33–43. https://doi.org/10.1016/j.jeap.2012.11.002

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.

Crookes, G. (1986). Towards a validated analysis of scientific text structure. *Applied Linguistics*, *7*(1), 57–70. https://doi.org/10.1093/applin/7.1.57

Crossley, S. A., Greenfield, J., & McNamara, D. S. (2008). Assessing text readability using cognitively based indices. *TESOL Quarterly*, *42*(3), 475–493. https://doi.org/10.1002/j.1545-7249.2008.tb00142.x

Da Silva, J. a. T. (2023). Is ChatGPT a valid author? *Nurse Education in Practice*, *68*, 103600. https://doi.org/10.1016/j.nepr.2023.103600

Dabamona, M., Satria, D. E., Fatimah, A., & Rahayu, S. (2022). Create a research space (CARS) in introduction of Indonesian bachelor thesis: A corpus-based analysis. *Journal of English Education and Teaching*, *6*(1), 126–141. https://doi.org/10.33369/jeet.6.1.126-141

De Araújo, C. G. S. (2014). Detailing the writing of scientific manuscripts: 25-30 paragraphs. *Arquivos Brasileiros De Cardiologia*. https://doi.org/10.5935/abc.20140019

Del Saz Rubio, M. M. (2011). A pragmatic approach to the macro-structure and metadiscoursal features of research article introductions in the field of Agricultural Sciences. *English for Specific Purposes*, *30*(4), 258–271. https://doi.org/10.1016/j.esp.2011.03.002

Dendrinos, B. (2014). *Applied linguistics to foreign language teaching and learning*. the National and Kapodistrian University of Athens.

Deng, J., & Lin, Y. (2023). The benefits and challenges of ChatGPT: An Overview. *Frontiers in Computing and Intelligent Systems*, *2*(2), 81–83. https://doi.org/10.54097/fcis.v2i2.4465

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., . . . Wright, R. (2023). Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, *71*, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Eke, D. (2023). ChatGPT and the rise of generative AI: Threat to academic integrity? *Journal of Responsible Technology*, *13*, 100060. https://doi.org/10.1016/j.jrt.2023.100060

Farnia, M., & Barati, S. (2017). Writing introduction sections of research articles in applied linguistics: Cross-linguistic study of native and non-native writers. *Indonesian Journal of Applied Linguistics*, *7*(2), 248. https://doi.org/10.17509/ijal.v7i2.8357

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). Mc Graw HIll.

Gao, C., Howard, F. M., Markov, N. S., Dyer, E., Ramesh, S., Luo, Y., & Pearson, A. T. (2023). Comparing scientific abstracts generated by ChatGPT to real abstracts with detectors and blinded human reviewers. *Npj Digital Medicine*, *6*(1). https://doi.org/10.1038/s41746-023-00819-6

Gao, S., & Pramoolsook, I. (2023). A cross-cultural move analysis of electronic engineering research article introductions: The case of Chinese, Thai, and native English scholarly writers. *Ampersand*, *10*, 100106. https://doi.org/10.1016/j.amper.2022.100106

Gill, S. S., & Kaur, R. (2023). ChatGPT: Vision and challenges. *Internet of Things and Cyber-Physical Systems*, *3*, 262–271. https://doi.org/10.1016/j.iotcps.2023.05.004

Giray, L. (2023). Prompt engineering with ChatGPT: A guide for academic writers. *Annals of Biomedical Engineering*, *51*(12), 2629–2633. https://doi.org/10.1007/s10439-023-03272-4

Günay, S., Öztürk, A., & Yiğit, Y. (2024). The accuracy of Gemini, GPT-4, and GPT-4o in ECG analysis: A comparison with cardiologists and emergency medicine specialists. *The American Journal of Emergency Medicine*, *84*, 68–73. https://doi.org/10.1016/j.ajem.2024.07.043

Hadi, M. U., Tashi, Q. A., Qureshi, R., Shah, A., Muneer, A., Irfan, M., Zafar, A., Shaikh, M. B., Akhtar, N., Wu, J., & Mirjalili, S. (2023). Large language models: A comprehensive survey of its applications, challenges, limitations, and future prospects. *TechRxiv*. https://doi.org/10.36227/techrxiv.23589741.v4

Henry, A., & Roseberry, R. L. (2001). A narrow-angled corpus analysis of moves and strategies of the genre: 'Letter of application.' *English for Specific Purposes*, *20*(2), 153–167. https://doi.org/10.1016/s0889-4906(99)00037-x

Herbold, S., Hautli-Janisz, A., Heuer, U., Kikteva, Z., & Trautsch, A. (2023). A large-scale comparison of human-written versus ChatGPT-generated essays. *Scientific Reports*, *13*(1). https://doi.org/10.1038/s41598-023-45644-9

Hirano, E. (2009). Research article introductions in English for specific purposes: A comparison between Brazilian Portuguese and English. *English for Specific Purposes*, *28*(4), 240–250. https://doi.org/10.1016/j.esp.2009.02.001

Hyon, S. (1996). Genre in Three Traditions: Implications for ESL. *TESOL Quarterly*, *30*(4), 693. https://doi.org/10.2307/3587930

Hürlimann, C. (2019). Results and findings. In sustainable management, wertschöpfung und effizienz. *Springer Gabler, Wiesbaden*, (pp. 189–282). https://doi.org/10.1007/978-3-658-27469-6_5

Hyland, K. (2007). Genre pedagogy: Language, literacy and L2 writing instruction. *Journal of Second Language Writing*, *16*(3), 148–164. https://doi.org/10.1016/j.jslw.2007.07.005

Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons*, *61*(4), 577–586. https://doi.org/10.1016/j.bushor.2018.03.007

Johns, A. M. (2008). Genre awareness for the novice academic student: An ongoing quest. *Language Teaching*, *41*(2), 237–252. https://doi.org/10.1017/s0261444807004892

Johns, A. M., Bawarshi, A., Coe, R. M., Hyland, K., Paltridge, B., Reiff, M. J., & Tardy, C. (2006). Crossing the boundaries of genre studies: Commentaries by experts. *Journal of Second Language Writing*, *15*(3), 234–249. https://doi.org/10.1016/j.jslw.2006.09.001

Kalota, F. (2024). A primer on generative artificial intelligence. *Education Sciences*, *14*(2), 172. https://doi.org/10.3390/educsci14020172

Kanoksilapatham, B. (2005). Rhetorical structure of biochemistry research articles. *English for Specific Purposes*, *24*(3), 269–292. https://doi.org/10.1016/j.esp.2004.08.003

Kanoksilapatham, B. (2007). Introduction to move analysis. In *Studies in corpus linguistics*. https://doi.org/10.1075/scl.28.04kan

Kayi-Aydar, H. (2013). Social Positioning, Participation, and second language learning: Talkative students in an academic ESL classroom. *TESOL Quarterly*, *48*(4), 686–714. https://doi.org/10.1002/tesq.139

Kelly, P. R., Gómez-Bellengé, F., Chen, J., & Schulz, M. M. (2008). Learner outcomes for English language learner low readers in an early intervention. *TESOL Quarterly, 42*(2), 235–260. https://doi.org/10.1002/j.1545-7249.2008.tb00117.x

Khan, S. W., Lee, G. I., Jalaluddin, I., & Tan, H. (2023). Occurrence frequency of rhetorical moves in introductions of linguistics research articles from Non-Scopus and Scopus journals. *Journal of Language Teaching and Research*, *14*(5), 1279–1289. https://doi.org/10.17507/jltr.1405.16

Kiryakova, G., & Angelova, N. (2023). ChatGPT—A challenging tool for the university professors in their teaching practice. *Education Sciences*, *13*(10), 1056. https://doi.org/10.3390/educsci13101056

Kutela, B., Msechu, K., Das, S., & Kidando, E. (2023). ChatGPT's scientific writings: A case study on traffic safety. *Social Science Research Network*. https://doi.org/10.2139/ssrn.4329120

Latif, E., Mai, G., Nyaaba, M., Wu, X., Liu, N., Lu, G., Li, S., Liu, T., & Zhai, X. (2023). AGI: Artificial General Intelligence for Education. *arXiv (Cornell University)*. https://doi.org/10.48550/arxiv.2304.12479

Laurence, A. (1997). In search of a general model for the structure of research article introductions. *CORE Reader*. https://core.ac.uk/reader/230075400

Li, L., Franken, M., & Wu, S. (2020). Bundle-driven move analysis: Sentence initial lexical bundles in PhD abstracts. *English for Specific Purposes*, *60*, 85–97. https://doi.org/10.1016/j.esp.2020.04.006

Liao, W., Liu, Z., Dai, H., Xu, S., Wu, Z., Zhang, Y., Huang, X., Zhu, D., Cai, H., Li, Q., Liu, T., & Li, X. (2023). Differentiating ChatGPT-generated and human-written medical texts: Quantitative study. *JMIR Medical Education*, *9*, e48904. https://doi.org/10.2196/48904

Lingard, L. (2023). Writing with ChatGPT: An illustration of its capacity, limitations & implications for academic writers. *Perspectives on Medical Education*, *12*(1), 261–270. https://doi.org/10.5334/pme.1072

Lintao, R. B., & Erfe, J. P. (2012). A move-analytic contrastive study on the introductions of American and Philippine master's theses in architecture. *Journal on English Language Teaching*, *2*(1), 15–26. https://doi.org/10.26634/jelt.2.1.1616

Lu, X., Yoon, J., Kisselev, O., Casal, J. E., Liu, Y., Deng, J., & Nie, R. (2021). Rhetorical and phraseological features of research article introductions: Variation among five social science disciplines. *System*, 100, 102543. https://doi.org/10.1016/j.system.2021.102543

Iorliam, A., & Ingio, J. A. (2024). A comparative analysis of Generative Artificial Intelligence tools for natural language processing. *Journal of Computing Theories and Applications*, *2*(1), 91–105. https://doi.org/10.62411/jcta.9447

Menard-Warwick, J. (2008). The Cultural and Intercultural Identities of Transnational English Teachers: Two Case Studies from the Americas. *TESOL Quarterly*, 42(4), 617–640. https://doi.org/10.1002/j.1545-7249.2008.tb00151.x

Meyer, A., Riese, J., & Streichert, T. (2024). Comparison of the performance of GPT-3.5 and GPT-4 with that of medical students on the written German medical licensing examination: Observational study. *JMIR Medical Education*, *10*, e50965. https://doi.org/10.2196/50965

Meyer, J. G., Urbanowicz, R. J., Martin, P., O'Connor, K., Li, R., Peng, P., Bright, T. J., Tatonetti, N. P., Won, K. J., Gonzalez-Hernandez, G., & Moore, J. H. (2023). ChatGPT and large language models in academia: opportunities and challenges. *BioData Mining*, *16*(1). https://doi.org/10.1186/s13040-023-00339-9

Miller, K. S., Lindgren, E., & Sullivan, K. P. H. (2008). The psycholinguistic dimension in second language writing: Opportunities for research and pedagogy using computer keystroke logging. *TESOL Quarterly,* 42(3), 433–454. https://doi.org/10.1002/j.1545-7249.2008.tb00140.x

Min, H. (2008). Reviewer stances and writer perceptions in EFL peer review training. *English for Specific Purposes*, *27*(3), 285–305. https://doi.org/10.1016/j.esp.2008.02.002

Mondal, H., & Mondal, S. (2023). ChatGPT in academic writing: Maximizing its benefits and minimizing the risks. *Indian Journal of Ophthalmology*, *71*(12), 3600–3606. https://doi.org/10.4103/ijo.ijo_718_23

Motoki, F. Y. S., Neto, V. P., & Rodrigues, V. (2023). More human than human: measuring ChatGPT political bias. *Public Choice.* https://doi.org/10.1007/s11127-023-01097-2

Mozaheb, M. A., Saeidi, M., & Ahangari, S. (2014). A comparative genre-based study of research articles' introductions written by English native/nonnative speakers. *Calidoscópio*, *12*(3). https://doi.org/10.4013/cld.2014.123.07

Nakatsuhara, F. (2008). Inter-interviewer variation in oral interview tests. *ELT Journal*, *62*(3), 266–275. https://doi.org/10.1093/elt/ccm044

Narksonthi, P. (2022). *An analysis of move structures in English movie reviews appearing on two websites* (Master's Thesis). Burapha University.

Nelson, S., Walsh, C. G., Olsen, C. A., McLaughlin, A. J., LeGrand, J., Schutz, N., & Lasko, T. A. (2020). Demystifying artificial intelligence in pharmacy. *American Journal of Health-System Pharmacy*, *77*(19), 1556–1570. https://doi.org/10.1093/ajhp/zxaa218

Nguyen, L. T., Tran, V. T., Mathesh, V., Tran, J. T., Ahmed, Y., Liu-Zarzuela, J. A., & Oorjitham, N. S. (2024). 1.69 Can artificial intelligence assess suicide risk in youth?: Comparing ChatGPT-3.5, ChatGPT-4, and ChatGPT-4O to psychiatrists. *Journal of the American Academy of Child & Adolescent Psychiatry*, *63*(10), S181. https://doi.org/10.1016/j.jaac.2024.08.089

Nguyen, T. T. H. (2023). EFL Teachers' perspectives toward the use of ChatGPT in writing classes: A case study at Van Lang University. *International Journal of Language Instruction*, *2*(3), 1–47. https://doi.org/10.54855/ijli.23231

Noy, S., & Zhang, W. (2023). Experimental evidence on the productivity effects of generative artificial intelligence. *Science*, *381*(6654), 187–192. https://doi.org/10.1126/science.adh2586

Nurmayanti, N., & Suryadi, S. (2023). The effectiveness of using Quillbot in improving writing for students of English education study program. *Jurnal Teknologi Pendidikan: Jurnal Penelitian Dan Pengembangan Pembelajaran*, *8*(1), 32. https://doi.org/10.33394/jtp.v8i1.6392

Nwogu, K. N. (1991). Structure of science popularizations: A genre-analysis approach to the schema of popularized medical texts. *English for Specific Purposes*, *10*(2), 111–123. https://doi.org/10.1016/0889-4906(91)90004-g

O'Connor, S. (2023). Corrigendum to "Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse?" [Nurse Educ. Pract. 66 (2023) 103537]. *Nurse Education in Practice*, *67*, 103572. https://doi.org/10.1016/j.nepr.2023.103572

O'Halloran, K. (2010). Investigating argumentation in reading groups: Combining manual qualitative coding and automated corpus analysis tools. *Applied Linguistics*, *32*(2), 172–196. https://doi.org/10.1093/applin/amq041

OpenAI. (2024). Hello GPT-4o. OpenAI. https://openai.com/index/hello-gpt-4o/

Pandey, G. P. (2022). Genre Analysis of Introductions of ELT Theses: Rhetorical structures and Steps. *Nepal Journal of Multidisciplinary Research*, *5*(5), 31–44. https://doi.org/10.3126/njmr.v5i5.51802

Peacock, M. (2002). Communicative moves in the discussion section of research articles. *System*, *30*(4), 479–497. https://doi.org/10.1016/s0346-251x(02)00050-7

Phichiensathien, P. (2016). Genre-based approach in academic English writing. *Pasaa Paritat Journal*, *31*, 211–238.

Phichiensathien, P. (2017). *Genre-based approach in academic English writing* (Doctoral dissertation). Mae Fah Luang University.

Phillips, C., Lipman, G. S., Gugelmann, H., Doering, K., & Lung, D. (2018). Snakebites and climate change in California, 1997–2017. *Clinical Toxicology*, *57*(3), 168–174. https://doi.org/10.1080/15563650.2018.1508690

Qamariah, H., & Wahyuni, S. (2017). How a Research Article Intruduction Structured? the Analysis of Swales model (Cars) on English research article introductions. *English Education Journal*, *4*(2), 136–146. https://www.neliti.com/publications/217615/how-a-research-article-intruduction-structured-the-analysis-of-swales-model-cars#id-section-content

Rahman, M. A., Terano, H. J., Rahman, N., Salamzadeh, A., & Rahaman, M. S. (2023). ChatGPT and academic research: A review and recommendations based on practical examples. *Journal of Education Management and Development Studies*, *3*(1), 1–12. https://doi.org/10.52631/jemds.v3i1.175

Rahman, M., Darus, S., & Amir, Z. (2017). Rhetorical structure of introduction in Applied Linguistics research articles. *EDUCARE*, *9*(2).

Ren, W. (2013). A longitudinal investigation into L2 learners' cognitive processes during study abroad. *Applied Linguistics*, *35(*5), 575–594. https://doi.org/10.1093/applin/amt019

Rochma, A. F., Triastuti, A., & Ashadi, A. (2020). Rhetorical styles of Introduction in English language teaching (ELT) research articles. *Indonesian Journal of Applied Linguistics*, *10*(2), 304–314. https://doi.org/10.17509/ijal.v10i2.28593

Rose, D. (2015). Genre in the Sydney school. In *Routledge eBooks*. https://doi.org/10.4324/9780203809068.ch15

Rustipa, K., Purwanto, S., & Rozi, F. (2023). Rhetorical structures, strategies, and linguistic features of problem statement to promote a teaching writing model. *Studies in English Language and Education*, *10*(2), 575–597. https://doi.org/10.24815/siele.v10i2.30855

Sabaner, M. C., Hashas, A. S., Mutibayraktaroglu, K. M., Yozgat, Z., Klefter, O. N., & Subhi, Y. (2024). The performance of artificial intelligence-based large language models on ophthalmology-related questions in Swedish proficiency test for medicine: CHATGPT-4 omni vs Gemini 1.5 Pro. *AJO International*, 100070. https://doi.org/10.1016/j.ajoint.2024.100070

Sabzalieva, E., & Valentini, A. (2023). *ChatGPT and artificial intelligence in higher education: quick start guide*. UNESCO international institute for higher education in Latin America and the Caribbean. https://unesdoc.unesco.org/ark:/48223/pf0000385146.locale=en

Samraj, B. (2002). Introductions in research articles: variations across disciplines. *English for Specific Purposes, 21*(1), 1–17. https://doi.org/10.1016/s0889-4906(00)00023-5

Sanmarchi, F., Bucci, A., Nuzzolese, A. G., Carullo, G., Toscano, F., Nante, N., & Golinelli, D. (2023). A step-by-step researcher's guide to the use of an AI-based transformer in epidemiology: an exploratory analysis of ChatGPT using the STROBE checklist for observational studies. *Journal of Public Health*. https://doi.org/10.1007/s10389-023-01936-y

Sheldon, E. (2011). Rhetorical differences in RA introductions written by English L1 and L2 and Castilian Spanish L1 writers. *Journal of English for Academic Purposes*, *10*(4), 238–251. https://doi.org/10.1016/j.jeap.2011.08.004

Sikander, B., Baker, J. J., Deveci, C. D., Lund, L., & Rosenberg, J. (2023). CHATGPT-4 and human researchers are equal in writing scientific introduction sections: a blinded, randomized, non-inferiority controlled study. *Cureus*. https://doi.org/10.7759/cureus.49019

Swales, J. M. (1990). *Genre analysis*. Cambridge University Press.

Swales, J. M. (2004). *Research genres*. Cambridge University Press. https://doi.org/10.1017/cbo9781139524827

Tarchi, C., Zappoli, A., Ledesma, L. C., & Brante, E. W. (2024). The use of ChatGPT in Source-Based writing tasks. *International Journal of Artificial Intelligence in Education*. https://doi.org/10.1007/s40593-024-00413-1

Tessuto, G. (2015). Generic structure and rhetorical moves in English-language empirical law research articles: Sites of interdisciplinary and interdiscursive cross-over. *English for Specific Purposes*, *37*, 13–26. https://doi.org/10.1016/j.esp.2014.06.002

Xiao, Y., & Zhi, Y. (2023). An exploratory study of EFL learners' use of ChaTGPT for language learning tasks: Experience and perceptions. *Languages*, *8*(3), 212. https://doi.org/10.3390/languages8030212

Zainuddin, S. Z., & Shaari, A. H. (2017). Contextual layers in the establishment of research niche in Doctoral Thesis Introductions by Malaysian Writers. *GEMA Online Journal of Language Studies, 17*(2), 146–162. https://doi.org/10.17576/gema-2017-1702-09

Zhao, X., Cox, A. B., & Cai, L. (2024). ChatGPT and the digitization of writing. *Humanities & Social Sciences Communications*, *11*(1). https://doi.org/10.1057/s41599-024-02904-x

Zinkevich, N. A., & Ledeneva, T. V. (2021). Using Grammarly to enhance students' academic writing skills. *Professional Discourse & Communication*, *3*(3), 51–63. https://doi.org/10.24833/2687-0126-2021-3-4-51-63

APPENDIX A

LIST OF THE RESEARCH ARTICLES USED FOR MOVE AND STEP ANALYSISIN THE STUDY

Abasi, A. R., & Akbari, N. (2008). Are we encouraging patchwriting? Reconsidering the role of the pedagogical context in ESL student writers' transgressive intertextuality. *English for Specific Purposes*, *27*(3), 267–284. https://doi.org/10.1016/j.esp.2008.02.001

Atay, D. (2008). Teacher research for professional development. *ELT Journal*, *62*(2), 139–147. https://doi.org/10.1093/elt/ccl053

Cheng, A. (2008). Individualized engagement with genre in academic literacy tasks. *English for Specific Purposes*, *27*(4), 387–411. https://doi.org/10.1016/j.esp.2008.05.001

Crossley, S. A., Greenfield, J., & McNamara, D. S. (2008). Assessing text readability using cognitively based indices. *TESOL Quarterly*, *42*(3), 475–493. https://doi.org/10.1002/j.1545-7249.2008.tb00142.x

Farris, C., Trofimovich, P., Segalowitz, N., & Gatbonton, E. (2008). Air traffic communication in a second language: Implications of cognitive factors for training and assessment. *TESOL Quarterly*, *42*(3), 397–410. https://doi.org/10.1002/j.1545-7249.2008.tb00138.x

Kelly, P. R., Gómez-Bellengé, F., Chen, J., & Schulz, M. M. (2008). Learner Outcomes for English language learner low readers in an early intervention. *TESOL Quarterly*, *42*(2), 235–260. https://doi.org/10.1002/j.1545-7249.2008.tb00117.x

Menard-Warwick, J. (2008). The Cultural and Intercultural Identities of Transnational English Teachers: Two Case Studies from the Americas. *TESOL Quarterly*, *42*(4), 617–640. https://doi.org/10.1002/j.1545-7249.2008.tb00151.x

Miller, K. S., Lindgren, E., & Sullivan, K. P. H. (2008). The psycholinguistic dimension in second language writing: Opportunities for research and pedagogy using computer keystroke logging. *TESOL Quarterly*, *42*(3), 433–454. https://doi.org/10.1002/j.1545-7249.2008.tb00140.x

Min, H. (2008). Reviewer stances and writer perceptions in EFL peer review training. *English for Specific Purposes*, *27*(3), 285–305. https://doi.org/10.1016/j.esp.2008.02.002

Mugford, G. (2008). How rude! teaching impoliteness in the second-language classroom. *ELT Journal*, *62*(4), 375–384. https://doi.org/10.1093/elt/ccm066

Nakatsuhara, F. (2008). Inter-interviewer variation in oral interview tests. *ELT Journal*, *62*(3), 266–275. https://doi.org/10.1093/elt/ccm044

Sheu, H. (2008). The value of English picture story books. *ELT Journal*, *62*(1), 47–55. https://doi.org/10.1093/elt/ccm077

Suzuki, M. (2008). Japanese learners' self-revisions and peer revisions of their written compositions in English. *TESOL Quarterly*, *42*(2), 209–233. https://doi.org/10.1002/j.1545-7249.2008.tb00116.x

Walter, C. (2008). Phonology in second language reading: Not an optional extra. *TESOL Quarterly*, *42*(3), 455–474. https://doi.org/10.1002/j.1545-7249.2008.tb00141.x

APPENDIX B

THE EXAMPLES OF THE GENRE ANALYSIS RESULTS

Human Author RAI 5				
Assessing Text Readability Using Cognitively Based Indices (Word Count: 244)		**Move**	**Step**	**Lexical Bundle**
1	Accurately predicting the difficulty of reading texts for second language (L2) learners is important for educators, writers, publishers, and others to ensure that texts match prospective readers' proficiency.	1	1	*"is important for educators, writers, publishers, and others"* highlights the significance of the topic.
2	This study explores the use of Coh-Metrix (Graesser, McNamara, Louwerse, & Cai, 2004; McNamara, Louwerse, & Graesser, 2002), a computational tool that measures cohesion and text difficulty at various levels of language, discourse, and conceptual analysis, as an improved means of measuring English text readability for L2 readers.	3	1	"*This study explores the use of Coh-Metrix"* announces the present research descriptively.
3	Although traditional readability formulas such as Flesch reading ease (Flesch, 1948) and Flesch-Kincaid grade level (Kincaid, Fishburne, Rogers, & Chissom, 1975) have been accepted by the educational community, they have been widely criticized by both first language (L1) and L2 researchers for their inability to take account of deeper levels of text processing (McNamara, Kintsch, Butler-Songer, & Kintsch, 1996), cohesion (Graesser et al., 2004; McNamara et al., 1996), syntactic complexity, rhetorical	1	3	" *have been accepted by the educational community, they have been widely criticized* " reviews previous research and identifies limitations.

Human Author RAI 5				
Assessing Text Readability Using Cognitively Based Indices (Word Count: 244)		**Move**	**Step**	**Lexical Bundle**
	organization, and propositional density (Brown, 1998; Carrell, 1987).			
4	Coh-Metrix offers the prospect of enhancing traditional readability measures by providing detailed analysis of language and cohesion features through integrating language metrics that have been developed in the field of computational linguistics (Jurafsky & Martin, 2000).	1	2	"*Coh-Metrix offers the prospect of enhancing traditional readability measures*" makes a general statement about improvements.
5	CohMetrix is also well suited to address many of the criticisms of traditional readability formulas because the language metrics it reports on include text-based processes and cohesion features that are integral to cognitive reading processes such as decoding, syntactic parsing, and meaning construction (Just & Carpenter, 1987; Perfetti, 1985; Rayner & Pollatsek, 1994).	1	2	"*CohMetrix is also well suited to address many of the criticisms"* makes a general statement about its capabilities.

Source Crossley et al. (2008)

Human Author RAI 9				
Individualized engagement with genre in academic literacy tasks (Word Count: 524)		**Move**	**Step**	**Lexical Bundle**
1	Genre is often defined in the ESP tradition as structured communicative events engaged in by specific discourse communities whose members share broad communicative purposes (Bhatia, 1993, 2004; Swales, 1990; see Hyon, 1996, for a discussion of genre in the ESP and other traditions).	1	2	"*Genre is often defined in the ESP tradition*" provides a general background.
2	Over the past two decades, genre has become an increasingly important concept in ESP and EAP research and practices (Hyland, 2004; Tardy, 2006).	1	1	"*genre has become an increasingly important concept*" highlights the significance.
3	Many researchers have analyzed the recurring generic features and the rhetorical contexts of various discipline-specific genres (see, for example, many articles in this journal).	1	2	*"Many researchers have analyzed"* provides a general background.
4	These analyses have, in turn, generated many insightful genre-based pedagogical proposals and teaching materials (e.g., Bhatia, 1993; Flowerdew, 1993; Hyland, 2004; Johns, 2002; Paltridge, 2001; Swales & Feak, 2000, 2004; Weissberg & Buker, 1990).	1	3	"These analyses have... generated many insightful genre-based pedagogical proposals" reviews previous research.
5	In recent years, the efficacy of these proposals and materials has been explored in varying geographical and pedagogical contexts.	1	2	"the efficacy of these proposals and materials has been explored" provides general background.
6	In the University of Brunei Darussalam, for example, Henry and Roseberry (1998) studied how ‘‘genre-based instruction and materials improved learners’ ability to produce effective tokens of the genre” of the tourism brochure (p. 148).	1	3	"Henry and Roseberry (1998) studied" reviews previous research.
7	In Jordan, Mustafa (1995) examined how formal instruction in the genre of the term paper raised university students’ awareness of term paper conventions.	1	3	"Mustafa (1995) examined" reviews previous research.

Human Author RAI 9				
Individualized engagement with genre in academic literacy tasks (Word Count: 524)		**Move**	**Step**	**Lexical Bundle**
8	In Hong Kong, Pang (2002) explored the impact of genre-based teaching on some undergraduate students' writing of film reviews.	1	3	"Pang (2002) explored" reviews previous research.
9	In Ukraine, Yakhontova (2001) documented her students' intellectual and emotional reactions to an influential ESP genre-based writing textbook (Swales & Feak, 1994) and the course in which the book was adopted.	1	3	"Yakhontova (2001) documented" reviews previous research.
10	In the United States, Hyon (2002) found that the L2 graduate students interviewed immediately after an EAP genre-based reading course reported increased attention to rhetorical features in texts and improved reading confidence and speed.	1	3	"Hyon (2002) found" reviews previous research.
11	A related study of the same population led Hyon (2001) to conclude that ''genre-knowledge gained through explicit instruction can be remembered by EAP students over an extended period of time and facilitate aspects of L2 reading and writing" (p. 434).	1	3	"Hyon (2001) to conclude" reviews previous research.
12	Also in the US, Swales and Lindemann (2002) explored how L2 graduate students in their academic writing class learned the literature review section of research articles (RAs).	1	3	"Swales and Lindemann (2002) explored" reviews previous research.
13	They were impressed with the students' abilities to produce ''a greater number of intelligent structures than are typically proposed in the literature" and to ''elucidate much about the reasoning behind the various approaches" to literature reviews (p. 117).	1	3	"They were impressed with the students' abilities" reviews previous research outcomes. Continues the idea from the previous sentence.
14	These studies have invaluably enhanced our understanding of the ESP genre-based literacy framework.	1	1	"These studies have invaluably enhanced our understanding" highlights the significance.

Human Author RAI 9				
Individualized engagement with genre in academic literacy tasks (Word Count: 524)		**Move**	**Step**	**Lexical Bundle**
15	An issue that remains to be addressed in these studies, however, is the interaction between learner characteristics, including learners' histories and goals of learning, and their analysis and production of target genres in genre-based writing classes (see a detailed discussion of this literature gap in Cheng, 2006a).	2	1A	"An issue that remains to be addressed" indicates a gap in the literature.
16	Since understanding such an interaction can help us appreciate the full intricacies of learning in the genre-based literacy framework, this study aimed to fill the above-mentioned literature gap by exploring the following three research questions: What features did an L2 graduate student attend to when she analyzed discipline-specific genre samples? What generic features did the student incorporate into her own writing? Why did the student focus on these features in her genre-analysis and writing tasks?	3	2	"this study aimed to fill the above-mentioned literature gap by exploring the following three research questions" presents the research questions or hypotheses.

Source Cheng (2008)

ChatGPT RAI 5				
Assessing Text Readability Using Cognitively Based Indices **(Word Count: 602)**		**Move**	**Step**	**Lexical Bundle**
1	**Background** The assessment of text readability has long been a crucial area of study in English Language Teaching (ELT), owing to its significant implications for both language learners and educators.	1	1	"*has long been* a *crucial area of study*" emphasizes the importance of text readability in ELT.
2	Readability, fundamentally, refers to the ease with which a reader can understand a written text, a factor influenced by various linguistic and cognitive elements (DuBay, 2004).	1	2	*"Readability, fundamentally, refers to"* provides a general definition and background on readability.
3	Historically, readability formulas such as the Flesch-Kincaid Grade Level and the Gunning Fog Index have been widely utilized to evaluate texts.	1	2	*"have been widely utilized to evaluate texts"* generalizes historical practices.
4	These formulas primarily focus on surface-level features like word length and sentence length (Klare, 2000).	1	2	*"primarily focus on surface-level features"* describes the characteristics of traditional formulas.
5	However, the evolution of cognitive science has ushered in more sophisticated methods that account for deeper cognitive processes involved in reading comprehension (Graesser, McNamara, & Kulikowich, 2011).	1	2	*" has ushered in more sophisticated methods that account for deeper cognitive processes"* describes advancements in the field.

ChatGPT RAI 5				
Assessing Text Readability Using Cognitively Based Indices **(Word Count: 602)**		**Move**	**Step**	**Lexical Bundle**
6	Recent advancements have seen the integration of cognitively based indices, which offer a more nuanced understanding of readability by considering factors such as syntactic complexity, semantic cohesion, and the reader's prior knowledge and inference abilities (Crossley, Allen, & McNamara, 2011).	1	2	"*Recent advancements have seen the integration, offer a more nuanced understanding of readability"* describes recent advancements.
7	These indices provide a holistic view of text difficulty, aligning more closely with the cognitive demands placed on readers, especially in an ELT context where learners' cognitive resources are often stretched by the dual challenge of language and content acquisition.	1	2	*" These indices provide a holistic view "* generalizes the benefits of these indices.
8	**Problem Statement** Despite the strides made in readability research, there remains a notable gap in applying cognitively based readability indices within ELT settings.	2	1A	"*there remains a notable gap* " indicates a specific gap.
9	Traditional readability measures, while useful, often fail to capture the multifaceted nature of reading comprehension, particularly for non-native English speakers (NNES).	2	1A	" *often fail to capture* " indicates a specific gap.
10	ELT learners face unique challenges that extend beyond vocabulary and sentence structure, including cultural nuances and pragmatic understanding (Nation, 2001).	1	2	*" ELT learners face unique challenges that extend beyond vocabulary and sentence structure*" describes specific challenges.
11	Therefore, relying solely on traditional readability formulas may lead to an underestimation or overestimation of text difficulty, potentially hindering effective teaching and learning.	1	2	*"may lead to an underestimation "* describes potential issues with traditional measures.

ChatGPT RAI 5				
Assessing Text Readability Using Cognitively Based Indices **(Word Count: 602)**		**Move**	**Step**	**Lexical Bundle**
12	Moreover, existing cognitively based indices have predominantly been validated and utilized within native speaker contexts.	1	2	*" have predominantly been validated and utilized "* gives general information.
13	There is a paucity of research exploring how these indices function when applied to texts designed for ELT purposes.	2	1A	*" There is a paucity of research "* indicates a gap.
14	This gap highlights the need for targeted studies that not only validate these indices for NNES learners but also refine them to better address the specific cognitive demands faced by this population.	2	1B	*"This gap highlights the need"* indicates a specific gap.
15	**Research Gaps** A critical examination of the literature reveals several research gaps that warrant attention.	2	1A	*"several research gaps that warrant attention"* indicates a need for further research.
16	Firstly, there is a lack of comprehensive studies that systematically compare traditional readability formulas with cognitively based indices in the context of ELT.	2	1A	*"there is a lack of comprehensive studies "* indicates a gap.
17	Such comparative analyses are essential to understand the relative effectiveness and limitations of each approach.	2	2	*"Such comparative analyses are essential to understand"* indicates the gap.
18	Secondly, the adaptation and validation of cognitively based indices specifically for ELT materials remain underexplored.	2	1A	*" remain underexplored"* indicates a specific gap.
19	This includes examining how well these indices predict comprehension outcomes for learners at different proficiency levels.	2	1A	*" This includes examining "* specifies the gap in predictive validity.

ChatGPT RAI 5				
Assessing Text Readability Using Cognitively Based Indices **(Word Count: 602)**		**Move**	**Step**	**Lexical Bundle**
20	Furthermore, there is a need for longitudinal studies that investigate the impact of using cognitively based readability indices on learners' reading development over time.	2	1A	*" there is a need for longitudinal studies"* indicates a gap in longitudinal research.
21	Most existing research tends to focus on immediate comprehension outcomes, neglecting the potential long-term benefits or drawbacks of these indices.	2	1A	*"neglecting the potential long-term benefits or drawbacks"* specifies the gap in longitudinal impact studies.
22	Finally, integrating qualitative insights from teachers and learners regarding their experiences and perceptions of text readability can provide valuable context to quantitative findings, leading to more holistic and applicable solutions in ELT settings.	2	1A	*"Finally, integrating qualitative insights from teachers and learners regarding their experiences and perceptions of text readability can provide valuable context to quantitative findings"* continue discussing about the gap
23	**Conclusion** In conclusion, while significant progress has been made in the field of text readability, there is a pressing need to bridge the gap between traditional readability formulas and cognitively based indices within ELT.	2	1A	*"there is a pressing need to bridge the gap"* indicates a gap that needs addressing.

ChatGPT RAI 5				
Assessing Text Readability Using Cognitively Based Indices **(Word Count: 602)**		**Move**	**Step**	**Lexical Bundle**
24	Addressing this gap requires rigorous research that not only validates these indices for NNES learners but also adapts them to better meet the unique cognitive demands of this group.	2	1A	*" Addressing this gap requires rigorous research "* indicates the need to address a gap.
25	By doing so, educators can be better equipped to select and design reading materials that are optimally challenging and supportive, ultimately enhancing the language learning experience.	2	1A	*" By doing so, educators can be better equipped to select "* continue talking about the gap

Source OpenAI. (2024)

ChatGPT RAI 9				
Individualized engagement with genre in academic literacy tasks (Word Count: 453)		Move	Step	Lexical Bundle
1	**Background** In recent years, the focus on individualized engagement with genre in academic literacy tasks has become increasingly prominent within the field of English Language Teaching (ELT).	1	1	*"has become increasingly prominent"* highlights the significance of the topic.
2	The concept of genre refers to the categorization of texts based on their distinctive features, purposes, and contexts, which serve as a framework for both reading and writing tasks in academic settings.	1	2	*"The concept of genre refers to"* provides general background information.
3	The recognition of genre-specific conventions is vital for students, particularly those learning English as a second language (L2), to effectively navigate and produce academic texts (Hyland, 2007).	1	1	*"is vital for students"* emphasizes the importance of the topic.
4	Research has shown that explicit instruction in genre can significantly enhance students' academic writing skills.	1	3	*"Research has shown that" provides general information*
5	For instance, Hyland (2004) highlights the importance of genre-based pedagogy, emphasizing how it helps learners understand the structural and rhetorical conventions of different types of academic texts.	1	3	*"Hyland (2004) highlights the importance"* reviews previous research.
6	This pedagogical approach equips students with the tools necessary to analyze and produce texts that meet the expectations of their academic disciplines, thereby fostering greater academic success (Hyland, 2004; Tardy, 2009).	1	3	*"This pedagogical approach"* continuation from the previous stentence
7	**Problem Statement** Despite the recognized benefits of genre-based instruction, there is a growing concern about the one-size-fits-all approach commonly employed in many educational contexts.	1	2	*" there is a growing concern "* provides general background information.

ChatGPT RAI 9				
Individualized engagement with genre in academic literacy tasks (Word Count: 453)		Move	Step	Lexical Bundle
8	This approach often fails to consider the diverse backgrounds, needs, and proficiency levels of individual learners, leading to varying degrees of engagement and success in academic literacy tasks.	2	1A	*" This approach often fails to consider "* indicates a gap
9	Individualized engagement with genre, which tailors instruction to meet the unique needs of each learner, has the potential to address these issues and promote more effective learning outcomes (Flowerdew, 2015).	1	2	*" has the potential to address these issues and promote more effective learning outcomes "* provides general background information.
10	However, implementing individualized engagement strategies in ELT classrooms presents several challenges.	1	2	*"However, implementing individualized engagement strategies"* provides general information
11	These include the need for teachers to possess a deep understanding of genre theory and its practical application, as well as the ability to design and deliver differentiated instruction that accommodates the diverse needs of their students (Johns, 2008).	1	2	*" These include the need for teachers to possess "* provides general background information.
12	Additionally, there is a lack of empirical research that systematically investigates the impact of individualized genre-based instruction on learners' academic literacy development.	2	1A	*"lack of empirical research"* indicates a gap.
13	**Research Gaps** While the theoretical and practical implications of genre-based pedagogy have been widely discussed, there remains a significant gap in the literature concerning the individualized application of these principles.	2	1A	*"there remains a significant gap"* indicates a gap.

ChatGPT RAI 9				
Individualized engagement with genre in academic literacy tasks (Word Count: 453)		Move	Step	Lexical Bundle
14	Existing studies tend to focus on generalized approaches to genre instruction without sufficiently addressing how individualized engagement can be effectively implemented and assessed in diverse educational settings (Bawarshi & Reiff, 2010).	2	1A	*"without sufficiently addressing"* indicates a gap
15	Moreover, there is limited empirical evidence on the specific outcomes of individualized genre-based instruction for L2 learners.	2	1A	*"limited empirical evidence"* indicates a gap.
16	Most research has concentrated on first language (L1) contexts, leaving a critical gap in understanding how these approaches can be adapted to support the unique challenges faced by L2 learners in academic environments (Paltridge, 2012).	2	1A	*"leaving a critical gap"* indicates a gap.
17	Further investigation is needed to explore how individualized engagement with genre can enhance academic literacy tasks and contribute to more equitable and inclusive educational practices in ELT.	2	1A	*" Further investigation is needed to explore "* indicates a gap.

Source OpenAI. (2024)

CURRICULUM VITAE

NAME Natdanai Loonlawan

EDUCATIONAL BACKGROUND

2021 Bachelor of Arts in Philosophy
Driyarkara School of Philosophy, Indonesia

WORK EXPERIENCE

2021-Present English Language Teacher
Xavier Learning Community