AN ANALYSIS OF THE METADISCOURSE MARKERS IN ENGLISH RESEARCH ARTICLES PUBLISHED IN NARESUAN UNIVERSITY JOURNALS

JUTHATIP WONGSA

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Master of Arts in English - (Type A 2)
2024

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Thesis entitled "An Analysis of the Metadiscourse Markers in English Research Articles Published in Naresuan University Journals"

By Juthatip Wongsa

has been approved by the Graduate School as partial fulfillment of the requirements

for the Master of Arts in English - (Type A 2) of Naresuan University

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ABSTRACT

The purposes of this study were 1) to investigate the Metadiscourse Markers used in Humanities and Social Sciences English research articles published in Naresuan University (NU) Journals, 2) to investigate the Metadiscourse Markers used in Science and Technology English research articles published in NU Journals, and 3) to compare the Metadiscourse Markers used in English research articles between these two disciplines. Hyland's (2005) Metadiscourse Markers (MDMs) model was the main framework employed in this study, consisting of two major categories of MDMs, namely Interactive and Interactional categories. The Interactive category includes Transitions (TR), Frame Markers (FM), Endophoric Markers (ED), Evidential Markers (EV), and Code glosses (CD). The Interactional category includes Hedges (HE), Boosters (BO), Attitude Markers (AM), Engagement Markers (EM), and self-mentions (SM). The data were a total of 40 datasets of written texts in the introduction and literature review sections published in NU Journals. 20 datasets were from Humanities and Social Sciences English research articles, and the other 20 datasets were from Science and Technology English research articles. They both were purposively selected from NU Journals between 2019 and 2022. The MDMs were collected and analyzed based on Hyland's (2005) taxonomy of MDMs. The findings revealed that both disciplinary authors tended to employ MDMs almost equally in

research articles. Also, they both employed Interactive MDMs more frequently. These findings are relevant for the teaching of research writing, highlighting that academic author should pay attention to the conventions of MDM usage in different disciplines.

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CHAPTER I

INTRODUCTION

Introduction

Academic writing is a formal, organized style of communication commonly used in academic settings such as universities and research institutions to express complex ideas, theories, and research findings. It emphasizes clarity, accuracy, and an evidence-based methodology, with a strong focus on maintaining objectivity and citing sources correctly. The goal of academic writing is to present information to a knowledgeable audience in a clear and structured way. The most common types of academic writing are essays, research papers or articles, reports, and theses or dissertations, while students and researchers may also need to write literature reviews, annotated bibliographies, case studies, and lab reports. In fields like education, reflective writing or journals are often used to analyze personal learning experiences, while critical analyses and book reviews are common in humanities courses (Ahmed, 2022). Therefore, academic writing is an essential skill for scholars to share their work with others in the same disciplines. To achieve scholarly acknowledgment, educators and researchers are required to master academic discourse. This involves developing clear, precise, and formal writing that adheres to specific formatting and citation guidelines. According to Hyland (2005), academic discourse enables scholars to engage in scholarly conversations by adhering to specific patterns of thought and language. This process allows scholars to present research, convey their views, and participate in academic discussions.

Crafting a manuscript for journal publication requires adherence to rigorous scholarly standards and alignment with the specific focus and readership of the targeted journal. As Hartley and Bruckmann (2021) highlight, this process begins with developing a clear and concise title, followed by an abstract that summarizes the research objectives, methods, results, and conclusions. The introduction should situate the research within the existing body of literature, clearly outlining its significance

and the research problem being addressed. Discourse markers are one method that writers employ to achieve clarity and consistency in their texts.

According to Fraser (2015), discourse markers function as pragmatic devices that manage the flow of information and guide the reader's interpretation of the discourse. Discourse markers are essential linguistic tools that contribute to the coherence and organization of both spoken and written communication. These markers, including words and phrases such as "however," "therefore," "on the other hand," and "for example," help signal relationships between ideas, manage the flow of discourse, and guide readers through the text. Contemporary research has provided deeper insights into the functions and types of discourse markers. Redeker (2006) emphasizes their role in structuring narratives and arguments, highlighting their importance in maintaining coherence.

A specific subset of discourse markers, known as Metadiscourse Markers (MDMs), focuses on organizing the text and engaging the audience by providing meta-level commentary on the discourse. Hyland (2005) defines MDMs as ways writers project themselves into their discourse to signal their attitudes and commitments. These linguistic devices assist writers in organizing their discourse, engaging with their audience, and conveying their attitudes toward the content. MDMs emphasize the structure of the discourse, directing readers through the text and highlighting how the material should be perceived, in contrast to content-focused language that communicates information. Ultimately, discourse markers, particularly MDMs, play a vital role in academic writing, as they help structure complex arguments, engage the audience, and convey the writer’s stance, contributing to the overall coherence and effectiveness of scholarly communication.

In the context of academic writing, particularly for students for whom English is a Foreign Language (EFL) or English is a Second Language (ESL), understanding and effectively using MDMs can enhance the clarity and impact of their manuscripts. As such, this study aims to explore the use of MDMs in academic writing, with a focus on how they contribute to the coherence and engagement of research articles.

Although academic writing is an important ability for EFL/ESL graduate students and new academics in a variety of fields, mastering this skill is one of the challenges for non-native English language writers. Sajid and Siddiqui (2015) noted

that EFL students lack the essential English language abilities, for example, errors in tenses, poor sentence construction, inability to summarize or paraphrase texts, and problems in using pronouns and articles.

In research articles, presenting background information and related previous discoveries of the research topic is crucial for academic writers. These introduction parts serve as the key messages that gain readers' interests in the article and encourage them to continue reading until the conclusion. Therefore, it is necessary for the authors to provide thorough understandings of the key terms used in the research. As Muller (2005) remarked, the use of appropriate signposts, including MDMs, plays a significant role in guiding readers in research articles. According to Bailey (2014), the introduction section of a research article provides an overview of the research topic, identifies the research problem or knowledge gap, and presents the theoretical framework or conceptual basis for the study. The literature review section demonstrates the researcher's understanding of the subject area and provides a comprehensive background. It also aids in focusing the research boundary as well as formulating research hypotheses or approaches to research questions.

Nevertheless, evidence from past research indicates that non-native speakers tend to use discourse markers less frequently in academic writing. This leads to challenges in conveying essential information and necessary communication in both the introduction and literature review sections. Several studies and scholarly articles have highlighted this challenge. For example, Al-Rubaye (2015) investigated the effect of different environments (EFL versus ESL) as well as the effect of time on the development of writers' MDMs. It was found that both EFL and ESL writers failed to employ various MDMs to express their attitudes clearly and engage their readers. In addition, Capar and Turan (2020) examined the usage of MDMs by Turkish non-native English speakers and native English speakers in 50 research articles each, authored by Turkish and American academics respectively, in the domain of teaching a foreign language. The results indicated a notable disparity in the utilization of Interactional MDMs between the two groups, with American authors employing them more frequently in their English research articles than Turkish authors.

According to Hyland (2008), different disciplines or fields of study have their own unique conventions, styles, and expectations. The use of MDMs, which are

expressions that help writers guide readers through their text, can vary significantly across these academic disciplines depending on writers' convention of writing. This variation has been underscored by Cao and Hu (2014) who conducted a comparative analysis of MDMs in research articles across different disciplines and research paradigms. The findings revealed variations in the use of MDMs features across disciplines and identified that the use of MDMs is influenced by disciplinary conventions and the specific research paradigm employed. Birhan (2021) also confirms the variation features in an investigation of MDMs in book review articles of different journals in three disciplines. The findings revealed variations in the frequency of usage for certain Interactive and Interactional markers, notably markers, with some being more commonly employed than others. Furthermore, differences in the utilization of MDMs were observed across different disciplines and journals. For soft science writers, MDMs were employed to connect with the readers and express writers' views. This suggests that book reviewers of English and Education may need to utilize more MDMs than their counterparts in computer science to enhance communication with their readers.

According to Biber and Gray (2016) the writing styles and discourse expectations between the fields of Humanities and Social Sciences and Science and Technology may differ due to the unique nature of their subjects and the specific audiences they target. In the Humanities and Social Sciences, writing is interpretative and expressive, focusing on cultural, philosophical, and artistic subjects. According to Miller and Jurecic (2019), it involves deep engagement with texts and ideas, critical analysis, and creative rhetorical elements. The aim is to explore and critique ideas, offer multiple interpretations, and provoke reflection. In the Social Sciences, writing is analytical and evidence-based, emphasizing clarity, objectivity, and logical progression. Muller and Hansen (2015) note that it uses empirical data to explain or analyze social phenomena, aiming to contribute to academic discourse, inform policy, or predict behaviors.

In contrast, writing in Science and Technology is defined by its structured format, precision, and technical accuracy, with a strong emphasis on presenting empirical research and data. This type of writing is characterized by its concise and highly organized nature, focusing on the clear presentation of research findings and

technical details. Graff and Birkenstein (2006) highlight that the goal of Science and Technology writing is to effectively report findings and advance knowledge within the scientific community. Each field's writing style reflects its methodological approach and purpose, ensuring that research findings are communicated effectively within their respective domains.

However, there seems to be limited research analyzing the use of MDMs in English research articles within the introduction and literature review sections across both the fields of Humanities and Social Sciences and Science and Technology. Due to the limited number of comparative studies in these fields, this research aimed to analyze and compare the use of MDMs between these two disciplines. The introduction and literature review sections were chosen because they are the sections that provide essential background information as well as the context of the research to help readers understand the significance of the study and its relevance to the broader academic context. According to Swales (2004), the introduction section is one of the most crucial parts of the research articles as it directly communicates with the readers and requires the use of communication tools, namely MDMs. Moreover, the literature review section helps identify gaps, controversies, or inconsistencies in previous research, which can justify the need for the current study. Also, it aids in the formulation of research hypotheses or guiding research questions (Pautasso, 2013). Given the significant role of discourse features in academic writing, the researcher would like to analyze and compare the use of MDMs in English research articles' introduction and literature review sections published in Naresuan University (NU) Journals within these two distinct fields.

NU Journals were selected due to its broad scope in publishing research and review articles across multiple disciplines. The journal encompasses a wide range of subjects, including Health Sciences, Linguistics, Humanities, Arts, and various other fields. As a result, it attracts submissions from academics and researchers affiliated with diverse universities and countries. A key feature of the journal is its open-access policy, which facilitates widespread dissemination and accessibility of its contents without cost to readers. This open-access model contributes to the journal's appeal as a platform for scholarly publication and knowledge dissemination.

The findings of this study will lead to more appropriate and effective writing for EFL and ESL writers who lack experience with MDMs as a tool in their academic writing. Importantly, academics and researchers who are interested in submitting research articles to the NU Journals will discover comprehensive insights into the use of MDMs in this study. Furthermore, scholars in the two fields can investigate differences in the use of MDMs to enhance the effectiveness of their academic writing.

Statement of the Problem

Many writers can produce text, but not all can effectively convey coherent messages or present their ideas in a structured manner. This challenge often arises from a lack of familiarity with the concepts of cohesion and coherence, particularly in the use of Metadiscourse markers (MDMs). MDMs are linguistic tools that help manage the flow of discourse by signaling relationships between ideas, guiding readers through the text, and enhancing overall clarity.

The Introduction and Literature Review sections are crucial in research articles as they lay the foundation and context for the study. Effective use of Metadiscourse markers (MDMs) in these sections enhances coherence and cohesion, guiding readers through complex arguments and creating a logical flow. MDMs, such as transitions ("however," "therefore"), frame markers ("first," "in conclusion"), and evidentials (citations and references), serve as tools that help organize ideas clearly and effectively. Mastering the use of MDMs can significantly improve the clarity, readability, and impact of academic writing, especially for non-native English speakers (Hyland, 2005).

Although MDMs have long been studied in the field of language, their use and impact are becoming increasingly relevant in the context of writing research articles. This study aims to analyze and compare the application of MDMs across three academic disciplines: Humanities, Social Sciences, and Science and Technology in introduction and literature review sections. By examining the differences and similarities in MDM usage across these fields, the study seeks to provide insights into how coherence is achieved and maintained in academic texts.

The findings of this research are particularly valuable for EFL and ESL students who are preparing manuscripts for journal publication. By highlighting the conventions and effective use of MDMs, this research aims to assist these writers in enhancing their academic writing skills, ensuring their manuscripts meet scholarly standards, and effectively communicating their ideas.

Research Objectives

1. To investigate the Metadiscourse Markers used in Humanities and Social Sciences English research articles published in Naresuan University Journals
2. To investigate the Metadiscourse Markers used in Science and Technology English research articles published in Naresuan University Journals
3. To compare the Metadiscourse Markers used in English research articles published in Naresuan University Journals between the Humanities and Social Sciences and Science and Technology

Research Questions

1. What are the Metadiscourse Markers used in Humanities and Social Sciences English research articles published in Naresuan University Journals?
2. What are the Metadiscourse Markers used in Science and Technology English research articles published in Naresuan University Journals?
3. To what extent are the Metadiscourse Markers used in Humanities and Social Sciences and Science and Technology English research articles published in Naresuan University Journals different?

Significance of the Study

This study will provide further information on MDMs and a tool that may assist writers in understanding the ideas of coherence and cohesiveness, particularly in EFL and ESL writers who are unfamiliar with these topics. Familiarity with MDMs may solve the problem that EFL and ESL writers may be unable to generate a cohesive and coherent writing and prevent them from communicating their ideas to the reader as effectively as they would like.

Definition of Terms

1. Metadiscourse is self-reflective linguistic material referring to the evolving text and to the writer and imagined reader of that text. It is based on a view of writing as social engagement and in academic contexts reveals the ways that writers project themselves into their discourse to signal their attitude towards both the propositional content and the audience of the text. (Hyland & Tse, 2004)
2. Academic Writing: A formal style of writing used in academic settings to communicate research findings, arguments, and analyses. It is characterized by clarity, coherence, and a structured approach, often adhering to specific guidelines and standards set by academic institutions or journals.
3. A research article is a document that presents the results of an investigation or exploration of a particular topic. According to Swales (2004), a research paper systematically develops a thesis based on gathered evidence such as data and literature review and is structured according to disciplinary conventions. Key components of a research article include an abstract, introduction and literature review, methodology, results, discussion, and conclusion. In this study, the main focuses are on the introduction and literature review sections.

Assumptions, Limitations, and Delimitations

1. It is assumed that the MDMs are used consistently within the English research articles published in NU Journals and that Hyland's (2005) framework for MDMs accurately captures their usage across the Humanities and Social Sciences as well as Science and Technology disciplines.
2. The data used in this study is gathered from English research articles published in NU Journals between 2019-2022, which are divided into two categories: 1) Humanities and Social Sciences; and 2) Science and Technology.
3. The study is limited to English research articles published in NU Journals and focuses only on the introduction and literature review sections.

CHAPTER II

REVIEW OF LITERATURE

This chapter reviews the relevant literature for the study, presenting both the theoretical framework and research on Metadiscourse Markers (MDMs). These studies provide a comprehensive understanding of current trends and developments in the use of MDMs to enhance academic writing. The chapter is structured into five main sections. It begins with an overview of academic discourse in research articles, followed by discussions on research article introductions and literature reviews. The chapter concludes with a review of previous studies and an analysis of MDMs in academic writing.

Academic Discourse in Research articles

Hyland (2005) defines academic discourse as the application of cognitive processes and language usage to establish a presence within the academic sphere. It encompasses not only the utilization of words but also serves as a manifestation of the writer's persona and presence. Consequently, academic discourse plays a crucial role in upholding the fabric of the academic community. According to Burke (2010), academic writing is "what academics do most, through publishing, communicating, and contributing to their knowledge". According to Hyland (2011), academic discourse refers to the cognitive and linguistic activities that occur in academic settings. Its significance is based on its critical role in promoting scholarly activities such as teaching, learning, sharing ideas, and knowledge creation. Textbooks, essays, presentations, dissertations, lectures, and research papers are key components of academic discourse, providing as the foundation for learning and knowledge development.

While Hyland (2011) and Burke (2010) emphasize the broad significance of academic discourse in fostering knowledge sharing and scholarly communication, Swales (1990) takes a more focused approach by linking academic writing to specific "communicative purposes" through genre analysis. This framework offers a structured

way to understand how writing styles, structure, and audience expectations shape academic discourse. Genre analysis establishes fundamental writing principles by creating a shared understanding for the intended audience and offering a structure for identifying writing that aligns with both the audience and genre.

Research Article Introduction

In the realm of academic writing, the discourse organization of a research article plays a pivotal role in effectively communicating research findings and insights to readers. According to Hopkins & Dudley-Evans (1988), researchers aim to establish a framework for a pedagogically useful description of the organization of discussion sections in research-focused articles and dissertations. This framework, presented through the results of their own investigations, seeks to provide a comprehensive understanding of the key parts that typically comprise a research article. These key parts often include the introduction, literature reviews and related studies, research objectives, methodologies, findings, discussion, and conclusion. These sections collectively shape the narrative of the research article, moving from a broad introduction that sets the context to specific details of methods and results, and then broadens again in the discussion and conclusion to place the new findings in a wider context. The introduction section of a research article serves multiple purposes, allowing authors to provide an overview of the study, contextualize the research within existing literature, and present the research objectives (Flowerdew, 2014). Furthermore, the introduction section serves as a framework that guides the reader in understanding the theoretical bases of the research. By presenting the background information and rationale for the research, as well as establishing the niche in which it contributes to the broader field, the introduction effectively sets the stage for the detailed exploration that follows.

In academic writing, the introduction is the first section written. It provides the scope of the research and what it is concerning (Evans, Gruba, & Zobel, 2014). In general, it presents the thesis structure, the research objectives and scope, the issue under investigation, and the study's scope limitations. However, in other fields, the introduction provides an overview of the research findings. It can assist readers comprehend the context of the research by providing instructive examples.

In line with Lipson (2005), the introduction is the most important chapter since writers must create interesting paragraphs throughout this section to persuade and engage readers to continue reading. To do this, authors must present the essential points of the subject by providing clear and powerful thesis statements and describing the primary questions they intend to address. Authors must include three important elements in their introduction chapters. In order to start, the chosen topic must provide significant insights into why the issue is necessary to debate, as well as define its significance in both practical and theoretical terms. Second, authors must explain the methodologies employed to investigate the problem. Third, authors must give the evidence they will use to support their research.

Swales' CARS (Creating a Research Space) model, first introduced in 1990 and updated in 2004, provides a structured framework for writing the introduction of scholarly research articles. This model helps authors situate their research within the existing body of knowledge, emphasizing its relevance and originality. It is particularly useful because it assists writers in three key ways: 1) beginning the writing process, which is often the most challenging step; 2) understanding how the introduction sets the stage for the rest of the paper; and 3) assessing how the introduction fits within the broader scope of the study. By applying the CARS model, writers can create engaging, well-organized introductions that not only showcase the significance of their research but also capture the attention of academic readers. This approach enhances both the clarity and persuasiveness of the introduction, positioning the research in a compelling and meaningful way (Swales, 2004; Swales & Swales, 1990).

Research Article Literature Review

The literature review, following the introduction, is a crucial section that synthesizes and analyzes previous research related to the topic. It not only acknowledges prior work but also identifies gaps and unresolved issues that the current research aims to address. This review establishes a scholarly context and justifies the necessity and relevance of the new study (Hodges, Kuper, and Reeves, 2008).

Hart (2009) defines a literature review as the selection of available documents (published and unpublished) that contain information, ideas, data, and evidence, written from a particular perspective to achieve specific aims or express certain views regarding the topic. An effective literature review critically examines these materials in relation to the presented research, ensuring a comprehensive understanding of the field.

By organizing the literature in this way, academic writers can highlight the significance of their research, identify gaps, and outline their contributions. This approach ensures that each section of the review contributes to a cohesive narrative, guiding readers through the complexities of the research in a structured and logical manner.

Metadiscourse markers play a key role in this discourse organization by engaging readers, helping them understand the significance of the study, recognize the research gaps, and comprehend the study's aims. MDMs thus facilitate smooth transitions to subsequent sections, enhancing clarity and guiding readers toward a deeper understanding of the research. This clear structure not only makes academic research more accessible but also promotes further scholarly inquiry and practical applications.

Metadiscourse Markers

According to the research by Hyland and Tse (2004), MDMs can be defined as linguistic elements present in a text that reveal the writer's self-awareness, referencing both the text itself and the writer's relationship with the imagined reader. Hyland and Tse (2004) are recognized authorities in the fields of academic writing and discourse analysis, with substantial contributions to the study of MDMs. Their work encompasses various aspects of academic writing, including the article "Metadiscourse in Academic Writing: A Reappraisal" (Hyland and Tse, 2004) and the book "Metadiscourse: Exploring Interaction in Writing" by Hyland (2005).

Hyland's (2005) contributions are particularly significant to the understanding of MDMs in EFL and ESL contexts, emphasizing their importance in academic writing. The research offers valuable insights into how writers employ MDMs to structure their texts, engage readers, and convey their perspectives and attitudes. In

Hyland's (2005) work, a model for MDMs was developed and subsequently applied in the current study.

Within the context of Hyland's (2005) research, MDMs are linguistic tools utilized by writers to direct readers through the text, aiding in the comprehension of the writer's standpoint and fostering a sense of interaction between the writer and the reader. The taxonomy of MDMs, as presented by Hyland (2005) and illustrated in Table 1 below, serves as the primary analytical framework for the present study.

Table 1 Hyland's (2005) Taxonomy of Metadiscourse Markers

Category	Function	Example
Interactive: Help to guide reader through the text		
Transitions (TR)	express semantic relation between main clauses.	In addition, thus, but, and
Frame Markers (FM)	refer to discourse acts, sequences, or text stages.	Finally, to conclude, my purpose here is to
Endophoric Markers (ED)	refer to information in other parts of the text.	noted above, see figure, in section
Evidential Markers (EV)	refer to sources of information from other texts.	according to X/(Y, 1990)/Z states
Code glosses (CD)	help readers grasp functions of ideational material.	such as, in other words, e.g.,
Interactional: involve the reader in the argument		
Hedges (HE)	withhold writer's full commitment to proposition.	might, perhaps, possible, about
Boosters (BO)	emphasize force or writer's certainty in proposition.	in fact, definitely, it is clear that
Attitude Markers (AM)	express writer's attitude to proposition.	unfortunately, I agree, surprisingly
Engagement Markers (EM)	explicitly refer to or build relationship with reader.	consider, note that, you can see that
Self-mentions (SM)	explicitly refer to authors.	I, we, my, your

Source: adapted from Hyland, 2005, 49

According to Table 1, Interactive MDMs serve as features that bring out an argument and explicitly identify the writer's preferred interpretations. These resources

anticipate the reader's understanding of the text and represent the writer's judgment on what needs to be explicitly provided to facilitate the reader's understanding of the text. The specific Interactive resources mentioned include Transitions (TR), Frame Markers (FM), Endophoric Markers (ED), Evidential Markers (EV), and Code glosses (CD).

Transitions (TR) are primarily conjunctions and adverbial phrases that assist readers in recognizing pragmatic relationships between steps in an argument. Internal and external transitions play three different discourse functions. Addition adds aspects to an argument and may include items such as and, also, additionally, etc. Comparison marks arguments as either similar (similarly, likewise, in the same way, etc.) or different (however, conversely, although, but, whereas, on the other hand, etc.). Consequence relations either tell readers that a conclusion is being drawn or justified (thus, therefore, consequently, in conclusion, etc.) or that an argument is being countered (admittedly, nevertheless, anyway, in any case, nonetheless).

Frame Markers (FM) are references to text boundaries or elements of text structure, such as sequencing, labeling text stages, announcing discourse goals, or indicating shifts in topics. They provide a framework for organizing and understanding the text.

Endophoric Markers (ED) are expressions within a text that direct attention to other sections, making supplementary content noticeable and easily accessible to the reader. They play a crucial role in helping readers grasp the intended meaning of the writer and in maintaining coherence. These expressions, which reference other parts of the text (e.g., as shown in Figure 2, in the next section, Example 10, in the table above, as mentioned earlier), highlight additional ideational material. By doing so, they contribute to making this material prominent, aiding readers in understanding the writer's intended meanings.

Evidential Markers (EV) provide indications of the origin and reliability of the information being provided. (According to, found that, reported, cited, mentioned) They are representations of an idea from another source that serve a similar purpose by showing the source of textual information that comes from outside the current text. They indicate the source and reliability of the information being given. In some

genres, this may entail report or reference to a credible source; in academic writing, it refers to community-based literature and serves as important support for arguments.

Code glosses (CD) provide supplementary information by rephrasing, explaining, or elaborating on the preceding content, ensuring that the reader can fully grasp the writer's intended meaning. CD are indicative of the writer's assumptions about the reader's knowledge base and are typically introduced by phrases such as this is called, in other words, refer to, this can be defined as, for example, etc.

Overall, these Interactive resources assist the writer's explicit understanding, guide the reader's interpretation, and assist comprehension by organizing the discourse and making important details available (Hyland, 2005).

Interactional MDMs are critical for engaging readers, conveying the writer's point of view and attitude toward the content delivered, and managing the level of personal participation in the text. This evaluative and engaging feature of Metadiscourse affects intimacy, attitude expression, epistemic judgments, commitments, and reader involvement. It is related to the attitude of the discourse, which is concerned with controlling the level of personality in the text. Hedges (HE), Boosters (BO), Attitude Markers (AM), Engagement Markers (EN), and Self-mentions (SM) are examples of Interactional resources explained (Hyland, 2005).

Hedges (HE) are linguistic devices, such as "possible," "might," and "perhaps," utilized by writers to signify their acknowledgment of alternative voices and viewpoints. This indicates a deliberate choice to refrain from making an absolute commitment to a proposition. Hedges are employed by writers to express reluctance in presenting propositional information categorically. They emphasize the subjective nature of a position by allowing information to be presented as an opinion rather than a fact, thus making that position open to negotiation.

Boosters (BO) refers to linguistic devices employed by writers to convey a sense of certainty, emphasize the strength of their statements, and bolster the persuasiveness of their arguments. The primary objective is to convince the reader of the validity or significance of the information being put forth. BO imply that the writer acknowledges the existence of potential diverse viewpoints but deliberately opts to narrow this diversity, presenting a confident and singular perspective, thereby addressing alternatives with a resolute voice.

Attitude markers (AM) serve as tools for conveying the writer's assessment of propositional information by expressing emotions like surprise, obligation, agreement, and importance. These markers indicate the writer's affective stance towards propositions rather than providing an epistemic evaluation. Despite comments on the status, relevance, reliability, or truth of information, attitude markers focus on conveying the writer's emotional responses, such as surprise, agreement, importance, obligation, frustration, and so on.

Engagement markers (EN) explicitly address readers, either by selectively focusing their attention or by including them as participants in the text. This can be achieved through the use of second-person pronouns, imperatives, question forms, and asides.

Self-mentions (SM) reflect the author's presence in the discourse, indicated by the frequency of first-person pronouns and possessives used.

Overall, Interactional resources in MDMs play a crucial role in engaging readers, conveying the author's perspective and attitude towards the information presented, and controlling the level of personal involvement in the text (Hyland, 2005).

In addition, Hyland (2018) investigated MDMs function in writing and its impact on coherence and cohesion. There was an extensive review of MDMs and their significance in establishing coherence and cohesion for EFL authors. As a result, MDMs assist EFL writers in establishing coherence and cohesion in their writing. They lead readers through the text by indicating connections between concepts, offering structure, and making the text more structured and understandable. Even though EFL/ESL writers can write correctly, not all of them are able to create clear messages or effectively deliver their ideas to readers. As stated by Hyland (2005), MDMs hold a significant role in the writing process for EFL/ESL authors. They contribute to the establishment of coherence, reader guidance, conveying perspective, and meeting the demands of academic writing. Hence, the use of MDMs in an effective manner that may overcome the limitations of NNS writers in producing scientific writing.

Linguists and researchers on MDMs present a variety of terms, definitions, and taxonomies. Each defined taxonomy or theory reveals its strengths and

weaknesses. Ädel (2006), Crismore, Markkanen, and Steffensen (1993), Hyland (2005), and Kopple (1985) were among the first who developed the taxonomy and boundaries of MDMs. The work of Hyland and Tse (2004) and Hyland (2005) contributes to EFL/ESL understanding of MDMs and its significance in academic writing. It provides valuable insights into how MDMs are employed by writers in order to shape their texts, engage readers, and convey their stance and attitude. Hyland (2005) developed the MDMs model, and this model was adopted for this study. Two dimensions of MDMs were employed in this study, including Interactive and Interactional dimensions. Each has five categories. Interactive category includes Transitions (T), Frame Markers (Fm), Endophoric Markers (En), Evidential Markers (Ev), and Code glosses (Co). Interactional category includes Hedges (H), Boosters (Bo), Attitude Markers (Am), Engagement Markers (En), and Self-mentions (Sm).

Previous Studies

The use of Metadiscourse Markers (MDMs) in academic writing has been a topic of considerable interest in discourse analysis. Metadiscourse refers to the linguistic device's writers use to organize their texts, engage readers, and convey their stance. These markers play a crucial role in making academic texts coherent, persuasive, and reader-friendly. Over the years, several studies have analyzed the use of MDMs across different languages, disciplines, and cultural contexts, with Hyland and Tse's (2004) and Hyland's (2005) taxonomies often serving as foundational frameworks for these investigations. The literature review of MDMS studies can be categorized into four main groups: (1) studies comparing the use of MDMs between native and non-native English speakers, (2) studies comparing the use of MDMs within similar academic disciplines, (3) studies comparing the use of MDMs across different academic disciplines, and (4) studies comparing the use of MDMs in relation to gender differences. By examining these studies, we aim to understand how MDMs contribute to the construction of academic arguments and how their use varies among different groups of writers.

The studies relating to comparing the use of MDMs between native and non-native English speakers

Khajavy, Asadpour, and Yousefi (2012) investigated the Interactive metadiscoursal features in the discussion section of English and Persian sociological research articles in 2009. 20 Sociological research articles were investigated. 10 articles were written in English and published in international journals, and 10 articles were written in Persian and published in national journals. It was found that English research articles in the sociological discipline use more overall Interactive features than Persian articles. Endophoric markers were the only subcategory in which Persian research articles appeared more frequently.

Gholami and Ilghami (2016) analyzed the data by including examples encountered during the scanning of the selected articles in the calculation according to the definitions given in the model of Hyland and Tse (2004) for the comprising categories; as Hyland states, MDMs is a meaning system with an open-ended set of language elements. Examples of transitions markers taken from scanned articles include "therefore, consequently," "furthermore," and "moreover." The following sentences from the corpus under study contain terms that have been underlined to indicate related markers.

Kobayashi (2016) examined variations in rhetorical preferences in second-language (L2) writings across different first-language (L1) groups. It compared the use of MDMs in L2 essays from six L1 groups (Chinese, Indonesian, Japanese, Korean, Taiwanese, and Thai) using the International Corpus Network of Asian Learners of English (ICNALE). The analysis employed a heat map with hierarchical clustering to explore differences in MDMs among these groups. The findings revealed significant distinctions in the use of MDMs between East Asian (Chinese, Japanese, Korean, and Taiwanese) and Southeast Asian (Indonesian and Thai) groups. Each group exhibited unique characteristics of MDMs, providing insights to improve L2 learners' writing. These findings have practical implications for English academic writing teachers, aiding them in correcting students' compositions and assisting language learners in understanding rhetorical conventions.

Sorahi and Shabani (2016) aimed to investigate the use of MDMs in 40 research article introductions 20 in English and 20 in Persian in the field of

linguistics. The results indicated that both Iranian and English research article introductions used Interactive markers more than Interactional ones. Similarly, in both English and Persian research articles, evidentials and transitions were the most frequently used Interactive resources, while hedges were the most frequently used Interactional resources. The results suggested that the similarities in the deployment of MDMs between the two sets of data stemmed from the influence of English as an international language and academic lingua franca. The factors influencing these similarities and differences were assumed to be culture-driven preferences, discipline-driven preferences, and reader responsibility.

Ghahremani Mina and Biria (2017) aimed to analyze Interactive and Interactional MDMs in a sample of 100 English research articles written by Iranian authors. The focus was on the discussion sections of randomly selected articles, totaling 70,000 words and published between 2010 and 2016. Using Hyland's 2005 taxonomy, the study identified the presence and frequency of different MDMs. The results showed that endophoric markers and code glosses were used at similar rates. In terms of Interactional MDMs, medical science articles employed hedges, boosters, and self-mentions more frequently than social science articles. Social science texts, on the other hand, had a higher proportion of engagement markers in their discussion sections. Attitude markers were used similarly across both disciplines. Interestingly, authors in social science seemed to prefer Interactive MDMs, while those in medical science utilized Interactional MDMs more frequently in their research articles.

Hayisama, Shah, and Adnan (2019) examined the use of Interactional MDMs and its relevance to the rhetorical style preferences in academic writing of Thai and Malaysian master’s students. Thai and Malaysian students were perceived as being uninterested in developing explicit relationships with their readers, resulting in their rhetorical tone of writing being less dialogic and distant. There were several possible explanations for Thai and Malaysian students' rhetorical preferences in thesis writing. Besides, another factor that might contribute to the study of the rhetorical style of writing produced by Thai and Malaysian students was the sociocultural perspective.

Mazidah (2019) conducted a study comparing the use of Interactive MDMs in abstracts from TEFLIN Journal (Indonesian scholars) and ELT Journal (native English scholars). They analyzed 50 abstracts from each journal using a quantitative

approach. The findings revealed that native English scholars used more MDMs compared to Indonesian scholars. Native English academics were found to use code glosses and transition markers more frequently, whereas Indonesian scholars used frame markers and evidentials more often. Endophoric marker use followed comparable patterns. Despite these differences, the T-test findings showed that the variations in MDMs usage between the two groups were not statistically significant. This suggests that, overall, the application of MDMs by both groups of scholars is comparable.

Kirisçi and Duruk (2022) indicate that MDMs is a device used to make a text intelligible, coherent, and persuasive. Their research investigated Interactive and Interactional MDMs in the abstract sections of academic research articles written in Turkish and English. Special Education and Preschool Education were two disciplines selected for the research. English articles written by native speakers of English, English articles written by Turkish speakers, and Turkish articles written by Turkish speakers were three different types of language use that were examined. Hyland and Tse's (2004) taxonomy were utilized to code MDMs in research articles. It was chosen since it is contemporary, simple, clear, and comprehensive. In addition, it includes an inclusive categorization based on earlier taxonomies such as Kopple (1985) or Bunton (1999). The research findings showed that Turkish writers used boosters and frame markers more frequently, while native speakers of English used hedges, code glosses, and self-mentions more.

Prasetyanti, Tongpoon-Patanasorn, and Sahan (2023) conducted a study to examine the use of MDMs in the introduction chapters of dissertations written by Native English Speakers and Indonesians, employing Hyland's (2005) taxonomy. Their findings indicated that in the category of Interactive MDMs, TR, FM, and EV in linguistics were more prevalent compared to those in the Education field. Moreover, the results showed that endophoric markers and code glosses were utilized at similar frequencies. In Interactional MDMs use, writers tended to employ HE, BO, and SM more frequently in linguistics than in education. Interestingly, there was no significant difference in the use of AM between the two disciplines. Notably, authors in linguistics appeared to prefer Interactive MDMs, whereas in education, Interactional MDMs were more commonly utilized in dissertation introductions.

The studies relating to comparing the use of MDMs published in similar academic disciplines

Suntara and Chokthawikit 2018 explored the use of Interactive and Interactional MDMs in 60 research articles abstract from public health in many institutions in Thailand, both at the undergraduate and postgraduate levels. Based on Hyland (2005) classification of stance and taxonomy of interactive MDMs, the findings revealed that the most frequent uses of stance were attitude markers, self-mentions, hedges, and boosters, respectively. Moreover, the use of transition markers to project additive, consequential, or contrastive connections was found extensively. The findings suggested that RA abstracts are a persuasive endeavor reflecting social communication and an interaction between author and audience.

Alzarieni, Zainudin, Awal, and Sulaiman (2019) investigate Interactional MDMs in 60 patent abstracts written in Arabic by Arabic-native drafters. The objectives were to identify which types of Interactional MDMs were prevalent in Arabic patent abstracts and to explain how MDMs function in these abstracts. The findings showed that boosters, hedges, and attitude markers were the most commonly used markers, with the remaining categories having a low frequency of occurrence. Furthermore, the analysis revealed that Interactional MDMs performed a variety of functions, including providing accurate data, avoiding commitment to precise figures, and persuasion, among others. The findings of this study can help Arabic-speaking drafters and novice inventors better understand the Interactional MDMs commonly used in patent abstracts. A better understanding of the pragmatic functions of Interactional MDMs can improve not only patent drafting skills but also the possibility of achieving a successful patent grant.

Nugrahani and Bram (2020) aimed to study the use of MDMs in scientific journal articles, using eight papers from a special edition published by LLT Journal: A Journal on Language and Language Teaching. The findings show that the investigated journal articles contain 708 MDMs, with Interactive MDMs appearing more frequently (529 occurrences) than Interactional MDMs (179 occurrences). Transitions like "but" and "thus" were the most often utilized MDMs, with 249 occurrences, while boosters like "in fact" and "definitely" were the least productive, with only 24

instances. This implies that authors employed Interactive MDMs more often than Interactional MDMs.

Grogan (2021) highlighted key aspects of scientific writing, including the challenges it poses, strategies for improving clarity, and the relationship between writing and scientific thinking. Grogan discussed how traditional scientific writing follows rigid structures (Introduction, Methods, Results, and Discussion—IMRaD) that can sometimes constrain creativity and hinder clear communication. These structures often make it difficult for scientists to engage readers while meeting academic standards. Grogan emphasized the importance of structure, language choice, and narrative flow in making scientific writing more accessible, not just for experts but for wider audiences as well.

Nur, Arsyad, Zaim, and Ramadhan (2021) sought to investigate the use of rhetorical moves and MDMs by Indonesian authors in Applied Linguistics within the abstracts of their research articles, published in both international and local journals. For the study's corpus, they selected 20 abstracts from international journals and 20 from local journals. The findings indicated similar trends in the abstracts of research articles across both types of journals. Authors demonstrated a preference for employing Interactive MDMs over Interactional MDMs, focusing primarily on enhancing text cohesion, coherence, and persuasiveness rather than engaging directly with potential readers.

The studies relating to comparing the use of MDMs across different academic disciplines

Estaji and Vafaeimehr (2015) explored the differences in the use, type, and frequency of Interactional MDMs in the introduction and conclusion sections of research papers across the two disciplines of Mechanical and Electrical Engineering. 42 research articles from each of the two disciplines were randomly selected from two major international journals. Hyland's (2005) model was employed for data analysis. A Chi-square analysis showed that while there were minor variations in the frequency and type of MDMs, there was no statistically significant difference between the disciplines. This might be because these two fields had the close relationship.

Mohamed (2020) conducted a study analyzing the initial drafts of 20 research articles, selected based on specific criteria: A) recent publication (no earlier than 2016) in Scientific, Technical, and Medical fields; B) authored by Egyptian researchers affiliated with Egyptian institutions; C) each researcher contributed only one article to the sample; D) submission to international journals. These criteria ensured the sample's relevance to the study. The findings revealed a notable discrepancy in the use of Interactive markers, which significantly outnumbered Interactional markers. Out of 2551 MDMs identified, 1978 (77.5%) were Interactive, while only 573 (22.5%) were Interactional. The most prevalent MDM observed was transitions, occurring 639 times (25% of the total), whereas engagement markers were the least frequent, appearing only 3 times (0.001% of the total). Overall, the study aims to highlight the writing challenges faced by Egyptian researchers in English academic writing and to encourage an increase in the volume of international research publications by this group.

The studies relating to comparing the use of MDMs in relation to gender differences

Suksawas (2016) investigated how Thai learners of different genders use MDMs when relating with their readers in English. The study used Hyland's (2005) MDMs model to show how significant MDMs help male and female writers' complete written tasks. The approach emphasizes the significance of language as an Interactive and Interactive method of communicating with readers. The study presented a small-scale, qualitative study conducted to investigate writing as a social activity among Thai learners. This study used interviews and linguistic analysis to uncover Thai learners' linguistic practices when writing letters to the editor and news reports. The study discovered that, while both male and female Thai writers used MDMs to communicate with their readers in letters to the editor and news reports. The study's main finding suggested that both male and female Thai writers should be explicitly educated in the classroom about MDMs and their linguistic resources in order to interact with the readers. Furthermore, educators should be aware of the MDMs learners of different genders use in their writing for specific purposes in higher-education pedagogy.

Saraswati and Pasaribu (2019) conducted a study that focused on the analysis of Interactive and Interactional MDMs in journal articles within the humanities and science fields. The study also investigated whether there was a correlation between the gender of authors and the use of these markers. A qualitative corpus-based method was employed to analyze a total of 40 journal articles: 20 articles written by male authors and 20 written by female authors. The results of this study revealed that Transition markers are the most common Interactive markers in both humanities and science articles (28.22%), while Endophoric markers are the least commonly used (1.83%). Furthermore, Hedges are the most common Interactional marker (12.3%), whereas Boosters are the least common (4.06%). The study suggests that humanities journals used more Interactional MDMs because they are believed to alert readers to the author's viewpoints on social phenomena. The authors continued to indicate that male and female authors used MDMs identifiers in the same way, implying that there is no clear relationship between gender and the use of MDMs in journal articles.

The existing body of research on MDMs highlights the diverse ways in which these markers are employed across different languages, disciplines, and genders. While some studies reveal significant differences in usage patterns, others suggest more similarities than variations. This literature review underscores the importance of understanding these patterns, particularly for EFL/ESL writers aiming to publish in international journals, as it can provide valuable insights into improving academic writing practices.

The previous studies are summarized in Table 2, categorized by year.

Table 2 Summary of Previous Studies

Year	Researchers	Focus	Type of texts	Context	Findings
(2012)	Khajavy, Asadpour, and Yousefi	Investigating the Interactive MDMs of sociological research publications in English	discussion section	20 research articles from the sociology discipline, 10 from English, and 10 from Persian	English research articles use more overall Interactive aspects than Persian

Year	Researchers	Focus	Type of texts	Context	Findings
		and Persian (Hyland's (2005) taxonomy)			
(2015)	Estaji and Vafaeimehr	Comparing the use, type, and frequency of Interactional MDMs in research papers from Mechanical and Electrical Engineering (Hyland's (2005) taxonomy)	introduction and conclusion sections	42 research articles written by English native speakers (21 Mechanical and 21 Electrical Engineering)	There were a few small variations in the frequency and type of MDMs between fields, but none were significantly different.
(2016)	Gholami and Ilghami	Investigating the differences in MDMs employed in biological RAs. (Hyland and Tse's (2004) taxonomy)	research articles	40 biological research articles published in the years 2008–2011, written by Iranian authors, and 40 research articles with the same characteris-tics, written by American authors	American receive more Interactional markers, with Iranian having the highest frequency for the Interactive markers.
(2016)	Kobayashi	Compared the use of MDMs in L2 essays from six L1 groups (Hyland's (2005) taxonomy)	Essays	1.3 million words of argumenta-tive essays written by East Asian groups (Chinese, Japanese, Korean, and Taiwanese)	There are substantial differences in the use of MDMs between East Asian (Chinese, Japanese, Korean, and Taiwanese)

Year	Researchers	Focus	Type of texts	Context	Findings
				and Southeast Asian groups (Indonesian and Thai).	and Southeast Asian (Indonesian and Thai) groups.
(2016)	Sorahi and Shabani	Investigating the use of MDMs in Persian and English research article introductions in the field of linguistics. (Hyland and Tse's (2004) taxonomy)	introduction section	40 linguistics research articles were analyzed, with 20 English articles from the Journal of Language and Social Psychology and 20 Persian articles from the Journals of Linguistic Researches, Journal of Contrastive Linguistic Researches, and Linguistic Researches in Foreign Languages.	The study found that Iranian and English research articles primarily use Interactive markers in introductions , evidentials and transitions, while hedges are the most commonly used Interactional resources.
(2016)	Suksawas	Investigating how meaningful MDMs support male and female writers to accomplish written tasks (Hyland's (2005) taxonomy)	Letters to the editor and news reports	16 Thai third-year English major students (8 male and 8 female) enrolled in English for Journalism course at NU.	Both male and female Thai writers should be explicitly educated in the classroom about MDMs and their linguistic resources in

Year	Researchers	Focus	Type of texts	Context	Findings
					order to interact with the readers.
(2017)	Ghahremani Mina and Biria	Identifying Interactive and Interactional MDMs in a targeted sample of 100 English RAs written by Iranian writers. (Hyland's (2005) taxonomy)	discussion section	From 2010 to 2016, 100 research articles written in English by Iranian writers were selected from journals of social and medical sciences, with 50 papers from each field.	While authors in the medical sciences employ Interactional MDMs more frequently, authors in the social sciences employ Interactive MDMs more frequently.
(2018)	Suntara and Chokthawikit	Investigating the use of Interactive and Interactional MDMs in the discipline of public health. (Hyland's (2005) taxonomy)	abstract section	60 research articles abstract from public health in many institutions in Thailand, both at the undergrad-duate and postgraduate levels.	The most frequent uses of stance were attitude markers, self-mentions, hedges, and boosters, respectively.
(2019)	Alzarieni, Zainudin, Awal, and Sulaiman	Investigating Interactional MDMs in Arabic by Arabic-native drafters within the field of human necessity. (Hyland's (2005) taxonomy)	abstract section	60 Arabic Patents drafted during the years 2008-2018 by native Arabic drafters in the field of human necessity	The most commonly used markers are boosters, hedges, and attitude markers, with the remaining types appearing infrequently.
(2019)	Hayaam,	Investigating	introduction	Both groups	Thai and

Year	Researchers	Focus	Type of texts	Context	Findings
	Shah, and Adnan	the use of Interactional MDMs and its relevance to the rhetorical style preferences in academic writing of Thai and Malaysian master's students. (Hyland's (2005) taxonomy)	and discussion sections	are English-major students specializing in Applied Linguistics, with Thai master's theses available online and Malaysian master's theses available in hard copies.	Malaysia should be given more instructional focus on how to utilize MDMs in making academic writing more persuasive and Interactive.
(2019)	Mazidah	Comparing the use of Interactive MDMs in abstracts written by Indonesian scholars and native English scholars, the study aimed to determine whether there is a significant difference in their application of Interactive MDMs. (Hyland's (2005) taxonomy)	abstract section	50 abstracts written by Indonesian scholars in the TEFLIN Journal and 50 abstracts written by native English scholars in the ELT Journal were analyzed using a quantitative approach.	The results showed that whereas Indonesian scholars used more frame markers and evidentials, native English speakers used more code glosses and transition indicators. Although these variations, the T-test findings showed that there was no statistically significant difference in the MDMs use between the two

Year	Researchers	Focus	Type of texts	Context	Findings
					groups.
(2019)	Saraswati and Pasaribu	An investigation of Interactive and Interactional MDMs in research articles in the humanities and sciences. (Hyland's (2005) taxonomy)	research articles	40 research articles were collected from the Science Direct website, with 20 written by male authors and 20 by female authors. The collection comprised 10 science journal articles authored by males and 10 by females, along with 10 humanities journal articles written by males and 10 by females.	The most commonly used Interactive markers in both fields were Transition markers, while Endophoric markers are the least commonly used. Hedges are the most common Interactional marker, whereas Boosters are the least common.
(2020)	Mohamed	Investigating the use of the unedited first draft research articles submitted for publishing in an international journal. (Hyland's (2005) taxonomy)	first draft research articles	The unedited first drafts of 20 research article selection criteria • Recent articles in Scientific, Technical, and Medical disciplines (before 2016). • Authored by Egyptian researchers	Among the total 2551 MDMs in the data, 1978 markers were Interactive (77.5%), while only 573 were Interactional (22.5%). The most frequently used MDM in the analyzed data was

Year	Researchers	Focus	Type of texts	Context	Findings
				affiliated with Egyptian institutions. • Each researcher has one article in the sample. • Articles submitted for international publication.	transitions, occurring 639 times (25% of the total), while the marker with the fewest occurrences was engagement markers, occurring 3 times (0.001% of the total).
(2020)	Nugrahani and Bram	Investigating the use of MDMs identified in scientific journal articles, the study analyzed the results and discussion sections. (Hyland's (2005) taxonomy)	results and discussion sections	The data source of this study comprised eight research articles from the result and discussion sections collected from LLT Journal, published in June 2018. This selection was based on their abundance of examples of MDMs identified in the preliminary data observation and	There was a significant difference between the number of Interactive MDMs, totaling 529 occurrences, and Interactional MDMs, which amounted to only 179 occurrences.

Year	Researchers	Focus	Type of texts	Context	Findings
				collection and that they were easily retrievable online.	
(2021)	Grogan	focusing on key aspects discussed in the work, including the challenges associated with scientific writing, strategies for improving clarity, and the relationship between writing and scientific thinking.	research articles	The relationship between writing and thinking in writing science.	The study suggested that scientific writing can be simplified by focusing on language use, structure, and clear narratives, thereby making it more accessible and impactful.
(2021)	Nur, Arsyad, Zaim, and Ramadhan	Investigating the use of appropriate rhetorical moves and MDMs in research article abstracts by authors from various language backgrounds in Applied Linguistics, as published in international and local journals. (Hyland's	abstract section	40 research article abstracts were chosen for the corpus of this study, comprising 20 research article abstracts published in international journals and 20 research article abstracts published in local journals.	The findings suggest consistent patterns across research article abstracts published in both international and local journals. Authors tended to employ Interactive MDMs more frequently than Interactional

Year	Researchers	Focus	Type of texts	Context	Findings
		(2005) taxonomy)			MDMs. This preference reflects their emphasis on enhancing text cohesion, coherence, and persuasive-ness over direct interaction with potential readers.
(2022)	Kirisçi and Duruk	Investigating the differences in MDMs in academic research articles written in Turkish and English. (Hyland and Tse's (2004) taxonomy)	abstract section	300 research abstracts published by international journals each 100 English articles written by English native speakers and Turkish speakers, and Turkish articles written by Turkish speakers.	The results of the study indicate that, in terms of Interactive and Interactional MDMs, there are differences across the languages.
(2023)	Prasetyanti, Tongpoon-Patanasorn, and Sahan	Examining the use of MDMs in dissertation introductions across four disciplines—physics, linguistics, engineering, and	introduction chapters of dissertations written	The study examined 200 English dissertation introductions written between 2000 and 2019, covering four disciplines:	The study revealed no significant difference in the use of AM across both disciplines. Additionally, linguistics authors

Year	Researchers	Focus	Type of texts	Context	Findings
		education—while comparing native English speakers and non-native Indonesian speakers, and assessing the usage of Interactive and Interactional markers in introductory sections. (Hyland's (2005) taxonomy)		hard-pure, soft-pure, engineering, and education. Each discipline had 25 dissertation introductions analyzed, contributed by both Native English Speakers and Indonesians. This comprehend-sive analysis provides insights into the usage of MDMs across different disciplines and linguistic backgrounds.	appear to prefer employing Interactive MDMs more, whereas education authors use Interactional MDMs more frequently in their dissertation introductions.

Based on the significance of MDMs in academic writing, particularly for EFL/ESL writers in the fields of Humanities and Social Sciences, as well as Science and Technology, the purpose of this research article is to investigate the use of MDMs by EFL/ESL writers in these two disciplines. The study examines the articles using Hyland's (2005) MDM theory, with a primary focus on the introduction and literature review sections published in NU Journals. The upcoming chapter, Chapter III: Research Methodology, will discuss the methods employed for data collection and analysis in this research.

CHAPTER III

RESEARCH METHODOLOGY

The research methodology section of a study serves to outline the specific methods and procedures used to conduct research. In this study, the focus is on examining the use of Metadiscourse markers (MDMs) in English research articles. This section describes the data sources, sampling techniques, and the rationale for selecting the research articles, as well as the process for analyzing the MDMs use across different academic disciplines and language backgrounds. The aim of this chapter is to provide a clear understanding of how data was collected and analyzed to address the research objectives, ensuring the study's reliability.

Research Design

Data Source

The corpora datasets were constructed using purposive sampling. Forty English research articles, published in Naresuan University journals between 2019 and 2022, were selected. These datasets included 20 research articles in Humanities and Social Sciences and 20 in Science and Technology. Specifically, 20 articles were chosen from Thai authors and 20 from non-native English authors. For each article, only the introduction and literature review sections were included, with a word count ranging from 750 to 1,000 words for both sections, excluding tables, figures, symbols, and formulas. The authors' identities were kept confidential, and the results of this study were used solely for academic purposes.

In the corpus of this study, the average word count for the introduction section in all 20 humanities and social sciences English research articles was approximately 10,680 words, while the literature review sections contained approximately 8,540 words, resulting in a total of 17,220 words. For the introduction section in science and technology in all 20 English research articles, the word count averaged approximately 10,100 words, and the literature review sections contained approximately 8,580 words, resulting in a total of 18,680 words. In this study, the word count in the

research writing data was required as the criterion for selecting articles. This was to ensure that the articles chosen had a similar number of words, preventing the way in which some articles employed MDMs more than others due to having the greater number of words.

Theoretical Framework

The main framework in this study was retrieved from Hyland's (2005) taxonomy of MDMs as shown in Table 1 in Chapter II.

Table 1 Hyland's (2005) Taxonomy of Metadiscourse Markers

Category	Function	Example
Interactive: Help to guide reader through the text		
Transitions (TR)	express semantic relation between main clauses.	In addition, thus, but, and
Frame Markers (FM)	refer to discourse acts, sequences, or text stages.	Finally, to conclude, my purpose here is to
Endophoric Markers (ED)	refer to information in other parts of the text.	noted above, see figure, in section
Evidential Markers (EV)	refer to sources of information from other texts.	according to X/(Y, 1990)/Z states
Code glosses (CD)	help readers grasp functions of ideational material.	such as, in other words, e.g.,
Interactional: involve the reader in the argument		
Hedges (HE)	withhold writer's full commitment to proposition.	might, perhaps, possible, about
Boosters (BO)	emphasize force or writer's certainty in proposition.	in fact, definitely, it is clear that
Attitude Markers (AM)	express writer's attitude to proposition.	unfortunately, I agree, surprisingly
Engagement Markers (EM)	explicitly refer to or build relationship with reader.	consider, note that, you can see that
Self-mentions (SM)	explicitly refer to authors.	I, we, my, your

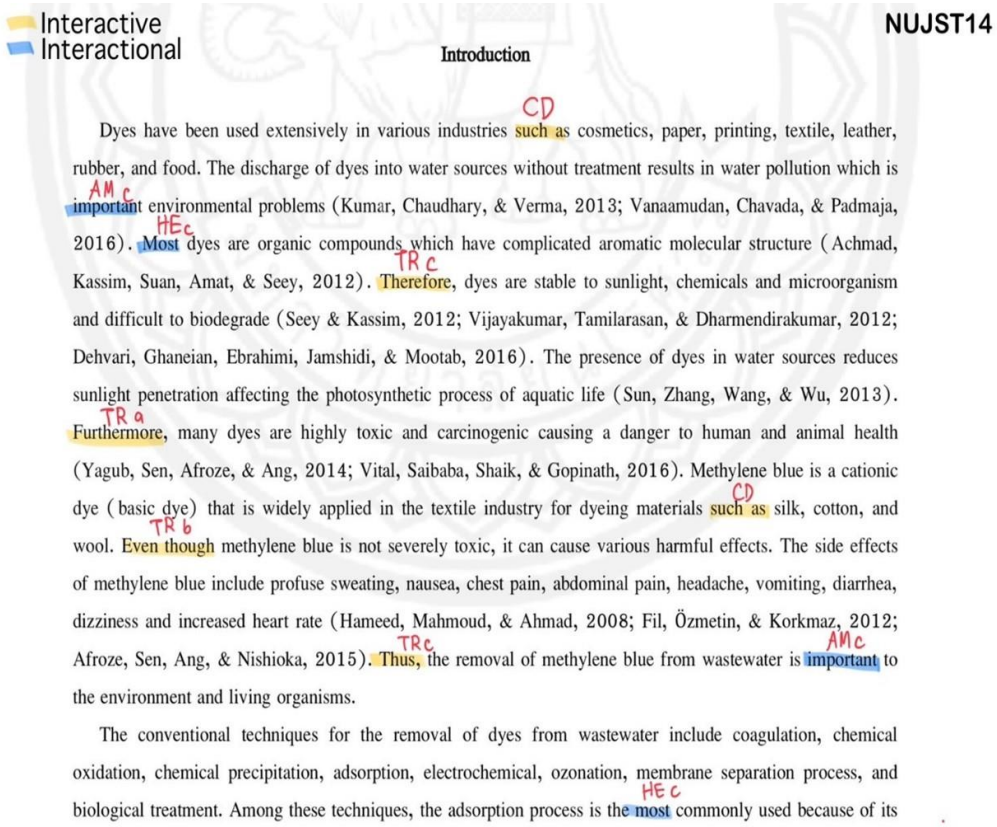
Source: adapted from Hyland, 2005, 49

This model consists of two major categories of MDMs: Interactive and Interactional categories. The Interactive category includes Transitions (TR), Frame

Markers (FM), Endophoric Markers (ED), Evidential Markers (EV), and Code glosses (CD). The main objective of these features is to provide an organized and coherent text that guides the reader through the text in the way that meets the reader's needs based on the writer's expectations. The Interactional category includes Hedges (HE), Boosters (BO), Attitude Markers (AM), Engagement Markers (EM), and self-mentions (SM). The main objective of these features is to provide an imaginative text in which the reader can easily identify the writer's style. It also aims to develop a personal relationship with the reader by expressing the writer's reactions to the content.

Data Analysis

In this study, the MDMs were counted and classified into their groups based on the proposed categories. To conduct qualitative analysis in each research article, the collected data were carefully examined. The number of MDMs was counted and classified individually, word by word. Once the word count was complete, the total number of words was calculated using Microsoft Excel to determine the frequency and percentage of each type. The researcher then read, analyzed, and reread the articles again before having two more inter-coders evaluate them to ensure that the analysis was accurate. To confirm the reliability of data coding and categorization, 10% of the data were analyzed by two inter-coders. The first coder was an expert in Applied Linguistics from the Faculty of Humanities, English Department, Naresuan University. The second coder was an expert in Linguistics, Society & Culture, also from the Faculty of Humanities, English Department, Naresuan University. The examples of data analysis are shown the figure below.


Interactive
Interactional

NUJST14

Introduction

Dyes have been used extensively in various industries such as cosmetics, paper, printing, textile, leather, rubber, and food. The discharge of dyes into water sources without treatment results in water pollution which is important environmental problems (Kumar, Chaudhary, & Verma, 2013; Vanaamudan, Chavada, & Padmaja, 2016). Most dyes are organic compounds which have complicated aromatic molecular structure (Achmad, Kassim, Suan, Amat, & Seey, 2012). Therefore, dyes are stable to sunlight, chemicals and microorganism and difficult to biodegrade (Seey & Kassim, 2012; Vijayakumar, Tamilarasan, & Dharmendirakumar, 2012; Dehvari, Ghaneian, Ebrahimi, Jamshidi, & Mootab, 2016). The presence of dyes in water sources reduces sunlight penetration affecting the photosynthetic process of aquatic life (Sun, Zhang, Wang, & Wu, 2013). Furthermore, many dyes are highly toxic and carcinogenic causing a danger to human and animal health (Yagub, Sen, Afroze, & Ang, 2014; Vital, Saibaba, Shaik, & Gopinath, 2016). Methylene blue is a cationic dye (basic dye) that is widely applied in the textile industry for dyeing materials such as silk, cotton, and wool. Even though methylene blue is not severely toxic, it can cause various harmful effects. The side effects of methylene blue include profuse sweating, nausea, chest pain, abdominal pain, headache, vomiting, diarrhea, dizziness and increased heart rate (Hameed, Mahmoud, & Ahmad, 2008; Fil, Özmetin, & Korkmaz, 2012; Afroze, Sen, Ang, & Nishioka, 2015). Thus, the removal of methylene blue from wastewater is important to the environment and living organisms.

The conventional techniques for the removal of dyes from wastewater include coagulation, chemical oxidation, chemical precipitation, adsorption, electrochemical, ozonation, membrane separation process, and biological treatment. Among these techniques, the adsorption process is the most commonly used because of its

Figure 1 The examples of data analysis

Note: See Appendix A for more details and examples of data analysis.

To achieve a high correlation between the researcher and the two inter-coders, the inter-coder reliability agreement of more than 80% was conducted, and the result indicated the high reliability of the data coding and categorization system of analysis. This process was conducted in order to ensure the reliability of the findings.

CHAPTER IV

RESULTS AND DISCUSSION

The results and discussion of this research are presented according to the three research questions (RQs) of this study. Table 3 below shows the results of the use of MDMs between these two disciplines of English research articles.

Table 3 The use of Metadiscourse markers in Humanities and Social Sciences and Science and Technology

Category	Humanities and Social Sciences (JCDR)		Science and Technology (NUJST)	
	Frequency	Percentage	Frequency	Percentage
Interactive				
Transitions (TR)				
a) addition	64	25.81	40	16.19
b) comparison	22	8.87	26	10.53
c) consequence	50	20.16	44	17.81
Total	136	54.84	110	44.53
Frame Markers (FM)				
a) sequencing	11	4.44	4	1.62
b) label states	1	0.40	2	0.81
c) announce goals	18	7.26	27	10.93
d) shift topic	0	0	0	0
Total	30	12.10	33	13.36
Endophoric Markers (ED)	4	1.61	4	1.62
Evidential Markers (EV)	45	18.15	40	16.19
Code glosses (CD)	33	13.31	60	24.29
Total	248	100	247	100
Interactional				
Hedges (HE)				
a) epistemic verbs	25	13.51	21	14.48
b) epistemic adverbs	25	13.51	24	16.55
c) epistemic expression	21	11.35	20	13.79

Category	Humanities and Social Sciences (JCDR)		Science and Technology (NUJST)	
	Frequency	Percentage	Frequency	Percentage
Total	71	38.38	65	44.83
Boosters (BO)				
a) intensifier verbs	16	8.65	23	15.86
b) intensifier adverbs	16	8.65	2	1.38
c) intensifier adjective	0	0	0	0
Total	32	17.30	25	17.24
Attitude Markers (AM)				
a) attitude verbs	0	0	1	0.69
b) attitude adverbs	17	9.19	24	16.55
c) attitude adjectives	23	12.43	23	15.86
Total	40	21.62	48	33.10
Engagement Markers (EM)				
a) reader pronoun	0	0	0	0
b) interjection	0	0	0	0
c) directive imperatives	7	3.78	1	0.69
d) obligation models	16	8.65	3	2.07
Total	23	12.43	4	2.76
Self-mentions (SM)	19	10.27	3	2.07
Total	185	100	145	100

RQ1: What are the Metadiscourse Markers used in Humanities and Social Sciences English research articles published in Naresuan University Journals?

According to Table 3, the results indicate that in English articles within the fields of Humanities and Social Sciences, Interactive markers (248 instances) were employed more frequently and with a greater variety of words compared to Interactional markers (185 instances). These results are consistent with the study by Saraswati & Pasaribu (2019), which collected 10 science journal articles written by males, 10 science articles written by females, 10 humanities journal articles written by males, and 10 humanities journal articles written by females, totaling 40 journal articles. The findings indicated that authors of humanities journal articles tend to use

Interactive MDMs more frequently than Interactional MDMs. Similarly, the study by Nur, Arsyad, Zaim, and Ramadhan (2021) examined 40 research article abstracts written in English by two groups of Indonesian authors in Applied Linguistics: expert and non-expert Indonesian authors. These abstracts were published in both local and international journals. The findings showed that Indonesian authors in Applied Linguistics tend to prioritize the use of Interactive MDMs over Interactional MDMs in both local and international English-medium journals. This preference could be attributed to their emphasis on improving text readability rather than actively involving prospective readers in their texts.

As seen in Table 3, the results indicate that, among the five categories of Interactive markers, the most frequently use markers were Transitions (136 instances, or 54.84%), Evidential Markers (45 instances, or 18.15%), Code glosses (33 instances, or 13.31%), Frame Markers (30 instances, or 12.10%), and Endophoric Markers (4 instances, or 1.61%), respectively. Furthermore, among the five categories of Interactional markers, the most frequent ones were Hedges (71 instances, or 38.38%), Attitude Markers (40 instances, or 21.62%), Boosters (32 instances, or 17.30%), Engagement Markers (23 instances, or 12.43%), and Self-mentions (19 instances, or 10.27%), respectively. The findings of this research support Khajavy, Asadpour, and Yousefi (2012) who investigated the Interactive metadiscoursal features in the discussion section of 20 English and Persian sociological research articles. The findings showed that in both English and Persian sociological research articles, the most frequently used markers were Transitions, with 412 instances in English out of a total of 614 instances and 310 instances in Persian out of a total of 472 instances. The results suggested that English scholars more closely guide the readers through their discussions in their research articles, especially in terms of the total number of instances. A similar finding was also found in Saraswati & Pasaribu (2019) who analyzed MDMs in 20 Humanities and 20 Sciences journal articles, and the result showed that the most frequently used in Humanity journal articles were Transitions (45.85%) and Hedges (22.1%).

This result suggests that writers in the Humanities and Social Sciences may be slightly more adept at using and more familiar with Interactive category markers compared to Interactional category markers. One possible explanation for this trend is

that the Humanities and Social Sciences often prioritize the structuring and organization of information, which Interactive markers facilitate by guiding the reader through the text. Furthermore, this finding is investigated in the introduction and review of literature sections, where researchers rarely show their point of view and attitude in these sections, leading to the infrequent use of Interactional markers.

RQ2: What are the Metadiscourse Markers used in Science and Technology English research articles published in Naresuan University Journals?

In Science and Technology English research articles, as can be seen in Table 3, it was found that, Interactive markers were used more frequently (247 instances) with a greater variety of words than Interactional category markers (145 instances). These results are in line with the findings of the study by Gholami and Ilghami (2016) who analyzed selected 20 articles including 10 research articles written by Iranian authors and 10 research articles written by American writers. The finding showed that Iranian authors employed Interactive and Interactional markers slightly more than their American counterparts. This finding is consistent with the study by Nugrahani and Bram (2020) who analyzed the results and discussion sections, with the data source comprising eight research articles collected from the LLT Journal. The analysis of journal articles revealed 708 MDMs, with more occurrences of Interactive MDMs (529) compared to Interactional MDMs (179). The most productive MDMs were the TR markers, with 249 instances, compared to Interactional MDMs.

The findings show that among the five categories of Interactive markers, the most frequent ones were Transitions (110 instances, or 44.53%), Code glosses (60 instances, or 24.29%), Evidential Markers (40 instances, or 16.19%), Frame Markers (33 instances, or 13.36%), and Endophoric Markers (4 instances, or 1.62%), respectively. In addition, among the five categories of Interactional markers, the most frequently use markers were Hedges (65 instances, or 44.83%), Attitude Markers (48 instances, or 33.10%), Boosters (25 instances, or 17.24%), Engagement Markers (4 instances, or 2.76%), and Self-mentions (3 instances, or 2.07%), respectively.

In contrast, Estaji and Vafaeimehr (2015) examined the differences in the use, type, and frequency of Interactional MDMs in the introduction and conclusion sections of research papers across the two disciplines of Mechanical and Electrical

Engineering. The result showed that the most frequently used were Boosters, Hedges and Attitude Markers respectively. Another study that contrasts with the present study was by Suntara and Chokthawikit (2018) who analyzed Interactive and Interactional MDMs in 60 research article abstracts within the discipline of public health. The findings revealed that the most frequent uses of stance were Attitude markers, Self-mentions, Hedges, and Boosters, respectively. Significantly, in Science and Technology English research articles, authors often did not refer to themselves and the readers in their research articles, as seen in the categories Engagement Markers and Self-mentions. The results indicate that authors in Science and Technology are more likely to use basic words and categories such as Transitions and Hedges. This suggests that Science and Technology authors should consider incorporating other MDMs apart from Transitions and Hedges to introduce greater variety in their usage.

The results indicate that authors in Science and Technology are more likely to use basic markers such as Transitions and Hedges. This suggests that Science and Technology authors should consider incorporating a broader range of MDMs beyond just Transitions and Hedges to introduce greater variety in their writing. Doing so would not only enhance the readability and impact of their articles but also better align their work with the broader expectations of academic discourse. However, the limited use of MDMs may represent a missed opportunity to enhance reader engagement and emphasize the significance of their research findings.

RQ3: To what extent are the Metadiscourse Markers used in Humanities and Social Sciences and Science and Technology English research articles published in Naresuan University Journals different?

Based on the indicated results, Interactive MDMs were more frequently used in Humanities and Social Sciences, specifically Transitions (136 instances, or 54.84%), Evidential Markers (45 instances, or 18.15%), Code glosses (33 instances, or 13.31%), Frame Markers (30 instances, or 12.10%), and Endophoric Markers (4 instances, or 1.61%). In Science and Technology, the most frequent Interactive MDMs were Transitions (110 instances, or 44.53%), Code glosses (60 instances, or 24.29%), Evidential Markers (40 instances, or 16.19%), Frame Markers (33 instances, or 13.36%), and Endophoric Markers (4 instances, or 1.62%), as shown in Table 3.

Furthermore, the most frequent markers of Interactional MDMs in Humanities and Social Sciences were Hedges (71 instances, or 38.38%), Attitude Markers (40 instances, or 21.62%), Boosters (32 instances, or 17.30%), Engagement Markers (23 instances, or 12.43%), and Self-mentions (19 instances, or 10.27%). In Science and Technology, the most frequently use markers were Interactional MDMs were Hedges (65 instances, or 44.83%), Attitude Markers (48 instances, or 33.10%), Boosters (25 instances, or 17.24%), Engagement Markers (4 instances, or 2.76%), and Self-mentions (3 instances, or 2.07%).

According to Table 3, in both fields, Interactive MDMs are used more frequently, most commonly with a greater variety of words than Interactional MDMs in Humanities and Social Sciences research articles (Interactive 248 instances, Interactional 185 instances), compared to Science and Technology English research articles (Interactive 247 instances, Interactional 145 instances). It shows that Humanities and Social Sciences writers use both Interactive MDMs and Interactional MDMs more frequently than Science and Technology writers. This might be because Interactive MDMs consist of familiar and commonly used words, making them easier to use in writing. In contrast, Interactional MDMs aim to convey the writer's opinions and viewpoints in the writing. This may be the reason why some writers are not proficient in using Interactional MDMs. These findings align with the study by Pooresfahani, Khajavy & Vahidnia (2012), indicating patterns of Interactive and Interactional MDMs in Applied Linguistics and Engineering. In both fields, writers tended to use Interactive MDMs more frequently than Interactional MDMs. The results of this present study are also in line with another study conducteb by Prasetyanti, Tongpoon-Patanasorn, and Sahan (2023) who identified MDMs in 100 English introduction sections of dissertations written by native English speakers and Indonesians. The overall findings showed that, in Interactive MDMs, the highest occurrences were Transition markers. In Interactional MDMs, the highest occurrences were Hedges.

However, this study contradicts the findings of the study by Ghahremani Mina and Biria (2017), where results showed that in 100 research articles written by Iranian authors in English, research articles in medical science were more frequently used compared to those in social sciences. Medical science articles used Hedges, Boosters,

and Self-mentions most frequently, respectively, and Interactional MDMs more frequently than Interactive MDMs.

Moreover, in these two fields, there are clearly different effects on the use of self-mentions. In Humanities and Social Sciences, there are 19 instances, while in Science and Technology, there are only 3 instances, which is a significantly different number. This suggests that Science and Technology authors might be adhering to a more impersonal style of writing, possibly due to the emphasis on objectivity and empirical data in these fields. As emphasized by Grogan (2021), writing plays a fundamental role in the scientific endeavor, encompassing various aspects such as delineating project ideas, collaborating with peers, condensing insights into manuscripts, and disseminating findings to broader audiences. Despite this significance, the training of budding scientists frequently prioritizes the scientific method and data collection procedures, often overlooking the importance of effective writing skills. Consequently, it can be deduced that authors in the realm of Science and Technology frequently abstain from referencing themselves or fellow researchers in their scholarly compositions.

Interestingly, both Humanities and Social Sciences and Science and Technology writers employed the same number of instances of the category Endophoric Markers in Interactive Categories (4 instances). Furthermore, the use of Interactive MDMs in Humanities and Social Sciences was most commonly related to the word "also" (19 instances, or 7.66%) in the category Transitions. On the other hand, the use of Interactive MDMs in Science and Technology was most frequently indicated by the word "such as" (41 instances, or 16.60%) in the category Code glosses. Additionally, the use of Interactional MDMs in Humanities and Social Sciences was most commonly related to the word "most" (21 instances, or 11.35%) in the category Hedges. Similarly, the use of Interactional MDMs in Science and Technology was most frequently indicated by the word "most" (17 instances, or 11.72%) in the category Hedges. It indicated that in both fields, they are likely to use the terms "also," “such as," and "most" more frequently because they are common words and simple to use. This indicates a dependence on clear and familiar language. While this may help with clarity, it also shows a lack of variation, which might limit the discourse's diversity.

Based on the findings, this study suggests that research writers in both disciplines should incorporate a greater variety of words and categories when using MDMs in the introduction and literature review sections. Writers could benefit from diversifying their use of MDMs by incorporating a broader range of Interactional markers, such as Attitude Markers or more frequent self-mentions. This would improve the communicative effectiveness of their writing, make their research more interesting, and connect it more closely with the broader standards of academic discourse, where the writer's voice and interaction with the reader are critical.

CHAPTER V

CONCLUSION, LIMITATIONS, IMPLICATIONS, AND RECOMMENDATIONS

Conclusion

The present study aimed at investigating the differences between Humanities and Social Sciences and Science and Technology articles in the use of Interactive and Interactional MDMs based on Hyland's (2005) taxonomy of MDMs in the introduction and literature review sections of 40 English research articles published in Naresuan University (NU) Journals between 2019 and 2022. According to the findings, the research authors of Humanities and Social Sciences used Interactive category markers more frequently and with a greater variety of words than Interactional category markers. For Science and Technology authors, Interactive category markers were employed more frequently and with a greater variety of words than Interactional category markers. Overall, each group of authors applied Interactive Markers more than Interactional Markers.

Limitations of the study

There were certain limitations apparent in this study that future research could address. The corpus was confined to a small number of research articles, with a focus solely on the introduction and literature review sections and within the same institutional journal. Future research should collect more data in the discussion and/or the entire research section, as well as across other journals so that the results are more diverse. Despite the limited data, this work can demonstrate differences in the utilization of MDMs across the two different disciplines. Nonetheless, it is advisable that more comprehensive investigations into the application of MDMs be undertaken, potentially incorporating qualitative data from authors, which would better serve the research objectives.

Implications of the study

The findings of this study have important implications for the teaching and practice of academic writing, particularly for EFL and ESL writers. By providing insights into the use of MDMs, this study offers a practical tool to help writers improve their understanding of coherence and cohesion. For EFL and ESL writers, who may struggle with these concepts, familiarity with MDMs can enhance their ability to produce more cohesive and coherent texts, thus improving the clarity of their communication.

Moreover, the findings indicate that authors across disciplines, including Humanities, Social Sciences, Science, and Technology, tend to use MDMs almost equally in their research articles, with both groups showing a preference for Interactive MDMs. This highlights the need for academic writing instruction to focus on the conventions of MDM usage specific to different fields. Teachers and researchers should emphasize the importance of Interactive and Interactional MDMs, which were found to be used more frequently and with greater variety than Interactional MDMs, especially in disciplines like Humanities, Social Sciences, and Science and Technology.

Recommendations for further research

The findings from this research can contribute to academic writing as they underscore the significance of discipline-oriented MDMs. The use of MDMs should be explicitly taught to help academics and research writers effectively communicate their ideas and engage with scholarly discourses in their chosen discipline. By using discipline-oriented MDMs, writers can convey their understanding of the subject matter, engage with existing research, and express their own perspective in a way that is relevant and meaningful to readers in that discipline.

For those who are preparing their manuscripts for publication submission, the findings imply that writers in these two disciplines pay more attention to the use of MDMs in the introduction and literature review sections as MDMs serve as the basis for comprehension of the article essence as well as facilitating connection between the authors and the readers. Effective use of MDMs would enhance better

understanding of the research articles' objectives and propositions of the study. In each discipline, the variety of different discourse markers appear to exist, underscoring the need for research articles authors to acknowledge and adhere to the established conventions in academic articles.

REFERENCES

REFERENCES

Ädel, A. (2006). *Metadiscourse in L1 and L2 English (Vol. 24).* John Benjamins Publishing.

Ahmed, A. A. M. (2022). Academic writing: Types, elements, and strategies. IJLHE: International Journal of Language, Humanities, and Education, *5*(2), 61–70.

Alzarieni, M. M., Zainudin, I. S., Awal, N. M., & Sulaiman, M. (2019). Interactional Metadiscourse markers in the abstract sections of Arabic patents. *Arab World English Journal*, *10*(2), 379–393. https://doi.org/10.24093/awej/vol10no2.29

Al-Rubaye, M. H. K. (2015). Metadiscourse in the Academic writing of EFL and ESL Arabic-Speaking Iraqi Graduate Students. (Masters dissertation). *Missouri State University*. https://core.ac.uk/download/pdf/233952349.pd

Bailey, S. (2014). *Academic writing: A handbook for international students.* Routledge.

Biber, D., & Gray, B. (2016). *Grammatical complexity in academic English: Linguistic change in academic writing.* Cambridge University Press.

Birhan, A.T. (2021). An Exploration of Metadiscourse usage in book review articles across Three Academic Disciplines: A Contrastive Analysis of Corpus-Based Research Approach. *Scientometrics 126*, 2885–2902. https://doi.org/10.1007/s11192-020-03822-w

Burke, S. B. (2010). *The construction of writer identity in the academic writing of Korean ESL students: A qualitative study of six Korean students in the US*. Indiana University of Pennsylvania.

Cao, F., & Hu, G. (2014). Interactive Metadiscourse in research articles: A comparative study of Paradigmatic and Disciplinary influences. *Journal of Pragmatics, 66*, 15–31.

Capar, M., & Turan, Ü. D. (2020). Interactional Metadiscourse in research articles written by Turkish and Native Speakers. *Anadolu Journal of Educational Sciences International, 10*(1), 324-358.

Crismore, A., Markkanen, R., & Steffensen, M. S. (1993). Metadiscourse in persuasive writing: A study of texts written by American and Finnish university students. *Written communication, 10*(1), 39-71. https://doi.org/10.1177/0741088393010001002

Estaji, M., & Vafaeimehr, R. (2015). A comparative analysis of Interactional Metadiscourse markers in the introduction and conclusion sections of mechanical and electrical engineering research papers. *Iranian Journal of Language Teaching Research, 3*(1), 37–56. https://doi.org/10.30466/ijltr.2015.20401

Evans, D., Gruba, P., & Zobel, J. (2011). *How to write a better thesis.* Melbourne University. Publishing.

Flowerdew, J. (2014). English for research publication purposes. In B. Paltridge & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 301–321). Chichester: Wiley-Blackwell

Fraser, B. (2015). The combining of Discourse Markers–A beginning. *Journal of Pragmatics*, *86*, 48-53.

Ghahremani Mina, K., & Biria, R. (2017). Exploring Interactive and Interactional Metadiscourse markers in discussion sections of social and medical science articles. *International Journal of Research in English Education, 2*(4), 11-29. http://dx.doi.org/10.29252/ijree.2.4.11

Gholami, J., & Ilghami, R. (2016). Metadiscourse markers in biological research articles and journal impact factor: Non-native writers vs. native writers. *Biochemistry and Molecular Biology Education, 44*(4), 349-360. https://doi.org/10.1002/bmb.20961

Graff, G., & Birkenstein, C. (2006). *They Say / I Say: The Moves That Matter in Academic Writing.* W.W. Norton & Company.

Grogan, K. E. (2021). Writing Science: What Makes Scientific Writing Hard and How to Make It Easier. *Bull Ecol Soc Am, 102*(1): e01800. https://doi.org/10.1002/bes2.1800

Hart, C. (2009). *Doing a Literature Review - Releasing the Social Science Research Imagination*. London et al.: SAGE Publications.

Hartley, J., & Bruckmann, S. (2021). *Academic Writing and Publishing: A Practical Handbook*. Routledge.

Hayisama, F., Shah, M. I. A., & Adnan, W. N. A. W. (2019). Rhetorical style across cultures: An analysis of Metadiscourse markers in Academic writing of Thai and Malaysian students. *LSP International Journal, 6*(1). https://doi.org/10.11113/lspi.v6n1.76

Healey, S. P. (2009). *The rise of creative writing and the new value of creativity.* University of Minnesota.

Hodges, B. D., Kuper, A., & Reeves, S. (2008). Qualitative Research: Discourse Analysis. *BMJ: British Medical Journal*, *337*(7669), 570–572. http://www.jstor.org/stable/20510756

Hopkins, A., & Dudley-Evans, T. (1988). A genre-based investigation of the discussion sections in articles and dissertations. *English for specific purposes*, *7*(2), 113-121.

Hyland, K. (2005). *Metadiscourse: Exploring interaction in writing*. Continuum. London, UK.

Hyland, K. (2005). Stance and engagement: A model of interaction in academic discourse. *Discourse studies, 7*(2), 173-192.

Hyland, K. (2008). Genre and Academic writing in the Disciplines. *Language Teaching, 41*, 543-562. https://doi.org/10.1017/S0261444808005235

Hyland, K. (2011). *Academic discourse. In Hyland, K. & Paltridge, B. (eds.) Continuum Companion to Discourse Analysis.* London: Continuum. pp 171-184

Hyland, K. (2018). *Metadiscourse: Exploring interaction in writing*. Bloomsbury Publishing.

Hyland, K., & Tse, P. (2004). Metadiscourse in Academic writing: A reappraisal. Applied linguistics, *25*(2), 156-177. https://doi.org/10.1093/applin/25.2.156

Khajavy, G. H., Asadpour, S. F., & Yousefi, A. A. (2012). A comparative analysis of Interactive Metadiscourse features in discussion section of research articles written in English and Persian. *International Journal of Linguistics, 4*(2). https://doi.org/10.5296/ijl.v4i2.1767

Kirişçi, D. I., & Duruk, E. (2022). A comparative study of Metadiscourse markers in the abstract sections of research articles written by Turkish and English researchers. *Shanlax International Journal of Education, 10*(4), 101–114. https://doi.org/10.34293/education.v10i4.5171

Kobayashi, Y. (2016). Investigating Metadiscourse markers in Asian Englishes: A corpus-based approach. *Language in Focus Journal, 2*(1), 19-35. https://doi.org/10.1515/lifijsal-2016-0002

Kopple, W. J. V. (1985). Some exploratory Discourse on Metadiscourse. *College Composition and Communication, 36*(1), 82. https://doi.org/10.2307/357609

Lipson, C. (2005). *How to write a BA thesis: A practical guide from your first ideas to your finished paper.* Chicago: The University of Chicago Press.

Mazidah, E. N. (2019). A comparison of the Interactive Metadiscourse in the abstracts of articles written by Indonesian and NES Scholars. *Etnolingual Journal, 3*(1), 57-73.

Miller, R. E., & Jurecic, A. (2019). *Habits of the Creative Mind.* Bedford/St. Martin's.

Mohamed, A. M. (2020). Meta-discourse use of Egyptian researchers writing English research articles for international publication. *Cairo Studies in English, 2020*(1), 158-179.

Muller, N. (Ed.). (2005). *Multi-Layered Transcription.* Plural Publishing.

Muller, J., & Hansen, K. (2015). *Writing in the Social Sciences.* Oxford University Press.

Nugrahani, V. E., & Bram, B. (2020). Metadiscourse markers in scientific journal articles. *Langkawi: Journal of The Association for Arabic and English, 6*(1), 1-16.

Nur, S., Arsyad, S., Zaim, M., & Ramadhan, S. (2021). Interacting with Readers: How nonnative authors of English use Meta-Discourse markers in their research article abstracts published in English Medium Journals. *Journal of Language and Linguistic Studies, 17*(1), 239-255.

Pautasso, M. (2013). Ten simple rules for writing a literature review. *PLOS Computational Biology, 9*(7), e1003149. https://doi.org/10.1371/journal.pcbi.1003149

Prasetyanti, D. C., Tongpoon-Patanasorn, A., & Sahan, A. (2023). Analyzing Metadiscourse markers in introduction chapters of dissertation in various disciplines. *In 1st Lawang Sewu International Symposium on Humanities and Social Sciences 2022 (LEWIS 2022)* (pp. 386-398). Atlantis Press.

Pooresfahani, A. F., Khajavy, G. H., & Vahidnia, F. (2012). A contrastive study of Metadiscourse elements in research articles written by Iranian applied linguistics and engineering writers in English. *English Linguistics Research, 1*(1), 88-96.

Redeker, G. (2006). Discourse markers as attentional cues at Discourse transitions. In *Approaches to discourse particles* (pp. 339-358). Brill.

Sajid, M., & Siddiqui, J. A. (2015). Lack of Academic writing skills in English language at higher education level in Pakistan: causes, effects, and remedies. *International Journal of Language and Linguistics, 2*(4), 174-186.

Saraswati, B., & Pasaribu, T. A. (2019). Metadiscourse markers and gender variation in journal articles. *SKASE Journal of Theoretical Linguistics, 16*(4). https://www.researchgate.net/publication/338096373_Metadiscourse_markers_and_gender_variation_in_journal_articles_SKASE_Journal_of_Theoretical_Linguistics_2019_Volume_16_No_4

Sorahi, M., & Shabani, M. (2016). Metadiscourse in Persian and English research article introductions. *Theory and Practice in Language Studies*, 6(6), 1175.

Suksawas, W. (2016). Gender-based study of Thai learners' Metadiscourse in writing for journalism. *LEARN Journal: Language Education and Acquisition Research Network, 9*(2), 173–187. Retrieved from http://files.eric.ed.gov/fulltext/EJ1229514.pdf

Suntara, W., & Chokthawikit, S. (2018). Interactional Metadiscourse in research article abstracts: An analysis from public health journals. *Language and Linguistics, 36*, 31-52.

Swales, J. M. (2004). *Research Genres: Exploration and Application.* Cambridge: Cambridge University Press. http://dx.doi.org/10.1017/CBO9781139524827

Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: essential tasks and skills* (3rd ed.). University of Michigan Press.

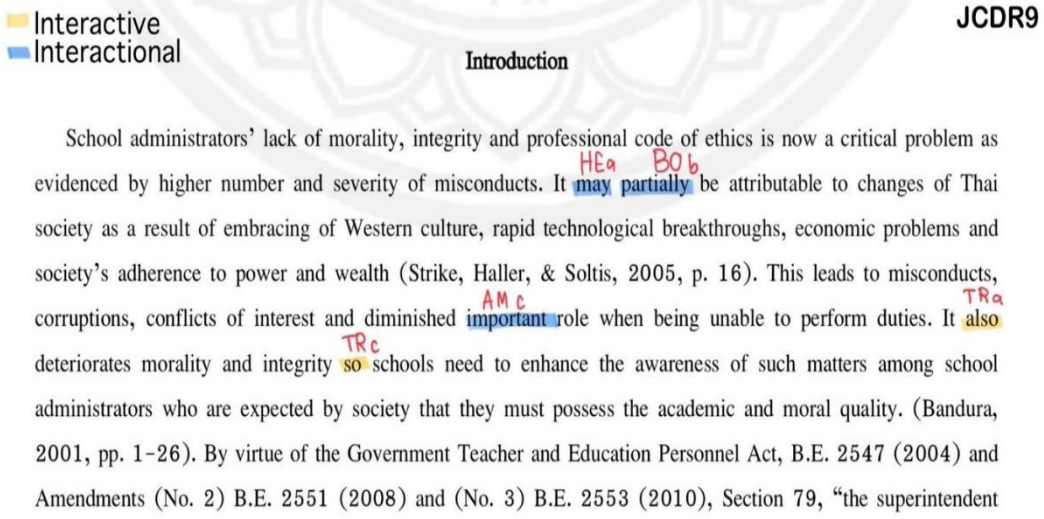
Swales, J. M., & Swales, J. (1990). *Genre analysis.* Cambridge university press.

APPENDIXS

Appendix A Example of the MDMs were counted and classified

Data Analysis

Examples of the MDMs were counted and classified into their respective groups based on the main framework. The number of MDMs was counted and classified individually, word by word, by highlighting the words with different colors in two types: Interactive highlighted in yellow and Interactional highlighted in blue, marked with the abbreviation of proposed categories. Subsequently, all the words were compiled into a table (see in Appendix B). The total number of words was then calculated using Excel to determine the frequency and percentage of each type.



shall prepare himself as role model of his subordinates and shall have the duty to develop his subordinates to have suitable knowledge, skill, attitude, merit, morality, integrity and professional code of ethics in the performance of public service effectively and efficiently". Besides, for Section 80, "the development program shall be provided for government teacher and education personnel before appointing them to some positions or academic standings in order to strengthen their suitable knowledge, skill, attitude, morality, integrity and professional code of ethics in the performance of official service effectively and efficiently and progress of public service" (OTEPC, 2019).

According to National Education Plan B.E. 2560-2579 (2017-2036), most Thais have problems concerning morality, integrity and unawareness of the importance of discipline, honesty and public mind in steering National Education Plan. The promotion of school administrators' morality, integrity and academic and managerial abilities according to position standards, good-governance-based administration and public mind or social responsibility should be focused (Ministry of Education, 2017) to enable learners to enjoy happy post-graduation life in society. Regarding strategies of Ministry of Education (2017), school administrators play an important role of social responsibility in enhancing morality, integrity, citizenship and global citizenship. The sufficiency economy philosophy is concretely applied to educational system and teacher professional development in the expectation that teachers adhere to professional code of ethics and professional standards (Government Gazette, 2013).

JCDR9

Social responsibility role of schools in Thailand influences their image without depending on advertisement because social responsibility activity or project is a tool for communicating and promoting acceptance of target groups, communities and stakeholders. Hence, there is the main policy in which corporate social responsibility (CSR) is applied to school administration within the framework of schools' direct and indirect responsibilities towards stakeholders' lifestyle and related environmental settings. It is an important duty to be concretely performed (Ministry of Education, 2020, pp. 1-3) for the benefit and sustainable development of relevant people in all school-related sectors in Thailand. The Ministry of Education, as a main unit responsible for all levels of education for youth, should supports CSR concept in Thai school context. For example, the action plan may be introduced for suitable development of morality and awareness of Thainess. Young people are nurtured into quality citizens and manpower for future development of Thailand (Roekkhao, 2015; Chankai, 2014; Sornsuwan, 2013). The schools' instruction for promoting CSR is a new issue so school administrators must understand relevant principles and methods for raising the awareness of importance of social responsibility activities. This will create the new culture in which schools have sustainable quality and standards with the creative increase of efficiency of administration by school administrators leading to development of school administrators' morality and integrity (Stefkovich, 2013, p. 97).

Interactive Interactional

Introduction

People in Generation Y (Gen Y) account for the proportion of 32% or around 1/3 of global populations. Asia has the most Gen Y population lodging over 1 billion which account for 86% of Gen Y globally. Moreover, people in Gen Y are the group of high incomes and purchasing power. They are also likely to become the ones who will determine the world trend in the next 20 years. People in Gen Y are the population who were born during B.C. 1981-2000 or B.E. 2524-2543, which was the era of dynamic technological changes (Anuratpanich, 2016; Thansettakij, 2017; Siam Commercial Bank, n.d.). These have made people who work in economic and social field put more emphasizing on Gen Y, by trying to understand the life style behaviors of Gen Y, since they will become the leaders of the next generation for the development of the digital world (Mongkol, 2020).

In consideration respectively to Thailand, it was found that Thailand has been passed through the Aged Society since 2005 and will completely be the Aged Society in 2021, with the anticipation that Thai population who are over 60 years old will account for 20% of the population proportion, and in 2031, the proportion will rise to 28% as the Supreme Aged Society (Post Today, 2020).

In developing social responsibility components in terms of morality, integrity and professional code of ethics, it concerns many integrated sub-variables to reflect attributes of social responsibility. Some of them are acquired through interviews with experts, while possibility of implementation is verified to determine weight of importance of sub-variables for continuous, directional and systematic development of administrators. This will help them become qualified people and respond to the needs of schools and all stakeholders. The development of school administrators' social responsibility in terms of morality, integrity and professional code of ethics will generate the body of knowledge that can be translated into practice. The author will develop all sub-variables according to the developed model. Interviews of school administrators and other stakeholders are a key for analyzing factor loading of which validity and theoretical consistency with empirical data are verified. Due to the said importance, the authors are interested in making interviews of school administrators to pave the way to development of morality, integrity and professional code of ethics of school administrators in Thailand. This is to reflect findings, which is the body of knowledge and innovation that direct school administrator development and development plan and school strategy formulation in response to goals of society and country.

Therefore, people in Gen Y have been the most proportion of work-force age and the group of population with the highest expectation to be the driven force for national development and as the anchors for looking after the increasing aged people in the future (Money and Banking Thailand, 2020).

However, the survey results concerning financial under the pilot project to educate financial matter to Gen Y, who have just started their careers conducted by Asian Development Bank cooperating with Thai National Bank in 2017, it was found that Gen Y had been aware that saving was essential but they were unable to do it. They were likely to purchase or a pay first save later. They did not take enough priority to saving as well. Furthermore, the Research and Development center for experience and information of TMB clients revealed the study results in 2018 under the title "Thai people have less than 6 months spare earnings when stop working". It was found that Gen Y had the difficulties of lacking saving with less than 6 months saving to spend and that around 80% of Thai people accounted for 28 million people, had savings to spend less than 6 months long. They had the behavior of pay first and save later and they never had any of the retirement plan (Thai PBS News, 2018). Likewise, the TMB Analytics center revealed the study results of financial behaviors collecting data from social media concerning Gen Y, it was found that most Gen Y had dreamed of better and more secure future; having their own houses, cars and saving money, however, it had still been too far to become true. The main reason was the cost trap or known as "the Must Have" which caused Gen Y to waste their money each year accumulated for 1.37 trillion Baht, accounted for 13% of GDP. It is comparable to the investment value in EEC in 5-year period or 8 times of investment in High-Speed Train Project connecting 3 airports (TMB Bank, 2019).

For the previous review of body of knowledge from researches concerning saving, it was found that the factors for anticipating savings were attitudes, marketing mix and parental socialization (Technical Promotion and Support Office 1-12, Ministry of Social Development and Human Security, 2016; Karunapen, 2017; Alwi et al., 2015). However, the body of knowledge concerning peer influence was scarcely mentioned even though Gen Y were already in early adult period in the age between 20-40 years old (Thammabus, n.d.). People at this age are in the beginning of their careers, less dependent on their parents or family and let their friends to take more role in place of their family (Chaisinthop, 2014). Moreover, the body of knowledge concerning Product Innovation was also scarcely mentioned even though it is currently in the era of Internet of Things, which significantly involves daily life resulting in the dynamic changes of behaviors and Gen Y rely more on technology and prefer to work via online for their financial planning and receiving information and news because Gen Y are digital natives who have grown up using IT devices and communication technology for entertainment and financial arrangement.

Furthermore, according to previous researches, it was found that Gen Y had saving covering for spending less than 6 months and if Thailand expected Gen Y to become the driven force for the country development and the ones who would look after increasing aged people or the elderly in the future, their savings were an immunity for self-reliance in the future in case of unexpected event occurrence and for supporting their living expenses during unemployment, especially after retirement or in their old age to avoid being the burden on their children and society. Therefore, the researcher decided to study on the factors affecting savings of Gen Y in Bangkok in order to gain information enhancing and fostering saving discipline which is essential for financial security in life and good quality of life in the long run. As saving is important to financial security enhancement for Gen Y people and low-income people to take part in helping themselves and also for general people to have

Interactive
Interactional

NUJST6

Introduction

Chronic wounds harm the healthcare economy of a country, especially in developing countries such as Thailand where resources are poor and funding is very limited. Where living expenses for most Thai people is 300 baht per day, the cost of wound dressing is approximately 140 baht per time, which does not include travel expenses or having to take time off, which severely impacts the lives of Thai patients with a chronic wound, which means that proper care of the wound is often not available, thus exacerbating the situation. Chronic wounds are defined as wounds that fail to proceed through the normal phases of wound healing in an orderly and timely manner but remain in the inflammation phase of healing (Guo & DiPietro, 2010). Wound healing is a complex process where immunohistochemistry, tissue regeneration and remodeling are predominant events (Ekor, 2014). Various factors affect wound healing such as the onset of infection, the wound site, the development of reactive oxygen species, the mechanism of wound healing, and patient age, diet and standard of personal care by the patient (Guo & DiPietro, 2010). A good understanding of these factors and their probable influence on wound healing is important, if not imperative, in the development of therapeutic agents for wound healing in patients.

Traditional medicines based on medicinal plants and medical procedures have been used to treat wounds of various kinds for generations but are only recently being seen as showing an equal ability to modern medicine and drawing the attention of medical practitioners (Ekor, 2014). The use of traditional medicine is determined by various factors such as availability, affordability, and its firm embedment in the beliefs of people

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(Payyappallimana, 2010). In Thailand, several plants are widely available and have significant medicinal benefits including wound healing properties, such as *Aloe vera* (Hekmatpou, Mehrabi, Rahzani, & Aminiyan, 2019) and *Curcuma longa* L. (Akbik, Ghadiri, Chrzanowski, & Rohanizadeh, 2014) which can be used as an alternative treatment.

The *Dioscorea bulbifera* Linn (Family: Dioscoreaceae) is known as an air potato. This plant grows in many locations in Thailand and is colloquially known as 'Wan Phra Chim'. Traditionally, its bulbils have been widely used not only in Thai folk medicine but also in Indian and Chinese folk medicine, and as far away as Cameroon in West Africa, as a diuretic and anthelmintic, in longevity preparations, for wound and inflammation treatment, and to treat sore throat, gastric cancer and rectal carcinoma (Ghosh et al., 2012; Mbiantcha et al., 2011). In addition, a previous study found that crude extracts of this plant possess an anti-inflammatory effect that reduces paw edema (Mbiantcha et al., 2011) and *Dioscorea bulbifera* Linn. enhanced the rate of wound contraction (Panduraju, Bitra, Vemula, & Reddy, 2010).

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In our study, Wan Phra Chim was developed in gel form at U Thong Hospital, Suphanburi Province in Thailand, where it was used in chronic wound patients under the supervision of a doctor. The treatment showed good results for wound healing which was similar to the successful results reported in a previous study that found that Wan Phra Chim contained a compound associated with anti-inflammatory activity, wound healing and had an antioxidant effect (Chaniad, Tewtrakul, Sudsai, Langyanai, & Kaewdana, 2020). Importantly, 50 gm of Wan Phra Chim gel cost 100 baht and is a sufficient quantity to treat wounds for 1-2 weeks depending on the size of the wound. This low cost, and the fact that the wound treatment with the gel can be applied by the patients in their homes, make this a low-cost treatment, particularly when travel costs, times away from work, and medical costs are no longer incurred.

However, there is a dearth of research studies that provide evidence of the efficacy of this medication which would support its inclusion in the national list of major drugs; the effect of *Dioscorea bulbifera* Linn on safety and wound healing activity is not yet fully understood. As a result, the purpose of the current study was to assess patient reporting of ADRs arising from the use of this medication as well as to provide proof of the primary efficacy of Wan Phra Chim gel on wound healing. One aspect of the research procedure was to have 10 participants take photos of the treatment's effect to provide additional supporting information to the Food and Drug Administration's review committee in the future.

Interactive Interactional

Introduction

Dyes have been used extensively in various industries such as cosmetics, paper, printing, textile, leather, rubber, and food. The discharge of dyes into water sources without treatment results in water pollution which is important environmental problems (Kumar, Chaudhary, & Verma, 2013; Vanaamudan, Chavada, & Padmaja, 2016). Most dyes are organic compounds which have complicated aromatic molecular structure (Achmad, Kassim, Suan, Amat, & Seey, 2012). Therefore, dyes are stable to sunlight, chemicals and microorganism and difficult to biodegrade (Seey & Kassim, 2012; Vijayakumar, Tamilarasan, & Dharmendirakumar, 2012; Dehvari, Ghaneian, Ebrahimi, Jamshidi, & Mootab, 2016). The presence of dyes in water sources reduces sunlight penetration affecting the photosynthetic process of aquatic life (Sun, Zhang, Wang, & Wu, 2013). Furthermore, many dyes are highly toxic and carcinogenic causing a danger to human and animal health (Yagub, Sen, Afroze, & Ang, 2014; Vital, Saibaba, Shaik, & Gopinath, 2016). Methylene blue is a cationic dye (basic dye) that is widely applied in the textile industry for dyeing materials such as silk, cotton, and wool. Even though methylene blue is not severely toxic, it can cause various harmful effects. The side effects of methylene blue include profuse sweating, nausea, chest pain, abdominal pain, headache, vomiting, diarrhea, dizziness and increased heart rate (Hameed, Mahmoud, & Ahmad, 2008; Fil, Özmetin, & Korkmaz, 2012; Afroze, Sen, Ang, & Nishioka, 2015). Thus, the removal of methylene blue from wastewater is important to the environment and living organisms.

The conventional techniques for the removal of dyes from wastewater include coagulation, chemical oxidation, chemical precipitation, adsorption, electrochemical, ozonation, membrane separation process, and biological treatment. Among these techniques, the adsorption process is the most commonly used because of its

low costs, easy operation, and high efficiency (Tichaona, Viola, Olindah, & Munyaradzi, 2013; Mahmoud et al., 2016). The characteristics of adsorbent resulting in the effective adsorption consist of high porosity, large specific surface area, and small particle size. At present, low-cost adsorbents, produced from industrial waste, agricultural waste and natural materials such as sawdust, corncob, rice husk, hazelnut shell, fly ash, red mud, wood, pine bark, cotton, peat, clay, etc., have been used for the removal of numerous dyes (Gupta & Suhas, 2009).

The cajeput tree (*Melaleuca cajuputi* Powell), also called paperbark tree, milk wood, or swamp tree, is a perennial tree of Myrtaceae family. Cajeput trees can be grown in swampy areas of the southeastern, southwestern and southern Thailand which commonly known as White Samet. The bark of cajeput tree is whitish or grayish brown, layered, papery, and spongy. The specific properties of cajeput tree bark are insulative, waterproof, and durable. Therefore, cajeput tree bark has already been used in several beneficial applications such as house wall material, caulking boat, and roofing material (Abdullah et al., 2001; Nuyim, 2002; Veeramani et al., 2015). Moreover, it is a good choice for use as a low-cost adsorbent due to its porous tree bark.

This study aims to investigate the ability of cajeput tree bark, as a low-cost adsorbent, for the removal of methylene blue from aqueous solutions. The effects of various parameters such as pH, contact time and initial concentration were examined by batch experiments. Besides, the isotherm and kinetics of methylene blue adsorption onto cajeput tree bark were also evaluated.

Appendix B

Table 4 The use of Metadiscourse markers in Humanities and Social Sciences and Science and Technology (including words)

Category		Metadiscourse Markers	Humanities and Social Sciences (JCDR)		Science and Technology (NUJST)	
			F	P	F	P
Interactive						
Transitions (TR)	a) Addition	additionally	1	0.40	0	3.24
		also	19	7.66	8	2.43
		as well as	4	1.61	6	1.21
		besides	3	1.21	3	1.21
		further	6	2.42	3	2.02
		furthermore	8	3.23	5	3.64
		in addition	9	3.63	9	2.43
		moreover	14	5.65	6	0.81
	b) Comparison	although	1	0.40	2	0.40
		conversely	0	0	1	0.40
		even though	2	0.81	1	6.48
		however	15	6.05	16	0.81
		likewise	1	0.40	2	1.62
		on the other hand	0	0	4	0
		similarly	2	0.81	0	0
		whereas	1	0.40	0	3.24
	c) Consequence	as a result	4	1.61	6	2.43
		because	1	0.40	4	1.62
		consequently	7	2.82	2	0.81
		correspondingly	0	0	1	0.40
		hence	4	1.61	2	0.81
		in consequence	1	0.40	0	0
		nevertheless	5	2.02	1	0.40
		nonetheless	0	0	1	0.40
		since	7	2.82	2	0.81
		so	5	2.02	1	0.40
		therefore	14	5.65	17	6.88
		thus	2	0.81	7	2.83
Total			**136**	**54.84**	**110**	**44.53**
Frame Markers (FM)	a) Sequencing	first	3	1.21	2	0.81
		firstly	0	0	1	0.40
		finally,	1	0.40	0	0
		last	1	0.40	0	0

		lastly	2	0.81	0	0
		next	1	0.40	0	0
		second	1	0.40	1	0.40
		subsequently	2	0.81	0	0
	b) Label States	so far	1	0.40	2	0.81
	c) Announce Goals	aim	7	2.82	7	2.83
		decided to	1	0.40	0	0
		focus on	8	3.23	5	2.02
		interested in	2	0.81	3	1.21
		objective	0	0	8	3.24
		purpose	0	0	4	1.62
	d) Shift Topic					
Total			**30**	**12.10**	**33**	**13.36**
Endophoric Markers (ED)		x above	3	1.21	4	1.62
		for section x	1	0.40	0	0
Total			**4**	**1.61**	**4**	**1.62**
Evidential Markers (EV)		according to	13	5.24	5	2.02
		explained	1	0.40	2	0.81
		defined	2	0.81	3	1.21
		discussed	0	0	2	0.81
		found that	5	2.02	5	2.02
		highlighted	2	0.81	0	0
		mentioned	2	0.81	0	0
		presented	1	0.40	5	2.02
		proposed	1	0.40	5	2.02
		reported	1	0.40	6	2.43
		researched	3	1.21	0	0
		revealed	6	2.42	2	0.81
		show that	0	0	4	1.62
		stated that	2	0.81	0	0
		studied	4	1.61	1	0.40
		supported	2	0.81	0	0
Total			**45**	**18.15**	**40**	**16.19**
Code Glosses (CD)		called	0	0	6	2.43
		defined as	1	0.40	1	0.40
		e.g.,	1	0.40	0	0
		for example	1	0.40	6	2.43
		for instance	3	1.21	1	0.40
		known as	6	2.42	5	2.02
		namely	2	0.81	0	0
		refer to	1	0.40	0	0
		such as	17	6.85	41	16.60
		via	1	0.40	0	0

Total			**33**	**13.31**	**60**	**24.29**
Total			**248**	**100**	**247**	**100**
	Interactional					
Hedges (HE)	a) Epistemic Verbs	appear	1	0.54	0	0
		indicate	4	2.16	2	1.38
		can	0	0	1	0.69
		could	2	1.08	3	2.07
		may	16	8.65	9	6.21
		might	0	0	1	0.69
		suggest	2	1.08	2	1.38
		tend to	0	0	3	2.07
	b) Probability Adverbs	about	0	0	6	4.14
		almost	0	0	1	0.69
		approximately	2	1.08	3	2.07
		around	3	1.62	1	0.69
		frequency	0	0	2	1.38
		generally	2	1.08	0	0
		likely	5	2.70	1	0.69
		mainly	2	1.08	2	1.38
		mostly	3	1.62	3	2.07
		often	4	2.16	4	2.76
		nearly	2	1.08	0	0
		never	1	0.54	0	0
		relatively	1	0.54	1	0.69
	c) Epistemic Expressions	most	21	11.35	17	11.72
		probable	0	0	1	0.69
		possible	0	0	2	1.38
Total			**71**	**38.38**	**65**	**44.83**
Boosters (BO)	a) Intensifier Verbs	found	13	7.03	14	9.66
		know	1	0.54	3	2.07
		show	2	1.08	6	4.14
	b) Intensifier Adverbs	always	4	2.16	1	0.69
		clearly	1	0.54	0	0
		completely	2	1.08	0	0
		concretely	4	2.16	0	0
		in fact	0	0	1	0.69
		never	1	0.54	0	0
		obviously	1	0.54	0	0
		partially	1	0.54	0	0
		scarcely	2	1.08	0	0
	c) Intensifier Adjectives					
Total			**32**	**17.30**	**25**	**17.24**
Attitude Markers	a) Attitude Verbs	expect	0	0	1	0.69

(AM)	b) Attitudinal Adverbs	appropriately	0	0	1	0.69
		especially	10	5.41	10	6.90
		even x	2	1.08	1	0.69
		importantly	1	0.54	1	0.69
		interestingly	0	0	1	0.69
		particularly	0	0	1	0.69
		significantly	3	1.62	4	2.76
		unfortunately	0	0	2	1.38
		usually	1	0.54	3	2.07
	c) Attitudinal Adjectives	appropriate	0	0	1	0.69
		better	1	0.54	0	0
		essential	1	0.54	0	0
		important	14	7.57	13	8.97
		creative	1	0.54	0	0
		good	2	1.08	4	2.76
		significant	4	2.16	5	3.45
Total			**40**	**21.62**	**48**	**33.10**
Engagement Markers (EM)	a) Reader Pronoun					
	b) Interjection					
	c) Directive Imperatives	key	5	2.70	1	0.69
		note that	2	1.08	0	0
	d) Obligation Modals	must	4	2.16	0	0
		should	12	6.49	2	1.38
		would	0	0	1	0.69
Total			**23**	**12.43**	**4**	**2.76**
Self-Mentions (SM)		the author	3	1.62	1	0.69
		the researcher	12	6.49	1	0.69
		our	4	2.16	1	0.69
Total			**19**	**10.27**	**3**	**2.07**
Total			**185**	**100**	**145**	**100**

Note: F: Frequency P: Percentage