UNIVERSITY OF CAPE COAST

GRAMMATICAL METAPHOR IN ACADEMIC WRITING: FUNCTIONAL DIVERSITY OF PROCESS NOMINALISATION IN RESEARCH ARTICLE ABSTRACTS ACROSS DISCIPLINES

BY

EBENEZER AGBAGLO

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature…… Date: …….

Name: Ebenezer Agbaglo

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature …… Date ……

Name: Prof. Joseph Benjamin Archibald Afful

Co-Supervisor's signature…… Date……

Name: Prof. Kwabena Sarfo Sarfo-Kantankah

ABSTRACT

In the past few decades, studies on research article (RA) abstracts have, largely, focused on their rhetorical organisation, with little attention paid to their linguistic features. The present study, therefore, investigates the use of process nominalisations as grammatical metaphor in Applied Linguistics, Economics, and Biology RA abstracts. Backed by systemic functional linguistics (SFL), specifically the theory of grammatical metaphor, the study, firstly, investigates the semantic choices made across the three disciplines in terms of process nominalisations and, secondly, examines the functions of process nominalisations in the discourse semantics stratum. Data for the study comprised 120 RA abstracts, 40 from each of the selected disciplines, published in a period of five years (2014-2018), and collected from the websites of six prestigious journals, two each from the disciplines investigated. Employing qualitative content analysis, specifically the directed and summative approaches, as its research design, the study revealed that, in Applied Linguistics and Economics, nominalised creative material processes have presumed human actors, suggesting that in these two disciplines, coming into existence is explained as happening through human agency. This contrasts with the use of such nominalisations in Biology, where creation is seen as happening as a result of some natural processes. Another interesting finding is the high use of nominalised verbal processes in Applied Linguistics, compared to the other disciplines studied. Concerning the functions of process nominalisations, the study revealed that process nominalisations are used, ideationally, to create taxonomy, interpersonally, to appraise, and, textually, to achieve cohesion. While the study provides empirical support to SFL theory, it also has implications for studies on nominalisation, disciplinary variation studies, and writing pedagogy.

KEY WORDS

Disciplinarity

Discourse semantics

Grammatical metaphor

Nominalisation

RA abstract

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DEDICATION

To all religious humanists around the world

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LIST OF ACRONYMS

AD	Academic discourse
AW	Academic writing
CARS	Create A Research Space
CETA	Corpus of English Texts in Astronomy
EAP	English for Academic Purposes
EFL	English as a Foreign Language
GM	Grammatical Metaphor
IF	Impact Factor
IMRD	Introduction, Method, Results, and Discussion
RA	Research article
SLF	Systemic functional linguistics
TLMs	Teaching and learning materials

CHAPTER ONE

INTRODUCTION

Introduction

The present study is a linguistic investigation of nominalisations in academic writing (AW), focusing on research article (RA) abstracts. This chapter provides the background to the study, formulates the research problem, and presents the research questions. The significance of the study is also noted in this chapter. Additionally, the delimitation of the study and the organisation of the study are presented in this chapter.

Background to the Study

Studies on academic discourse (AD) have grown considerably (Fortanet, 2005). The earliest studies on AD (e.g. Barber, 1988 [1962]; Halliday, Strevens, & McIntosh, 1964; Huddleston, 1971) were quantitative in nature, exploring the formal features of academic discourse in general, without focusing on specific genres. Huddleston (1971), for instance, explored the linguistic properties of scientific English, in general. Today, research on AD has narrowed its focus on specific spoken and written genres (such as lectures, conference presentations, text books, theses, and research articles) in specific disciplines. Focusing on syntactic forms, rhetorical organisation, and communicative purpose, such studies tend to incorporate large corpora (Hyland, 2009).

Research on AD, particularly English for Academic Purposes (EAP), since its inception, has focused traditionally on preparing non-native speakers for study in English (Flowerdew, 2014). Considering the discourses of non-native students as impoverished (Davis, 2003), such research aimed at teaching non-native students to write or speak like native students in academic contexts. In recent times,

however, besides its pedagogical aim, EAP is concerned with disseminating knowledge in different disciplines (Suomela-Salmi & Dervin, 2009), with its focus expanded to encompass scholarly writing, particularly investigating linguistic and rhetorical features of research articles (RAs) (Ngula, 2015).

AD is usually produced within an *academic community* (Swales, 2004), an intellectual domain in which academics find themselves. It is the academic community that determines the problems investigated, the research approaches adopted, the findings that emerge, and how such findings are shared. Successful academic writing (AW) or speaking, therefore, means projecting a shared context. In other words, individuals who find themselves in the same academic community may use language in similar ways. This implies that there are notable differences among knowledge produced across different academic communities. In effect, academic or scholarly discourses emerge from specific academic communities with different opinions concerning what is important to communicate and how it could be communicated (Gray, 2015; Hyland, 2006, 2009).

AD essentially focuses on knowledge construction. Knowledge construction involves the negotiation and evaluation of knowledge in an academic community (Swales, 2004). Knowledge construction also refers to how knowledge is encoded in texts, as writers interact with their real or imagined readers (Beke & Boliver, 2009). In fact, as Suomela-Salmi and Dervin (2009) note, AD does not exist without an *I* and an *Other*. What this means is that the existence of AD depends on both writers and readers. AD, therefore, involves the co-construction of theory, argumentation, synthesis, and interpretation, as well as their dissemination and popularisation. The readers of AD may be specialists, novices, young researchers, general public, or the media.

Basically, academic knowledge can be classified into 'pure' or 'applied' and 'hard' or 'soft' disciplines (Becher & Trowler, 2001). Generally, the natural sciences and mathematics are known as hard-pure disciplines, with the science-based disciplines such as engineering being classified as hard-applied. On the other hand, the humanities are generally considered soft-pure disciplines while such disciplines as education and law are termed soft-applied. Hard-pure disciplines produce quantitative knowledge which develops cumulatively, with new findings originating linearly from existing literature. On the converse, knowledge constructed by soft-pure disciplines is qualitative; it also usually emerges from a combination and recombination of existing literature (Holmes & Nesi, 2009).

Hyland (2006) presents disciplines along a continuum, placing the Sciences and Humanities at the two extreme ends, with Social Sciences in the middle, as shown in Figure 1:

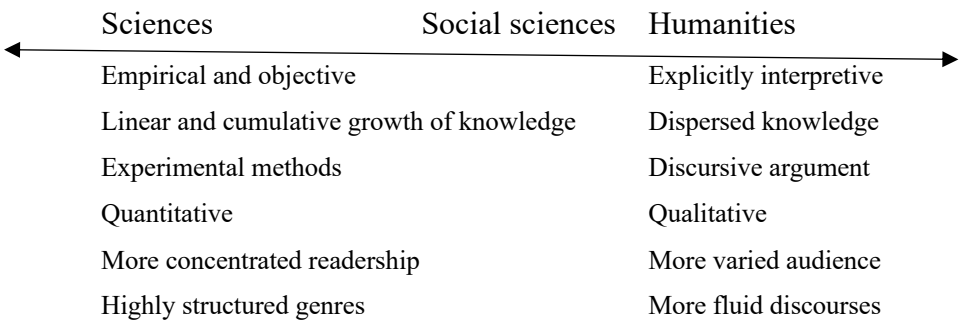

Figure 1: *The continuum of academic knowledge* (Hyland, 2006, p. 240)

Academic disciplines are identified by the distinct knowledge domains and intellectual problems with which particular groups of scholars are professionally concerned (Moore, 2011). Disciplinary discourses interpret the world in particular ways, each using different linguistic resources to create specialised knowledge. This suggests that writing in a particular discipline requires knowledge of the nature of disciplinarity in that domain, and more importantly, how that knowledge

can be communicated to the academic community at the time of writing (Murray & Moore, 2006). However, while it is convenient to represent disciplines as clearly distinguishable, they are subject to both historical and geographical variation (Becher & Trowler, 2001).

The research article (RA), which started in the form of letters published in *The Philosophical Transactions of the Royal Society* in the mid-seventeenth century, is now the principal site of disciplinary knowledge construction (Holtz, 2011). Over the years, the RA has become a very important academic genre due to its role in disseminating current research findings to readers. Another reason for placing premium on the RA is the practice of peer review as a way of filtering which beliefs should be transformed into knowledge. Consequently, the RA has produced an enormous volume of research (Hyland, 2009).

The abstract (which was not initially part of the RA) became an integral part of the RA in the 1960s and is now considered by most journals as an obligatory section of the RA (Holtz, 2011). An abstract acts as a "distillation" (Swales, 1990, p. 179) or "summary" (Graetz, 1982, p. 5) of the RA to which it is attached. Hyland (2004, p. 64) also notes that abstracts are "a selective representation rather than an attempt to give the reader exact knowledge of an article's content." RA abstracts serve as a vehicle for projecting and promoting news value of the accompanying article by encouraging the reader to read the article. This is achieved through the rhetorical organisation and the use of linguistic features which highlight originality and immediacy (Hyland, 2009).

A central feature of the language of the RA as a whole (and the abstracts, in particular) is abstraction. Abstraction is very important in scholarly writing (Halliday & Matthiessen, 2014), as it allows the reconstrual of experience into the

abstract and technical concepts used by specialists, through, for example, nominalisation (Halliday, 1998). Scholarly definitions of nominalisation have often been influenced by the scholar's theoretical background. From systemic functional linguistics (SFL) theoretical perspective, Halliday and Matthiessen (2014) define nominalisation as a grammatical metaphor (GM) "whereby any element or group of elements is made to function as a nominal group in the clause" (p. 94). Elements that can be nominalised include verbs, adjectives, etc.

Focusing on nominalisation of verbs, Martin and Rose (2007) define nominalisation as a process by "which a semantic category such as a process is realized by an atypical class as a noun instead of a verb" (p. 106). This suggests that nominalisation results from the realisation of processes (which are, by default, realised by verbs) by nouns. In other words, verbs are used for the unmarked realisation of processes. For example, the unmarked realisation of the process *to communicate* is by the verb *communicate* as in "Kofi *communicates* with his mother". However, the same process can be markedly realised by the noun *communication,* as in "The c*ommunication* between Kofi and his mother." This marked realisation of processes as nouns is known as process nominalisation. Process nominalisation, therefore, allows writers to represent experiences and reasoning using the grammatical structure of the nominal group, whose basic function is to construe entities rather than processes, and this is especially evident in scholarly writing (Halliday, 1998).

Statement of the Problem

Over the years, researchers have given considerable attention to process nominalisation, often comparing spoken and written AD (Norouzi, Farahani, & Farahani, 2012), or texts produced by native and non-native speakers of English

(Mahbudi, Mahbudi, & Amalsaleh, 2014; Naghizadeh & Naghizadeh, 2014; Terblanche, 2009; Wenyan, 2012). Process nominalisation has also been investigated cross-linguistically (Paul, 2014) and diachronically (Banks, 2008).

Despite the upsurge of research in this area of study, two important issues seem to have eluded researchers working in the area. In the first place, to the best of my knowledge, research on cross-disciplinary variability of process nominalisation in academic texts is scant, with Sarfo-Adu's (2015) study being among the few. This problem is further emphasized by Gray (2015): "We know less about the actual patterns of linguistic variation across disciplines than we know about variation across more broadly defined registers of academic writing" (p. 4). Further, the few cross-disciplinary studies (e.g. Jalilifar, White, & Malekizaadeh, 2017; Mehrabi, Jalilifar, Hayati, & White, 2018) have often been quantitative, focusing on the similarities and differences in the grammatical patterns of process nominalisation usage. In effect, such studies have largely overlooked what the semantic choices of process nominalisations reveal about the nature of disciplines investigated.

Secondly, while the literature suggests that process nominalisations function within the discourse semantics stratum, such literature has often been theoretical, without empirical support. A good example of such literature is Halliday (2005), who used contrived examples to illustrate what he calls the "pay-off" of nominalisation. This clearly shows that there is more to be done in this area of research. It is against this background that I conduct this research, aiming to contribute to the literature by investigating the use of process nominalisation in RA abstracts across three academic disciplines (Applied Linguistics, Economics, and

Biology) and to demonstrate how nominalisations function in the discourse semantics stratum.

Research Questions

This study was guided by two research questions:

1. What process nominalisations are used in RA abstracts across the three disciplines?
2. What are the functions of process nominalisations in RA abstracts across the three disciplines?

Significance of the Study

A study of this kind is significant in three principal ways: it adds to the existing literature; it has practical value, and it has pedagogical significance.

In the first place, the study is a significant contribution to the literature on the subject investigated. In this regard, given that the present study focused on RA abstracts, it contributes to knowledge on AD, particularly RA abstracts, as it extends our knowledge on nominalisation usage in RA abstracts. It is also a scholarly contribution to the existing scholarly works on nominalisation as GM, because it extends the literature on process nominalisation. This is especially important given that the present study is one of the first to explore process nominalisation in terms of its semantic types and functions across disciplines. Also, being among the first few studies on the functions of nominalisation in the discourse semantic stratum, the study contributes significantly to literature on discourse semantics. In this regard, the present study offers empirical support to previous theoretical literature on the functions of nominalisations in the discourse semantics stratum (see Halliday, 2005; Martin, 2008). Specifically, using RA

abstracts as data, the study shows how nominalisations can perform ideational, interpersonal, and textual functions in texts.

Practically, the study will be valuable to researchers all over the world, especially those in the academic disciplines explored by this study: Applied Linguistics, Economics, and Biology. This is because when they write articles for publication in highly reputable international journals, they are required to write abstracts that meet the expectations of the various academic discourse communities. The present study, therefore, will help both native speakers and non-native writers of English to perform competently by demonstrating awareness of how nominalisations are used in their various disciplines to construct disciplinary knowledge.

Regarding pedagogy, the study will be significant to universities all over the world, especially in their AW courses. In this regard, the findings of the study will be very useful to EAP scholars, curriculum developers and related scholars. In particular, the findings will serve as a basis for designing AW courses for students in the disciplines investigated. This will particularly be helpful to post-graduate students who will soon graduate to become scholars and researchers in their various disciplines. This significance of studies of this kind has been noted by Ngula (2015).

Scope of the Study

For a study like this, it is important for me to set some delimitations to ensure a manageable scope. In this section, I present three delimitations with respect to the disciplines under study, the genre under study, and the theoretical framework.

The first delimitation concerns the disciplines selected for the study. The three disciplines were selected to represent the three disciplinary domains

identified by Hyland (2004). Also, Applied Linguistics is chosen specifically because of the value it places on language and writing. With regard to Economics, it was selected as one of the disciplines for the study because, generally, as noted by Hood (2016a), linguistic studies on Social Sciences, in general, and Economics, in particular, are scarce. Finally, I selected Biology as a representative of the Sciences because, with the exception of a few studies that focused on Biology RA abstracts (e.g. Naghizadeh & Naghizadeh, 2014), most previous studies on the language of Biology focused on genres such as the textbook (Jalilifar, Alipour, & Parsa, 2014), undergraduate writing (Humphrey, Martin, Dreyfus, & Mahboob, 2010), and textbooks and RAs (Conrad, 1996), to the neglect of the Biology RA abstract.

The second delimitation concerns the genre selected for the present study: the RA abstract. For the purpose of this study, I decided to use RA abstracts as my data because most studies on the RA abstract have focused on its rhetorical organisation (e.g Belyakova, 2017; Byun, 2015; Cross & Oppenheim, 2006; Oneplee, 2008) and linguistic features such as hedges (e.g., Hu & Cao, 2011) and boosters (e.g., Gillaerts, 2014), paying little attention to process nominalisations. With the focus on process nominalisation, the present study differs remarkably from most previous studies on RA abstracts. Additionally, with my focus largely on the nature of the three disciplines investigated, I wanted to study a genre produced by experts rather than novice writers. The reason is that experts are believed to be familiar with ways of producing knowledge within their specific disciplines. Therefore, abstracts written by experts are most likely to reflect the nature of the disciplines investigated.

The final delimitation concerns the theory that supports the study. Nominalisation has been conceptualised differently in different linguistic schools. (For a review on the theoretical development of nominalisation, see Hou, 2014.) The present study is, however, grounded in systemic functional linguistics (SFL) approach to English nominalisation. The choice of this theory is informed by the researcher's desire to explore nominalisation as a grammatical metaphor. Also, with my interest in ascertaining the semantic choices made with respect to process nominalisations, the systemic-functional approach to nominalisation is ideal for the study.

Organisation of the Study

The study is organised in five chapters. Chapter One, the introductory chapter, serves as a background to the entire study. It discusses the background to the study and presents the statement of the problem, research questions, significance of the study, scope of the study, and organisation of the study. Chapter Two reviews the literature. It particularly presents the theory that supports the study. Additionally, previous studies related to the present study are critically reviewed in Chapter Two. The third chapter presents the methodological procedures I followed in conducting the study. These include the research design, sampling procedure, and analytical framework. In Chapter Four, I present the analysis and discussion of the data in line with the research questions. In Chapter Five, I summarise the entire study, present the key findings of the study, discuss the implications of the study, and suggest areas for further research.

Chapter Summary

Generally, the chapter provided a background to the study. It first discussed, among other things, the nature of AD, discourse community, and the concept of discipline. The problem for the study was then formulated, paying attention to the gap in the literature. From the research problem emerged two research questions. In this chapter, I also noted the significance of the study, focusing on how the study will contribute to the literature on RA abstracts and nominalisations, among other things. Finally, the chapter presented the scope of the study and the organisation of the study.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Chapter One presented the background to the study, statement of the problem, research questions, significance of the study, scope of the study, and organisation of the study. In this chapter, I discuss two important issues: the theory that underpins this study and previous research on the subject under investigation. The chapter, first, presents a discussion on SFL and grammatical metaphor (GM), narrowing its focus to nominalisation. It then presents a general discussion on disciplinarity and reviews previous studies on RA abstracts and nominalisation.

Theoretical Framework

The study is grounded in Systemic Functional Linguistics (SFL) as a theory of language, focusing on nominalisation as a GM. SFL is unique in, at least, three senses: firstly, in the claims it makes regarding the metafunctional organisation of all natural languages; secondly, in the particular uses and significance it attaches to the notion of 'system'; and, finally, in the particular claims it makes regarding the relationship of language or 'text' and context (Christie, 2002). In the subsequent sub-sections, I consider SFL from a broader perspective, and, then, narrow it down to grammatical metaphor and nominalisation.

Systemic Functional Linguistics (SFL)

As indicated earlier, SFL is unique in three main ways: a) the metafunctional organisation of language, b) the concept of system, and c) the relationship between text and context.

Regarding the metafunctional organisation of language, SFL is of the view that language is used to perform three main functions: a) ideational metafunction, b) interpersonal metafunction, and c) textual metafunction. The ideational metafunction concerns the construal of some aspects of experience. It refers to those aspects of the grammar which are most directly involved in the representation of the world and its experiences (Halliday & Matthiessen, 2014).

The ideational metafunction is realised through the resources of transitivity and of lexis, which are involved in representing experience (Christie, 2002). The interpersonal metafunction concerns those grammatical resources which reveal the relationship of interlocutors. These grammatical resources include those of mood, modality, and person. Finally, the textual metafunction refers to those grammatical resources that are used in organising the language into a successful message. Such resources include the resources of theme, information, and cohesion.

In sum, the metafunctional viewpoint on meaning mirrors three key dimensions of human interaction: a) how we construe the world as events, entities, and circumstances, b) how we interact with others in the expression of relationships and values, and c) how we organise our messages to make sense to others in the context of our interactions (Hood, 2016a).

The second aspect of SFL is the notion of system. SFL considers language as a meaning system, which allows us choices with an entry condition (Christie, 2002). Because language is believed to offer humans a cluster of choices, it is considered to be polysystemic. For example, when constructing an English clause, one makes choices from the grammar regarding theme (the point of departure for the message of the clause), mood (and hence the speech function taken up), and transitivity (the type of process, associated participants, and any circumstance).

There are various quite complex available choices with respect to each of the systems—theme, mood, and transitivity—and, for the most part, they are not conscious (Eggins, 2004).

The third feature of SFL concerns the relationship between language (or text) and context. SFL models language and context as semiotic systems in a relationship of realisation, where language and context realise each other (Martin, 2000). The language choices related to a particular context of situation or domain are referred to as register. Register is often described with reference to three contextual variables: a) field, b) tenor, and c) mode. Field is usually explained in terms of what is going on in the text (field of activity) or the subject matter of the text (field of experience) (Matthiessen, 2019). Tenor, on the other hand, concerns the relationship between participants in the text, whereas mode is considered to be the channel of communication. These three contextual variables—field, tenor, and mode—respectively correspond with the three metafunctions identified earlier—ideational, interpersonal, and textual metafunctions (Christie, 2002).

Another important aspect of the SFL model is its view of stratification. As far as language use is concerned, SFL makes a distinction between content plane and expression plane. While the content plane concerns meaning-making, the expression plane focuses on the realisation of meaning in spoken or written language (phonology/graphology) through the organisation of segmental and prosodic features. The content plane is further stratified into lexicogrammar and discourse semantics (Doran, 2016; Martin, 2000). According to Martin (2000), meaning made within a clause is the focus of lexicogrammar while discourse semantics focuses on meanings beyond the clause, paying particular attention to resources for achieving cohesion in texts. Lexicogrammar comprises two sub-

strata—lexis and grammar—and grammar encompasses syntax and morphology (Halliday & Matthiessen, 2014). Figure 2 illustrates the stratal organisation of language.

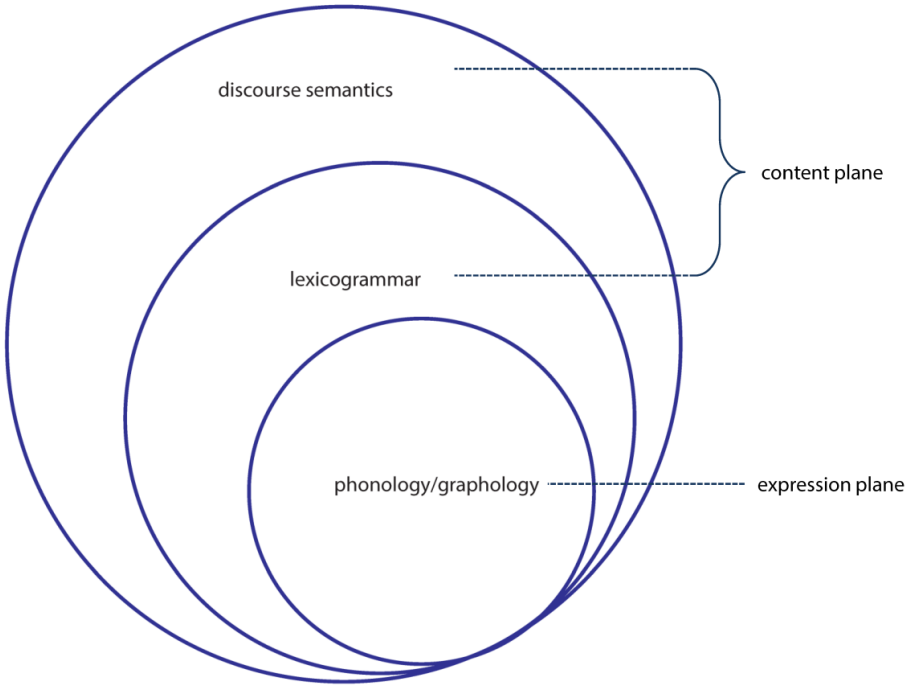

Figure 2: *Strata of language* (Martin, 2000, p. 6)

Every instance of language involves making a choice from all strata, with each stratum contributing its meaning. In effect, choices made in discourse semantics are realised by choices in lexicogrammar, and choices in lexicogrammar are realised by phonology/graphology (Martin, 2014). The present study is partly focused on how choices in discourse semantics are realised at the level of lexicogrammar by the use of nominalisation.

Grammatical Metaphor (GM)

Halliday (1985) introduced the concept of *grammatical metaphor* in SFL as a complementary resource to lexical metaphor. In developing this concept of grammatical metaphor, Halliday begins by introducing the general concept of

rhetorical transference which involves the 'non-literal' use of words, identifying the various types such as synecdoche, metonym, simile, and metaphor. Halliday then focuses on metaphor and expands its meaning to introduce the concept of GM.

Halliday (1985, 1994) introduced a new perspective of looking at metaphor. He notes that, traditionally, something is said to be metaphorical if it refers to something else. In this sense, a word with a metaphorical meaning also has another meaning which is "literal." In other words, a term or word with literal meaning can have transferred meanings which are metaphorical (Simon-Vandenbergen, Taverniers, & Ravelli, 2003). Halliday calls this perspective of looking at metaphor "a view from below," that is, variations in the meaning of a given expression, and distinguishes it from what he calls "a view from above," which involves different ways of expressing a given meaning. The two complementary perspectives are presented in Figure 3:

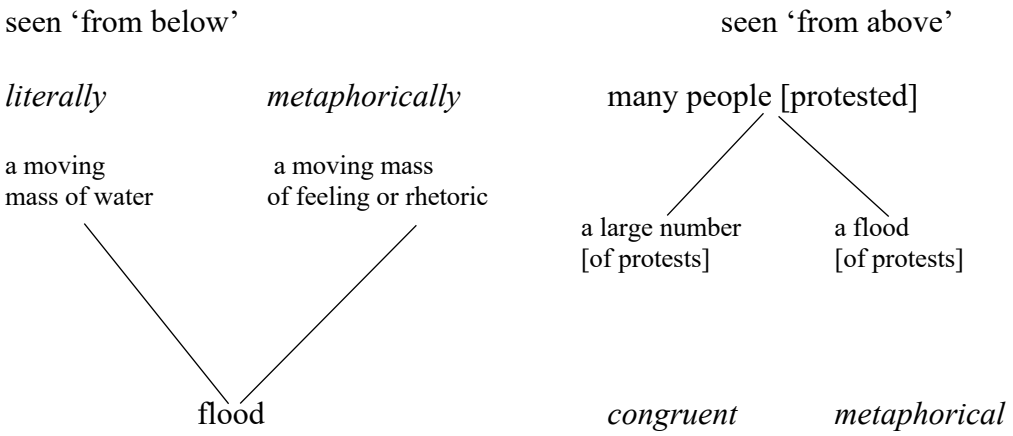

Figure 3: *Two perspectives on metaphor* (Halliday, 1994, p. 342)

As indicated in Figure 3, looking at the word *flood* from the "view from below," we realise that the word has another meaning different from its literal meaning, which is the metaphorical meaning. Thus, while *flood* literally means "a moving mass of water," it metaphorically means "a moving mass of feeling or rhetoric." On the other hand, taking the "view from above," the meaning *many*

people [protested] can either be realised congruently as "a large number of protests" or metaphorically as "a flood of protests". With this, Halliday (1994) argues that, in the view from above, the term "literal" is not very appropriate. The variation between different expressions of the same meaning is, therefore, defined in terms of markedness, where certain forms that conform to the typical ways of saying things are called "congruent" realisations. Thus, GM involves incongruent and alternative ways of expression which are metaphorical. In other words, the congruent version is the typical way of saying things whereas the incongruent version is a sentence or expression which uses a different grammatical construction from the congruent version to achieve various purposes in texts (Halliday & Matthiessen, 2014). Martin (1992) notes that grammatical metaphor is a content plane that derives structures requiring more than one level of interpretation. Similarly, O'Halloran (2003, p. 83) observes that "grammatical metaphor necessitates more than one level of interpretation: the metaphorical (the transferred meaning) and the congruent."

Halliday (1994) identifies two types of GM: a) metaphors of transitivity (ideational metaphor) and b) metaphors of mood and modality (also known as interpersonal metaphor). For the purpose of this study, I discuss ideational metaphor in detail because it comprises nominalisation. In ideational metaphor, the grammatical variations between congruent and incongruent realisations become evident in transitivity configurations. In order to bring out the metaphorical nature of an incongruent expression, it is compared to an equivalent congruent form. In an analysis of a more complex ideational metaphor, it is possible to have a "chain of metaphorical interpretations" (Halliday, 1985, p. 328) as steps in between the

metaphorical form under analysis and the congruent form, that is, the typical way of realising that meaning (Simon-Vandenbergen *et al*., 2003).

Ravelli (1988) presents a framework for the analysis of ideational metaphors. Like Halliday (1985, 1994), she takes the view from above perspective. For analytical purposes, Ravelli classifies ideational GM into nine (9) general types. In this classification, she notes that the semantic choice which forms the basis of each type of the metaphor is represented in terms of the grammatical labels, such as 'material process,' 'circumstance,' 'participant,' etc. Using a different method, Halliday and Matthiessen (1999) classify grammatical metaphor into thirteen (13) types.

One type of GM that has attracted much attention is nominalisation of process. Through this phenomenon, processes, which are congruently encoded as verbs, are encoded as nouns. For example, *grammatical metaphor evolved* is congruent, while *the evolution of grammatical metaphor* is non-congruent and, therefore, a GM for the congruent form. In this example, *evolved*, which is a verb has been transformed into *evolution*, which is a noun, rendering it nominalised. Tables 1 and 2 present Ravelli's (1988) and Halliday and Matthiessen's (1999) respective classifications of ideational GM.

Table 1: **Ravelli's Classification of Ideational Grammatical Metaphor**

Semantic choice		Metaphorical realization	Congruent realization	Example
	Function	Class	Class	
1 a material process	Thing	nominal group	verbal group	the appointment of an ambassador
1 b mental process	Thing	nominal group	verbal group	it changed our perception of the situation
1c relational process	Thing	nominal group	verbal group	the sheer cost of it
1 d verbal process	Thing	nominal group	verbal group	we had no talks last year
1e behavioural process	Thing	nominal group	verbal group	its continuation
2 process	Epithet, Classifier	nominal group	verbal group	incoming soviet missiles
3a quality of a Thing	Thing	nominal group	adjective	peace through strength
3b quality of process	Thing	nominal group	adverb	a sense of security
3c quality of a process	Epithet, Classifier	adjective	adverb	its intrinsic worth
4a modality	Epithet	adjective (modal)	adverb	the possible outcome
4b modality, modulation	Thing	nominal group	adjective, passive verb	first strike capability
5 a logical connection	Thing	nominal group	conjunction	for that reason
5b logical connection	Process	verbal group	conjunction	the arms race contains the threat
6 circumstance	Process	verbal group	prepositional phrase	night follows day
7a participant	Classifier	adjective	nominal group	economic development
7b participant	Thing	nominal group	nominal group	the art of generalship
8a' expansion	Relative Act, Clause	embedded clause	ranking clause	WWII I is more likely than [[peace breaking out]}
8b projection	Fact	embedded clause	ranking clause	[[all it can do]] is [[to retaliate]]
9 circumstance	Epithet, Classifier	adjective	prepositional clause	historical experience

Source: Ravelli (1988, p. 139)

Table 2: **Halliday and Matthiessen's Classification of Ideational Grammatical Metaphor**

Semantic type			class shift	example
Congruent		metaphorical		
1. Quality		entity	adjective – noun	unstable – instability
2. i. Process	event of process		verb – noun	transform – transformation
ii.	aspect of phase of process		tense/phase verb (adverb) – noun	going to/try – prospect/attempt
iii	modality of process		modality verb (adverb) – noun	can, could – possibility; potential
3. circumstance	[minor process]	entity	preposition – noun	with – accompaniment
4. relator		entity	conjunction – noun	so – cause, proof if – condition
5. i. process	event of process	quality	verb – adjective	[poverty] is increasing – increasing [poverty]
ii.	aspect or phase of process			tense/phase verb begin – initial
			(adverb) – adjective	
	modality of process		modality of verb (adverb) – adjective	[always] will – constant
6. i. circumstance	manner	quality	adverb – adjective	[acted] brilliantly brilliant [acting]
ii.	time/place	quality	prepositional phrase – adjective	[argued] for a long time [lengthy] argument
iii		(class)	prep. phase – noun premodifier	crack on the surface – surface [cracks]

Table 2 continued

7.	relator	quality	conjunction – adverb	before – previous
8.	circumstance	process	be/go + preposition – verb	be about – concern be instead of – replace
9.	relator	process	conjunction – verb	and – complement then – follow; so – lead to
10.	relator	circumstance	conjunction – preposition(al) phrase	when – in times of so – as a result
11.	0	entity	0 – noun	[x] – the fact of x
12.	0	process	0 – verb	[x] – x occurs
13.	entity	modifier (of entity)	noun – (various)	engine fails – engine failure; glass fractures – the fracture of glass; cabinet decided – government's decision

Source: Halliday and Matthiessen (1999, pp. 246-248)

Ravelli's (1988) classification, as presented in Table 1, gives five (5) types of nominalisation of processes which align with process types: a) material, b) mental, c) relational, d) verbal, and e) behavioural. Also, as indicated in Table 2, Halliday and Matthiessen (1999) present three (3) types of nominalisation of processes. Halliday and Matthiessen's classification divides processes into event (the process encoded in the lexical verb), aspect or phase (where this is encoded in a verb such as *try*), and modality. This final category, that is, modality, is not encoded as a lexical verb, and Ravelli deals with this elsewhere in her classification.

The present study considers only those cases which are encoded in lexical verbs and follows Ravelli (1988) in distinguishing between different process types. Being concerned exclusively with the ideational metafunction, this study also excludes cases of interpersonal metaphors. There has been an upsurge of research on grammatical metaphor, especially in academic writing. Such studies will be reviewed in the next section.

Previous Research on Grammatical Metaphor (GM)

In this section, I present a critical review of relevant studies conducted on GM, in general, and nominalisation, in particular. Presented on thematic lines, the purpose of this review is to argue that despite the considerable number of studies on nominalisation, very little attention has been paid to process nominalisations distinguishing the disciplines that this study focuses on.

Halliday (1996) has noted that the nature of scientific discourse continues to evolve in its inter-relationship with the continuing evolution of scientific knowledge. In the late twentieth century and in the twenty-first century, this may involve a greater tolerance of indeterminacy and flux, and an accompanying

backing off from the present extremes of nominalisation and GM to accommodate a more process-centred technical discourse oriented to a clausal, rather than a nominal, mode and developing the verbal group as a technical resource. Halliday has also suggested that although contemporary technical discourse must have nominalisation in order to construct taxonomies, it could be nudged away from its obsession with pseudo-things to linguistic forms which lessen the semiotic distance.

Similar to Halliday (1996) is Halliday and Martin's (1996) investigation of the role of GM in Science discourse, which focused on ways in which Science discourse necessarily involves GM in order to build knowledge and organise text. Regarding knowledge construction, Halliday and Martin noted that GM is used to establish technical terms and relate them to one another, and to explain the causal relations among processes. In organising texts, on the other hand, GM is crucial to appropriately parcel out information as peaks of thematic prominence, providing readers with an angle on the field and peaks of news, building on from what can be assumed.

Halliday and Martin (1996) pointed out that the tone of the discourse sounds more abstract as well as more formal as a result of nominalisation. In addition, nominalisation is believed to be one of the most important resources and powerful structures of creating a lexically dense style via building long nominal groups which differentiate spoken and written discourses (Sarani & Talati-Baghsiahi, 2015). Nominalisation also helps to create textual cohesion, remove human participants, and make the text more objective (Baratta, 2010). Martin (2008) also noted that since nominals are important for both positive and negative evaluation, nominalisation affords the opportunity for evaluation. The lesson I take from

Martin's article is that "disciplinarity as we know it depends necessarily on nominalisation to build knowledge, to organize discourse building knowledge and to distribute values during this process" (p. 832). What this implies is that a good attempt at investigating disciplinary knowledge building must take nominalisation into consideration, and this, therefore, necessitates the present study.

Magnusson (2013) also noted that GM allows an expanded meaning potential through several interacting changes that are connected to the written representation of experience and its crystalline productive way of meaning and orientation towards things. In the first place, the use of GM resets the relations between semantics and lexico-grammar, allowing process meanings to be realised as subjects through nominalisation. Secondly, GM increases the lexical density of texts and favours the representation of the world in abstraction in which human agency is reduced. Magnusson also noted that grammatical metaphor performs the textual function. This is created when a grammatical metaphor refers to the preceding or subsequent text with anaphoric or cataphoric reference.

Terblanche (2009) investigated the use of nominalisations by first-language English users (L1) and black South African English (BSAE) users, and examines possible functional differences between types of nominalisations, for example, abstract versus concrete. In the study, a list of 29 suffixes that form nominalisations were analysed, focusing on differences regarding the type of suffix, the frequencies of suffixes in the data, and linguistic background of participants. He concludes that BSAE users employ nominalisations in very similar frequencies as native English users. This conclusion disproves a previous speculation by Van Rooy and Terblanche (2009) that L2 speakers and writers do not have the means to use grammatically complex structures like nominalisations. Terblanche's study

investigated nominalisation, taking into consideration the affixes used in creating nominalisation. In this regard, Terblanche's study is similar to Sarfo-Adu's (2015) study. The present study, however, investigates nominalisation from the SFL perspective, by focusing on the semantic types of process nominalisations.

Wenyan (2012) analysed nominalisation in the discussion sections of 10 medical papers by native English writers and 10 medical papers by Chinese academic writers drawn from popular medical English journals to identify the frequency of nominalisation types, lexical density, and thematic progression. The findings revealed that nominalisation accounts for the higher percentage for native writers, which serves to organize texts and might be the reason for their fluency and coherence. The study noted that nominalisation plays a crucial role in building the logical structure of medical English papers and in improving formality.

Jalilifar *et al.* (2014) examined nominalised expression types in an Applied Linguistics book and a Biology book as two distinct disciplines and found no significant difference in the use of nominalisation. The findings also revealed a greater concentration of nominalisation in the Applied Linguistics book, compared to the Biology textbook studied. However, further research is needed to see how nominalisation is exploited in other genres and other disciplines. The present study, thus, goes beyond Jalilifar *et al*.'s study to consider more disciplines, while focusing on a different genre: the RA abstract.

Turning to the studies by Arizavi and Namdari (2015) and Jalilifar, Saleh, and Don (2017), we observe that they are relevant to the present study, as they both studied nominalisation in one of the disciplines the present study seeks to investigate: Applied Linguistics. They, however, differ from the present study in terms of genre: Arizavi and Namdari studied the Discussion section of the RA,

Saleh and Don focused on Introduction and Method sections of the RA, while the present study focuses on the RA abstract. Saleh and Don investigated the use of nominalisation in making knowledge claims in Applied Linguistics RAs and revealed a high concentration of nominalisation in the Introduction section. The study also revealed the use of a contrasting range of nominalised expressions in various sections of the RA studied. Similarly, the study conducted by Arizavi and Namdari revealed a higher concentration of some kinds of nominalisation in some moves of the Discussion section of the RA than others. Having looked at these studies, I realised that, since the various sections of the RA contained contrasting use of nominalised expressions, then the use of nominalised expressions could also vary across disciplines, hence, the need for the present study.

Norouzi *et al*.'s (2012) study differs from the two studies reviewed above in two main respects: a) it is comparative and b) deals with different genres, including science textbooks and accredited science magazines. Specifically, using a corpus of 80,000 words, Norouzi *et al.* aimed to investigate comparatively the use of process nominalisations across written and spoken scientific language and found a higher frequency of nominalisation in the written language, compared to the spoken one. This study, therefore, concurs with Sarani and Talati-Baghsiahi (2015), who found that nominalisations are higher in written discourse. The study also found the material process type as the highest kind of nominalisation in the data studied, followed by the relational process type. Although the present study aims at investigating comparatively the types of nominalisation in texts, it focuses on disciplinary variation instead of variation by mode of discourse.

Kazemian, Behnam, and Ghafoori's (2013) study is similar to the one conducted by Norouzi *et al.* (2012) in terms of genre. Kazemian *et al*., using SFL

as a theory of language, investigated the roles played by process nominalisations in 10 scientific texts drawn from influential magazines. Like Norouzi *et al.*'s study, the study revealed material process and relational process types as the most dominant process nominalisation types in the texts. It was also found that nominalisations make the tone of scientific texts more abstract, technical, and formal. With its focus on the types and functions of nominalisation in scientific texts, this study is relevant to the present study.

By analysing nominalisation from a cross-cultural perspective, Mahbudi, Mahbudi, and Amalsaleh's (2014) study differs from the studies reviewed so far. Specifically, Mahbudi et al. studied the use of nominalisations and lexical density in forty (40) abstracts from medical journals. Twenty (20) of the abstracts were written by native English speakers while 20 of them were written by non-native Iranian English speakers. The findings revealed that Iranian writers used fewer nominalisations, compared to native English speakers. Although the present study focuses on RA abstracts, it studies nominalisations only—lexical density is beyond the scope of the present study.

A similar study that was also conducted from the cross-cultural perspective is Hu (2015). He compared Chinese English and Singaporean English, focusing on GM, its stylistic effects, and the underlying sociocultural and generic conventions. The study revealed relatively less GM in Singapore English texts than their Chinese counterparts within the academic genre. In other words, Chinese academic texts tend to exhibit a higher degree of technicality and compactness than the Singaporean counterpart. It must be noted that Hu's study differs from the present study in two main ways: firstly, while this study focused on four different types of GM (nominalisation, adjectivisation, verbalisation, and prepositionalization), the

present study is limited to process nominalisation and, secondly, the reviewed study focused on a corpus built from different genres while the present study focuses on RA abstracts.

Taking the cross-disciplinary approach, Jalilifar, White, and Malekizadeh (2017) investigated the use of nominalisations in eight textbooks in two disciplines: Applied Linguistics and Physics. The findings indicate that, in comparison to Applied Linguistics writers, Physics academic writers tend to a) package more information into compound nominal phrases by deploying a pattern where nominals are followed by strings of prepositional phrases and b) more frequently express particularity using nominals preceded by classifiers. Writers in Applied Linguistics, on the other hand, are found to manifest a greater tendency toward conveying generality by using a pattern where nominals are realized with few pre/post modifiers. Whilst this study and the present study are both cross-disciplinary in focus, they differ in terms of genre: while the study reviewed focused on textbooks, the present study focuses on RA abstracts. Also, the reviewed study focused on the grammatical patterns of nominalisations while the present study focuses on semantic types of process nominalisation.

A study conducted by Mehrabi, Jalilifar, Hayati, and White (2018) is similar to Jalilifar, White, and Malekizadeh's (2017) study reviewed above in terms of approach but differs from it in terms of genre. Mehrabi *et al*., using a corpus-based method, compared the use of process nominalisations and their distribution in the thematic structures of Introduction sections of RAs across hard and soft Sciences. The findings showed a higher use of process nominalisation in the hard Sciences, compared to the soft Sciences. The findings also revealed that the writers tend to employ process nominalisations in clause Rhemes, instead of Themes, and

this is not surprising, given the role of Themes in the information structure of clauses.

Farahani and Hadidi (2008) aimed to bring out how grammatical metaphor is used in modern prose fiction, as opposed to such a deployment in the language of Science. Drawing mostly on the conceptualization of GM, the study focused on *Harry Potter* series as a modern prose fiction and *Computational Neuroscience of Vision* as a scientific text. The findings revealed six categories of GM in modern prose fiction and point to the category of prepositional and generic GM as the mainstays underpinning all GM in the genre. Similar to Farahani and Hadidi's (2008) study is the one conducted by Nabifar and Kazemzad (2012) on the types of nominalisation as GM in *Harry Potter* and *The Prisoner of Azkaban*. Specifically, the study aimed to identify nominalisation types in the first two chapters of each of the books studied and offer a congruent wording in order to find out the lexical density of each wording. The findings revealed that the use of nominalisation increases the lexical density.

Seyedvalilu and Ghafoori's (2016) study is similar to Farahani and Hadidi's (2008) study in its focus on a literary text. Precisely, Seyedvalilu and Ghafoori's study investigated how the use of nominalisations in the novel *Frankenstein,* written by Mary Shelly, is evident in its cinematic adaptation. In other words, they attempted to investigate possible differences in the use of nominalisation in the novel as a type of literary prose fiction and in one of its cinematic adaptations. The findings indicated that the frequency of occurrence of nominalisation in the written version was much more than in the cinematic adaptation. The lesson I learnt from that paper is that one text, when presented in different modes, may differ in terms of the use of nominalisation.

Sarani and Talati-Baghsiahi's (2015) study differs from all the studies reviewed thus far in one major respect: it is a comparative study that deals with two categories of writers, the novice and the expert. Using a corpus of forty RAs, they explored the employment of nominalisation in the writings of Iranian graduate students (both MA and PhD students) and experienced figures in the field of Applied Linguistics. The findings indicated that the experts used more nominalisations than novice writers. Though both this study and the present one are comparative in nature, they differ in terms of what is being compared. That is, while the study reviewed compared research articles and two categories of writers, the present study focuses mainly on the RA abstract.

A study conducted by He and Yang (2014) differs from all the studies reviewed so far: it focused on transfer directions of grammatical GMs. Specifically, unlike most of the studies reviewed so far, their study focused on all the three types of GM, with the aim of exploring the possibility of the occurrence of bidirectional transfer in or across the three types of grammatical metaphor (ideational metaphor, interpersonal metaphor, and textual metaphor). It was found that rank-shift takes place along two dimensions, with both dimensions being unidirectional. While ideational metaphor was manifested as downward rank-shift, metaphor of modality was manifested as a unidirectional shift from modal verbs through modal adverbs or prepositional phrases to modal projecting clauses, the metaphor of mood as a unidirectional shift from unmarked to marked lexico-grammatical categories. Also, textual metaphor was manifested as a unidirectional shift from unmarked to marked structures.

While most of the studies reviewed so far were conducted on expert writing, a few studies have been conducted on texts produced by students. Studies of this

type include those conducted by Liardét (2016), Ryshina-Pankova (2010), Guo, Hong, Wang, and Azlinda (n. d.), and Qing (n. d.). Among these studies, those conducted by Ryshina-Pankova and Qing are similar, focusing on cross-cultural variations in the use of GM. Ryshina-Pankova studied fifty-five book reviews written by advanced American learners of German and thirty texts written by native speakers in the same genre, focusing on the identification of various types of GMs as characteristic of various acquisition levels. The author also investigated writers' use of GM in constructing a logical argument or a persuasive evaluation. The findings revealed grammatical metaphor as a prominent feature of adult language use in literate and academic contexts by native or nonnative language users.

Similarly, Quint (n. d.) compared the use of nominalisations between native and non-native speakers of English. The corpora for his study comprised six theses of Chinese MA candidates majoring in English linguistics who represent advanced foreign language learners and six theses of English-speaking linguists who represent English native speakers. The study concluded that native speakers of English use more nominalisations than non-native English speakers. Similarly, Naghizadeh and Naghizadeh (2014) investigated the use of nominalisation in RA abstracts written by native and non-native Iranian writers in four disciplines: Biology, Linguistics, Mechanical Engineering, and Computer Engineering. The corpus was made up of eight abstracts, four written by native speakers and four by Iranian researchers. The findings revealed that nominalisations frequently occurred in abstracts, regardless of the discipline. The results also revealed no statistically significant difference in the use of nominalisations by native and non-native speakers. Surprisingly, Naghizadeh and Naghizadeh's findings run counter to Mahbudi *et al.*'s (2014) and Quint's (n.d.) studies.

Guo, Hong, Wang, and Azlinda (n. d.), on the contrary, adopted the cross-disciplinary approach in their study. They compared the construction of knowledge and the development of grammatical metaphor in Secondary 3 (Year 9) students' writing in English and Social Studies. Having analysed a sample of 42 students' writings, they found that arguing in the subjects, Social Studies and English Language, employ different grammatical resources and point to different directions. Specifically, while English employs rankshifted embedding, Social Studies employs, to a greater extent, GM. While this cross-disciplinary study, unlike the present study, focused on unpublished works, it deepens our understanding of the textual features that distinguish one discipline from another.

A few studies on students' writings compared texts produced by high-performing students and those produced by less-performing students. Thompson (2010) and Liardet (2016) are examples of studies of this kind. Liardét's study found that the high-scoring texts, compared with low-scoring ones, deploy experiential GMs more frequently, with slightly greater variation and with more significant textual impact. However, despite the lower incidence of experiential GM in the low-scoring texts, there were several indicators of the students' developing the resources necessary to succeed.

Similarly, Thompson (2010) compared the use of nominalisation in high-rated dissertations and low-rated ones. Specifically, Thompson studied ten dissertations, all of which were written by non-native speakers of English. Whereas five of the dissertations were classed as high-rated, that is, they were awarded marks in the 70+ (Distinction) range, the other five were classed as low-rated, and were awarded marks between 53 percent and 56 percent. She analysed the Introductions, Methodology, Conclusion, and twenty pages each of the Analysis

and Discussion sections. The study revealed that nominalisation was more fully used in high-rated dissertations, compared to low rated ones. Thompson, however, admitted that, due to the small nature of the corpus, it will be problematic generalising the findings.

Prasithrathsint (2014) also aimed to analyse AW in Thai, with a focus on nominalization, and to find what function nominalisation performs in this genre. The data for the study comprised academic articles and a number of editorials, which are 51,163 and 71,267 words long, respectively. The findings confirmed the claim that nominalisation is a marker of AW. Specifically, it was found that nominalisations occurred more frequently in academic papers than in editorials—5 versus 2.6 out of 100 words. The author concluded that, since what is stated in academic papers is based on closely-investigated knowledge, in order to present the knowledge with credibility, authors must have objective stance.

Yue, Wang, and Zhang (2018) analysed the use of five types of nominalisations in abstracts from Linguistics academic papers. By adopting a mixture of qualitative and quantitative methods, the authors calculated frequencies of each type of nominalisation and discussed features of these nominalisations. The findings revealed that process nominalisation occupied 84.8% and quality nominalisation accounted for 13.4%. However, circumstance nominalisation and relator nominalisation only accounted for 0.2% and 1.1%, respectively. Furthermore, the author only found 6 instances of zero nominalisation. Additionally, it was found that process nominalisation can condense information, increase the level of abstraction of abstracts, and form fixed collocation patterns in abstracts. Quality nominalisation can achieve impersonalization but increase the

distance between readers and writers. While this study focused on all the types of nominalisation, the present study focuses on only process nominalisation.

This section has focused on exploring previous research on GM and nominalisations, revealing some interesting insights. In the first place, in terms of focus, previous studies on nominalisation have focused, generally, on Science discourse (Halliday, 1996; Martin, 1996), with others focusing on specific discipline(s) (Guo *et al*., n. d.; Jalilifar *et al*., 2017; Yue *et al*., 2018). Some authors have also compared texts produced by different category of writers (Liardet, 2016; Quint, n. d.; Ryshina-Pankova; 2010; Thompson, 2010). Again, in terms of theoretical approach, some of the studies reviewed so far are closely related to the present study, as they also used SFL for the analysis (e.g., Farahani & Hadidi, 2008; Guo *et al*., n. d.; He & Yang, 2014; Sarani & Talati-Baghsiahi, 2015; Thompson, 2010; Yue et al., 2018). However, with its focus on disciplinary variation in terms of process types of nominalisations, the present study differs from most of the previous studies that used the SFL approach. Furthermore, the literature review suggests that the SFL literature (e.g., Halliday, 2005; Kazemian *et al*., 2013; Martin, 2008) on the functions of nominalisations in the discourse semantics stratum comes with little empirical evidence. These observations serve as a springboard for the present study to, first, investigate cross-disciplinary variation in nominalisation usage, focusing on the semantic classification of process nominalisations and, second, show how process nominalisations function within the discourse semantic stratum, using the RA abstracts from the three disciplines under study. The aim is, firstly, to show what nominalisation usage reveal about the nature of disciplines investigated and, secondly, to provide empirical evidence on the SFL perspective on functions of process nominalisations in AW. Having

reviewed studies on grammatical metaphor, I now turn my attention to disciplinarity in academic writing, and that is the focus of the next section.

Disciplinarity in Academic Writing

Over the past decades, the notion of disciplinarity (or disciplinary culture/disciplinary identity) has attracted researchers in the field of AD. In Applied Linguistics, Becher and Trowler's (2001) contribution remains one of the most significant works on disciplinary differences. Becher and Trowler's disciplinary grouping has served as a springboard for further empirical studies on AD, both written and spoken. The most cited among such empirical studies is Hyland's (2004) study on disciplinary variations in social interaction in eight disciplines. Other empirical studies combine disciplinary variation with other forms of variation (e.g. Ngula, 2015). The present study is also a contribution on disciplinary variation. This section discusses the notion of disciplinarity in written AD, paying attention to some studies done in this respect.

Investigations into the characteristics of specific disciplines have been the focus of many studies (e.g. Becher & Trowler, 2001; Dahl, 2004; Hyland, 2002). Such studies have referred to disciplines as cultures with distinct behaviours, beliefs, and norms that define the professional lives of the members of the community. Specifically, it is the discipline that determines the methodological approaches researchers use in conducting research, how they report research findings, and how they interact with their colleagues (Becher & Trowler, 2001). Becher and Trowler (2001) identify some elements that constitute a discipline: a) the presence of university departments devoted to the discipline, b) international currency, c) academic credibility, d) intellectual substance, and e) the appropriateness of the subject matter.

The present study is interested in how language use by academics reflects the nature of their disciplines. Hyland (2004) offers an insightful perspective on this. He argues that, while members of disciplinary communities may have different opinions regarding many fundamental issues, these opinions—which are communicated through ways accepted by the disciplines—reflect the contexts of the disciplines. According to Hyland, these forms of communication are situated in specific disciplines and "reflect something of the epistemological and social assumptions of the author's disciplinary culture" (p. 9). What this implies is that each of the disciplines that this study focuses on (Applied Linguistics, Economics, and Biology) may use language that is reflective of its epistemological assumptions.

Disciplinary cultures have been classified variously, with Becher and Trowler's (2001) and Hyland's (2004) being among the most cited classifications. Becher and Trowler's classification distinguishes cognitive characteristics of disciplines from their social characteristics and refers to these respectively as "territories" and "tribes." The cognitive characteristics of disciplines, basically, concern the intellectual terrain, encompassing issues like the subject matter of the discipline and ways of studying it. On the other hand, the social characteristics of disciplines concern forms of communication among members of specific disciplines.

Based on the cognitive dimension, Becher and Trowler (2001) classify disciplines as either "hard" or "soft," or "pure" or "applied." On the other hand, Hyland (2004) classifies disciplines into three: (a) Sciences, (b) Social Sciences, and (c) umanities. Each discipline investigated in this study represents a different section in Hyland's classification: Biology is a Sciences discipline; Economics is

a Social Science discipline, and Applied Linguistics falls under humanities. There is a large body of empirical literature on disciplinary discourses, to which we now turn our attention in the following sub-sections, starting with the Sciences.

Sciences

In this sub-section, I present previous studies on the nature of the discipline of Sciences. These studies are reviewed along three dimensions: (a) those that focus on the Sciences, in general; (b) those that focus on specific Sciences discipline(s); (c) those that are diachronic in nature.

With regard to the first trend, that is, those that generally focus on Sciences, Martin and Veel (2005) examine how technicality is built in scientific texts. They note that technicality transforms commonsense knowledge into scientific knowledge (which is, in turn, condensed and distilled so that it can enter into relations with other technicalities) and this is used in constructing taxonomies and classifications. Some studies also reveal that, while Science discourse has been described as objective and impersonal, it also has interpersonal meanings. Martin (2007), for example, notes that, in the language of Science, causation fuses with modality such as probability and obligation. Hood's (2010) study also reveals how Sciences explicitly evaluate objects of study but implicitly evaluate contributions to knowledge. Another study that falls in this category is Lemke's (1990) exploration of the language of Science.

The second thread of research into the language of Sciences focuses on specific disciplines, including Biology (Cardinali, 2015; Humphrey & Hao, 2013; Humphrey, Martin, Dreyfus, & Mahboob, 2010; Martinez, 2005), Mathematics (O'Halloran, 2005, 2007, 2009, 2011), and Physics (Doran, 2018). Conrad's (1996) investigation into the language of Biology revealed that the language of Biology

RAs is more impersonal than that of Biology textbooks. Humphrey *et al.* (2010), on the other hand, analysed undergraduate writing in Biology, with the aim of designing an online teaching program to support assignment writing. Cardinali's (2015) study also revealed some lexical bundles that may be considered as the building blocks of AW in Biology. Similarly, Humphrey (2016) investigated knowledge construction in classroom discourse, focusing particularly on secondary school Biology. The findings highlighted the need for instructors to guide students to use specialised knowledge in their fields.

O'Halloran's (2005) investigation focused on mathematical symbolism, visual images, and mathematical construction of realities. She noted that the discourses of Mathematics and Sciences include elements of the functional sign systems of the language, mathematical symbolism, and visual display. Similarly, Martin (2007) noted that field (a set of activity sequences oriented to some global institutional purpose, including the taxonomies of participants involved in these sequences), a register variable, provides a social semiotic perspective on knowledge structure, and knowledge is realised through, and constructed by ideational meaning. He emphasized that in Geology texts, the activity sequences give rise to technical terms naming participants.

Those with diachronic focus investigate how the language of Science evolves over time. The most cited and significant among these studies include Atkinson (1992), Salager-Meyer (1999a, 1999b, 2000), and Bazerman (1984). Salager-Meyer (1999a), for example, investigated the evolution of contentiousness in medical articles published between 1810 and 1995. Similarly, Bazerman examined the evolution of the experimental RA in the journal *Physical Review* from 1893-1930. Halliday and Martin (1996) investigated the evolution of

scientific language from Chaucer through Newton to late twentieth-century scientific writing. Halliday (2002) also observed the evolution of grammatical features, including nominalisations and causal relations enabling "the clause to function effectively in constructing knowledge and value" (p. 173) in scientific texts. Other more recent studies of this kind include Budgell, Kwong, and Millar (2013) and Cantos and Vazques (2011). Budgell *et al.* explored how the language of Chiropractic has changed over time. Similarly, using Corpus of English Texts in Astronomy (CETA), Cantos and Vazques investigated the evolution of the lexical specificity in the discipline of Astronomy from 1710 to 1920. Their study revealed, among other things, the introduction rate of new astronomy-specific vocabulary.

These studies, to some extent, have succeeded in exploring the lexical, rhetorical, and pragmatic features that characterise the language of Science, in general, and that of specific Sciences disciplines. In terms of the specific disciplines studied, of all the studies reviewed so far, it is Cardinali (2015), Humphrey, Martin, Dreyfus, and Mahboob (2010), Humphrey and Hao (2013), and Martinez (2005) which are directly related to the present study. However, what is particularly important to the analytical approach adopted in the present study is Martin's (2007) revelation that knowledge is constructed through ideational meaning. This underscores the significance of investigating nominalisations in terms of process types, as it is through process types that ideational meanings are realised. Martin's comment, therefore, provides a basis for the present study.

Social Sciences

In this sub-section, I present findings of previous studies on the language of Social Sciences. Generally, the studies presented here reveal the nature of knowledge in social science disciplines.

Work on the Social Sciences owes much to Wignell (1997, 2007). Wignell (1997) took both a diachronic perspective—tracing the evolution of the discourse from the mid-seventeenth century to the early twentieth century—and a synchronic perspective, analysing sample texts from the academic disciplines of Sociology, Economics, and Political Science. Wignell found that the discourse of Social Sciences is different in kind from both the Physical Sciences and the Humanities but because of its origins and evolution, it shares some features of both. The Physical Sciences use technicality as a primary resource for naming, categorizing, analysing, and interpreting the world, whereas the Humanities use abstraction as their principal resource. The Social Sciences disciplines are both abstract and technical. This is because, although the discourse of Social Science evolved from Humanities discourses of Moral Philosophy, over time, that abstract discourse evolved into one which is both technical and abstract.

Other studies conducted on the language of Social Sciences include Henderson (2000), Ngula (2015), and Vičič (2013). The study conducted by Vičič (2013) on the demonstrative "this" in Tourism RAs is diachronic in focus. Henderson's study on the use of metaphor in Economics texts also revealed the linguistic means used by the discipline to construct its view of the world as well as the nature of knowledge claims in, and self-image of, Economics. Ngula's study combined cross-disciplinarity with contrastive rhetoric. He investigated how Ghanaian authors in three Social Science disciplines—Sociology, Economics, and Law—use epistemic modality in RAs and compared the findings with international RAs produced by Anglo-American authors. One significant finding of his study was that, in terms of disciplinary variation patterns, there was a difference between the international RAs and those produced by Ghanaian authors.

Humanities

This sub-section discusses previous studies on humanities. Studies presented here are discussed under four sub-themes: a) studies focusing on one humanities discipline, b) those with a diachronic focus, c) those that are comparative in nature, and d) those that are cross-linguistic in nature.

The first group of studies to be examined are those that focus on a single discipline. Previous research in the humanities focused mainly on the discipline of History (Coffin, 2000, 2006; Martin, 2002; Martin & Wodak, 2003), Literary Studies (Halliday, 2002; Webster, 2015), Cultural Studies (Hood, 2016b), and Film Studies (Coffin & Donohue, 2014). Coffin's (2006) study, for instance, examined recording, explaining, and arguing genres in History, focusing on the realisation of time, cause, and evaluation in those genres. Similarly, Martin (2007), noting the role of abstraction in the realisation of time and cause in History, mentioned that abstraction enables the packing up of time, shifting gaze from the unfolding events (as they occur) to periods of time which gain meaning density as they accrue. Martin (2007) added that History discourse focuses "on explaining what happened over time, using cause in the clause to do so" (p. 46). Martin (2002) had noted that while the language of history is highly abstract, it also has some elements of "fuzzy" technicality, evident in such terms as "nationalism", "socialism", "communism," and "capitalism." Hood (2016) concurred that similar elements of technicality can be found in Cultural Studies and concluded that such technicality is a defining feature of humanities, in general.

The second strand of research on humanities is diachronic in focus. Kuhi and Mousavi (2015) studied RA Discussion sections in the field of Applied Linguistics, focusing on the use of prominent interactional markers, including

hedges, boosters, and attitude markers. Their study revealed changes that occurred across four time frames (1980-1985; 1986-1990; 2000-2005; 2006-2010). One significant finding of the study was that interpersonally, particularly hedges, increased over time in the Applied Linguistics RA Discussion sections. Dahmardeh, Parsazadeh, and Parsazadeh (2017) similarly traced the evolution of secondary school English course books from 1939 to 2016 in Iran. These studies have been particularly important in revealing how the language of humanities disciplines evolve with respect to time. While the present study is not a diachronic one, Kuhi and Mousavi's (2015) study is particularly significant to the present study since their study focused on attitude markers, as nominalisations (the focus of the present study) sometimes function as attitude markers.

Some studies focusing on humanities are comparative in nature, combining humanities disciplines with other disciplines (Martin, 2007; Wignell, 2007). Such studies clarify how and why different academic discourses draw differently from the meaning potential of the language. Simply put, such studies explain how different disciplines instantiate differently from systems of lexico-grammar, discourse semantics, register, and genre. In Martin's (2007) exploration of knowledge structures as field of discourse in History (and Science) texts, for instance, he notes that, unlike Science, History is not a discipline that uses technical vocabulary. Martin's study additionally reveals that historians, however, achieve some level of technicality through activity sequencing where chronology is organised through setting in time realised through prepositional phrases of temporal location, which allows time to be nominalised, through "a process of 'thingification' whereby activity is reconstrued as abstract things" (p. 44). When

time, packed as a thing, is named and where proper names become established for phases of history, they become technical terms.

The final strand of studies focusing on humanities is those which are cross-linguistic in nature. In his study, Muñoz (2013) found that both English and Spanish writers make extensive use of pronominal discourse functions in RAs. In a similar vein, Bašić and Veselica-Majhut (2016) investigated linguistic patterns of direct author reference in Linguistics research papers in English and Croatian, focusing on the use of first person singular and plural pronouns. The findings revealed significant differences in the frequency of use of the target pronouns, as well as their discourse functions. While the present study is not a cross-linguistic one, the relevance of these studies to the present one cannot be overlooked, as the studies reviewed here used English-medium papers as part of the data.

Interesting conclusions could be drawn from this review on previous research on Humanities. First, while there are many humanities disciplines, the one that has been extensively studied is History. The second conclusion I draw from this review is that ways of constructing disciplinary knowledge evolve over time. What this means is that the way a particular discipline constructed knowledge in the past may be different from how they construct it today. I have also noted that, generally, whereas Science uses technicalities to build disciplinary knowledge, the humanities mainly use abstraction to construct knowledge. However, as revealed by Martin (2002) and Hood (2016), this does not mean that humanities disciplines do not use technicalities at all. Finally, the review reveals that cross-linguistic factors may also have some influence on disciplinarity.

In this section, I have focused on presenting scholarly views on the notion of disciplinarity. I have paid attention to how disciplinary cultures have been

described, emphasizing their characteristics identified by Becher and Trowler (2001) while indicating that the present study adopts the classification of disciplines presented by Hyland (2006). An attempt has also been made to present a panoramic view of research on disciplinary variations in written AD. From this broader perspective, I now move closer to the purpose of this study by focusing particularly on the RA abstract, and that will be the theme of the next section.

Previous Studies on RA Abstracts

Previous studies on abstracts focused on two types of abstracts: (a) thesis abstracts and (b) RA abstracts. Despite the high number of studies on thesis abstracts, the present literature review focuses on RA abstracts to maintain the highest level of relevance to the scope of the current study. This section explores such studies from two perspectives: (a) Move analysis and (b) linguistic features of abstracts.

RA Abstracts in Move Analysis

Most previous studies on RA abstracts were conducted within the framework of genre analysis. In this section, I critically examine such studies along two lines: (a) intra-disciplinary studies and (b) cross-disciplinary studies. While studies with intra-disciplinary focus explore abstracts from one discipline, the cross-disciplinary ones compare abstracts from two or more disciplines, focusing on their organisational and linguistic features.

Studies with intra-disciplinary focus include Santos (1996), Lores (2004), Cross and Oppenheim (2006), Zhen-ye (2008), and Vathanalaoha and Tangkiengsirisin (2018). Lores, for instance, examined the rhetorical structure and thematic organisation of RAs in Linguistics journals. Similarly, Cross and

Oppenheim investigated the semantic organisation and thematic structure of L2 RA abstracts from the field of Protozoology. Zhen-ye also studied the move structures and personal pronouns usage in fifty English RA abstracts from the field of Financial Economics, revealing a three-move pattern. Additionally, the analysis of personal pronouns showed that first-person plural pronouns are used far more frequently than other types of personal pronouns.

Another trend of research combined intra-disciplinarity with other sources of variation. In this group are studies that are cross-linguistic in nature, as they compare RA abstracts across languages. Marefat and Mohammadzadeh (2013), for instance, examined 90 English and Persian abstracts written in the field of Literature by English and Persian native speakers based on the IMRD (Introduction, Method, Results, and Discussion) and CARS (Create A Research Space) models. The findings indicate that, firstly, Literature RA writers generally focus on Introduction and Results, neglect Method and Discussion, and do not mention the niche in previous related works; secondly, although none of the models was efficient, Literature abstracts generally matched CARS more than IMRD; and finally, abstracts written by Persian native speakers had minor deviations from both the Persian and the international norms and exhibited a standard of their own.

Similarly, Belyakova (2017) conducted a cross-linguistic investigation of abstracts written in English by Russian novice researchers and English-speaking experts in Geoscience. Juan and Tao (2013) also compared English abstracts in leading international medical journals to those in Chinese ones. Their study revealed that Move 1 (research background) was nearly absent in the abstracts written by Chinese writers. Moreover, Chinese writers tend to overuse passive structures and avoid the use of first-person pronouns, which is inconsistent with

their Anglo-American counterparts' preference for the active voice and the first-person pronouns. With the growing need to communicate efficiently with the international discourse community, such cross-linguistic comparisons including the English language are increasing and leading to interesting results. The studies have, thus far, revealed intriguing similarities and differences with respect to rhetorical structure of RAs. These findings, which may be partially interpreted in terms of varying cultural norms, reveal important pedagogical implications for the learning of the English language.

Further, some of the studies with intra-disciplinary focus compared RA abstracts written by native and non-native speakers in a particular discipline. Significant among such studies include Dong and Xue (2010), Ji (2015), and Al-Khasawneh (2017). Al-Khasawneh, for instance, compared abstracts written by native speakers and non-native speakers in the field of Applied Linguistics. The findings reveal that, while both groups of abstracts studied followed a three-move structure (Purpose, Method, and Conclusion), there was a significant difference between those writers in the Introduction and Conclusion moves. Dong and Xue's study similarly compared RA abstracts produced by native speakers and those produced by non-native speakers, in terms of their generic structure. The corpus for the study comprised twenty abstracts, ten each from native speakers and non-native speakers. It was found that abstracts written by native speakers had a more complex structure, compared to those written by non-native speakers. The findings also revealed that, although the structural patterns of abstracts written by native speakers of English vary, it can still be inferred that the Introduction and the Result moves are obligatory while the Method and the Discussion moves are optional. Such comparisons provide useful implications for language instructors and the

learners themselves about how the abstracts of English language learners are similar and/or different from native speakers of English, thereby allowing learners to improve their writing based on the findings of these comparisons.

Another thread of research examined RA abstracts with reference to authors, comparing abstracts written by expert and novice writers, with the latter often represented by graduate students (e.g., Byun, 2015; Menezes, 2013; San & Tan, 2012). For example, Byun (2015) identified the features of RA abstracts produced by English as a Foreign Language (EFL) graduate students, while investigating the variation in rhetorical structure and metadiscourse of English abstracts between Korean novice academic writers and experts who use English as a native language. Having analysed 91 abstracts written by Korean graduate students of English language major (drawn from a university annual periodical) versus 91 abstracts written by experts who use English as a native language (drawn from 7 international and well-recognized journals), Byun found that the novice writers' abstracts tend to follow Swales's (2004) model and show preference for the use of evidentials, boosters, and engagement markers. Novice writers' abstracts also revealed more a cross-disciplinary variation and a significantly different use of metadiscourse.

Further, some studies have explored how abstracts of highly ranked journals are written. A good example of studies that fall in this line of research is Oneplee (2008). Oneplee, using a corpus of 100 abstracts published between 2006 and 2008, investigated the organisation of RA abstracts in two prestigious journals: *Nature* and *Science*. Using Santos (1996) as an analytical framework, Oneplee found that abstracts contain five moves—Background, Purpose, Methodology, Findings, and Conclusion—and that the two journals assign less space to the

methodology move. He concluded that the findings reflect a general pattern in the scientific field.

Corollary to the above is the trend of research which has compared abstracts of highly prestigious journals with those of less prestigious journals. A good example of studies of this kind is El-Dakhs (2018). El-Dakhs compared peer-reviewed articles from Linguistics journals that are indexed in the Web of Science and Scopus to less prestigious ones in terms of generic structure and metadiscourse. He realised that abstracts in Linguistics were characterised by a five-move structure, with the dominant pattern being "Purpose-Method-Findings-Conclusion," which represented almost a quarter of the move patterns in the abstracts of both more and less prestigious journals. With respect to textual and interpersonal metadiscourse markers, the study also revealed significant differences between the two groups of abstracts compared.

Up to this point, the review has focused on studies with intra-disciplinary focus. As revealed by the review, most of such studies (e.g., Al-Khasawneh, 2017; Lores, 2004; Marefat & Mohammadzadeh, 2013; Oneplee, 2008) focused mainly on the rhetorical organisation of the RA abstracts studied, without considering their linguistic features. The few that considered linguistic features also focused on such features as metadiscoursal elements (e.g., Byun, 2015; El-Dakhs, 2018), passive voice (e.g., Juan & Tao, 2013), and pronouns (e.g., Zhen-ye, 2008), to the neglect of grammatical metaphor. It is this gap that triggered the present study.

Although studies with intra-disciplinary focus (like those presented above) are important to the present study, the cross-disciplinary ones are of more relevance to the present study since this present research is also cross-disciplinary in focus. I will, therefore, explore these studies in a little more detail. Previous cross-

disciplinary studies on the RA can be classified into two: (a) those that compare abstracts from two or more disciplines and (b) those that combine inter-disciplinarity with other forms of variation.

Most of the studies that fall within the first category (that is, those that compared RA abstracts from two or more disciplines) usually examine the RA abstracts from the genre perspective, comparing the rhetorical structure, communicative purpose, and various linguistic features across different disciplines to explore potential disciplinary variations. Cavalieri (2014), for instance, compared abstracts from the field of Applied Linguistics and, focusing on communicative practices and linguistic patterns. The findings showed that Medicine abstracts tend to emphasise a more empirical research perspective, whereas Applied Linguistics abstracts seem to give greater importance to general theoretical and methodological issues. Regarding style, the study revealed that researchers in the field of Applied Linguistics, unlike their counterparts in the field of Medicine, tend to signal their presence in the abstracts by using personal framework markers and by using verbs of saying. While Cavalieri's study is related to the present study in its use of Applied Linguistics RA abstracts as data, it focused more on rhetorical organisation, writers' style of writing, and verbs instead of grammatical metaphor, in general, and nominalisation, which the present study seeks to investigate.

Similarly, Darabad (2016), using a total of 63 abstracts (21 published abstracts from each field) from accredited international journals, investigated the schematic structure and linguistic features of abstracts in three disciplines: (a) Applied Linguistics, (b) Applied Mathematics, and (c) Applied Chemistry. The study revealed significant similarities and differences in terms of the schematic

structure and the linguistic features, such as authors' self-mention, voice, and tense of verbs in each move. Like Cavalieri's (2014) study, Darabad's study also overlooked nominalisation as a linguistic feature of the RA abstracts investigated. Other related studies compared Applied Linguistics and English as a Second Language (e.g., Al-Shujairi, Ya'u, & Buba, 2016), Law and Business (e.g., Hatzitheodorou, 2014), five sub-disciplines of Engineering (e.g., Maswana, Kanamaru, & Tajino, 2015), Nanoscience and Nanotechnology (e.g., Hwang, Nguyen, & Su, 2017), Linguistics and Literature (e.g., Doró, 2013), Applied Linguistics, Applied Economics, and Mechanical Engineering (e.g., Saboori & Hashemi, 2013), and Linguistics and Applied Linguistics (e.g., Suntara & Usaha, 2013). These studies are significant, as they reveal major similarities and differences among target disciplines.

A more recent line of enquiry within the cross-disciplinary vein combines disciplinary variation with other sources of variation. Pezzini (n. d.), for instance, investigated the rhetorical structure of abstracts written in English and Portuguese, focusing on the disciplines, Linguistics and Translation Studies. The analysis revealed a high occurrence of present simple tense and active voice in all moves and passive voice only occasionally. One other significant finding of the study is that the absence of the writer (which is a distinctive feature of scientific discourse) is obtained by means of passive voice and typical statements used as resources to avoid the use of personal pronouns. This study also did not investigate nominalisation as a linguistic feature of the RA abstracts.

Finally, a few cross-disciplinary studies on RA abstracts study them together with other genres. Samraj's (2005) study which compared the generic structure of RA introductions and abstracts from two related fields, Conservation

Biology and Wildlife Behaviour, for instance, revealed that RA introductions and abstracts in Conservation Biology bear a greater similarity in function and organisation than the same two genres in Wildlife Behaviour. This study revealed that disciplinary variation in academic writing is also manifest in the relationship among genres.

This sub-section has discussed how previous studies have investigated the rhetorical organisation of RA abstracts. The review has revealed that while most of such studies investigated both the rhetorical organisation and linguistic features of abstracts, such studies often focused on such linguistic features as verbs (e.g., Cavalieri, 2014), self-mention (e.g., Darabad, 2016), and voice (e.g., Pezzini, n. d.), to the neglect of nominalisation, and this leaves a gap that the present study aims to fill. This review further reveals that, aside from disciplinarity, there are other factors (for instance, cross-linguistic factors) that could bring about variability in the rhetorical organisation of RAs.

Linguistic Features of Abstracts

This sub-section focuses on the linguistic items that have often been investigated in studies on disciplinary variation. These linguistic resources are usually analysed from the register and corpus linguistic perspectives.

The first strand of studies to be examined comprises those that focus on a specific discipline. The most relevant of such studies to the present study is Farjami (2013), who focused on Applied Linguistics. Farjami reported results from a corpus-based study that explored the frequency of words in the abstracts of Applied Linguistics journal articles. The abstracts of major articles in leading Applied Linguistics journals, published from 2005 to November 2011, were analysed using software modules from the Compleat Lexical Tutor, focusing on a list of the most

frequent content words, lists of frequent words, and abbreviations not found in the British National Corpus. The study also weighed Applied Linguistics abstracts against the General Service List (GSL) and the Academic Word List (AWL) and identified words in these abstracts which are shared by the GSL or the AWL or are unique to one set. The study separately listed words from the GSL and the AWL which are proportionally more frequent in these abstracts than in general written texts and, hence, may be reasonably regarded as playing key textual roles in Applied Linguistics abstracts and, by extension, discourse. Other disciplines that have featured prominently in studies with intra-disciplinary focus include Engineering (e.g., Abarghooeinezhad & Simin, 2015), English as a Foreign Language (EFL) (e.g., Nurhayati, 2017), and Linguistics (e.g., Bašić &Veselica-Majhut, 2016).

While the studies reviewed in the above paragraph focused on one discipline, other studies combined intra-disciplinarity with other forms of variability. Among such research is the type that combined intra-disciplinarity with cross-linguistic variation. Hu and Cao (2011), for instance, compared the use of hedges and boosters in Applied Linguistics RA abstracts in English- and Chinese-medium journals. Their findings indicated that abstracts published in English-medium journals featured markedly more hedges than those published in Chinese-medium journals and that abstracts of empirical RAs used significantly more boosters than those of non-empirical academic articles. Such cross-linguistic studies, though not directly related to this study, reveal how linguistic/cultural factors could lead to variability in RA abstracts of the same discipline.

Some intra-disciplinary studies are also diachronic in focus. Studies conducted by Gillaerts (2014) and Kuhi and Mousavi (2015) on the field of Applied

Linguistics and that of Haas (1994) on the field of Biology are noted among studies of this kind. Gillaerts explored the rhetorical features in the abstracts of a renowned international academic journal with a long-standing tradition in the field of Applied Linguistics, *Applied Linguistics*, from a diachronic perspective. The study revealed an increase in boosters and attitude markers, showing that persuasive intents are gradually more overtly included in the abstracts. Though these studies, unlike the present study, focused on single disciplines, they are directly related to the present study in terms of disciplines studied.

The second thread of research to be considered encompasses those that are cross-disciplinary in focus. Disciplines compared include Humanities, Social Sciences, and Natural Sciences (e.g., Stotesbury, 2003a, 2003b), Physics, Sociology, and Literature (e.g., Babaii & Ansary, 2005), Applied Linguistics, Civil Engineering, and Dentistry (e.g., Moattarian & Alibabaee, 2015), and Linguistics, Psychology, and Educational Research (e.g., Muñoz, 2013). One of the earliest studies of this kind is Graetz (1982), who reported a study on over 87 abstracts from the disciplines of Health Sciences, Social Sciences, Education, and Humanities. She aimed to gain insights into their linguistic properties. She observed that the purpose of abstracts was to "give the reader an exact and concise knowledge of the total content of the very much lengthier original, a factual summary which is both an elaboration of the title and a condensation of the report" (Graetz, 1982, p. 23). Her work, although pioneer, has been often criticized. According to Ventola (1997), Graetz's classification criterion is "relatively ad hoc [and] it is merely a list of some of the realizations found in the scientific abstracts studied" (p. 345).

Stotesbury (2003b) was particularly interested in discovering whose voice was heard in the abstracts from three disciplines in view of the use of citations and voice. His findings revealed that the Humanities abstracts clearly differed from those of the Social and Natural Sciences since they included approximately four times as many citations as did the Social and Natural Science abstracts. It was also found that the writer's voice was most often heard in the Natural Science abstracts, while Humanities and Social Sciences abstracts preferred the passive voice and impersonal metaphor. Similarly, Kwary, Kirana, and Artha (2017) investigated the similarities and differences in the use of verb tenses and modals across four different disciplines (Health Sciences, Life Sciences, Physical Sciences, and Social Sciences) and found that the present and the past tense are the most dominant tenses. The study also revealed "can" as the most dominant modal in the abstracts examined. In a similar vein, Sala (2015), using RA abstracts in four different disciplines—Applied linguistics, Economics, Law, and Medicine—investigated how differently and according to what linguistic parameters such texts codify ideational material, represent disciplinary beliefs and values, and negotiate meanings with the community of reference.

Other studies of this kind include Ebrahimi (2016), Çakır (2016), Ebrahimi and Motlagh (2015), Rashidi and Alihosseini (2012), and Dahl (2004). Ebrahimi's study, for instance, investigated the Theme types and patterns used in 120 research article abstracts from the disciplines of Applied Linguistics, Economics, Agriculture, and Applied Physics. Çakır, on the other hand, examined the use of stance adverbs in RA abstracts. Closely related to the present study is Sarfo-Adu's (2015) study on nominalisation in RA abstracts. Sarfo-Adu compared the use of nominalisations in abstracts of RAs in the Humanities and the Sciences, using a

corpus of 50 abstracts drawn from the Humanities and the Sciences. The findings of the study revealed that abstracts are characterised by nominal style. It was also found that there was a higher frequency of nominal structures in the Sciences than the Humanities. Further intra-discipline analysis showed a divergent use of suffixation in the realization of nominalisations. It must, however, be noted that, while the present study and Sarfo-Adu's one are similar in focus, they differ in terms of the approaches adopted: Sarfo-Adu's study operated within the framework of Chomsky's transformational generative grammar (TGS), while the present study uses SFL as a theoretical framework. Specifically, Sarfo-Adu's study focused more on suffixes used to realise nominalisations while the present study is interested in semantic types of process nominalisation as well as the functions of nominalisation in the discourse semantics stratum.

Unlike the cross-disciplinary studies reviewed so far, Alonso-Almeida's (2014) study was both cross-disciplinary and cross-linguistic in focus. Alonso-Almeida explored evidentiality and epistemic devices in English and Spanish RA abstracts from the disciplines of Medicine, Computing, and Legal Science. One important finding of the research was that, in general terms, across the disciplines studied, the use of evidential and epistemic devices was more prominent in the English sub-corpus than the Spanish one.

Bondi's (2014) study also differs from those reviewed so far since it was both cross-disciplinary and diachronic in focus. Bondi investigated comparatively and diachronically self-mention and authorial voice in three different disciplinary fields (History, Economics, and Linguistics), with the aim of tracing changes occurring over a time period that has seen tremendous growth in the status of abstracts in the field, together with their increasing availability in electronic journal

databases. This study is related to the present study since they both focus on more than one discipline.

The present section has reviewed previous studies on linguistic features of RA abstracts. The review has shown that RA abstracts have been explored through various methodological approaches. In particular, RA abstracts have been studied from intra-disciplinary (e.g., Farjami, 2013; Nurhayati, 2017), cross-disciplinary (e.g., Stotesbury, 2003a, 2003b), cross-linguistic (Hu & Cao, 2011), and diachronic (Gillaerts, 2014; Kuhi & Mousavi, 2015) perspectives. In terms of linguistic items explored, the studies have focused on hedges and boosters (Gillaerts, 2014; Hu & Cao, 2011), citation (Stotesbury, 2003b), verb tenses and modality (Kwary, Kirana, & Artha, 2017), stance adverbs (Çakır, 2016), and nominalisation (Sarfo-Adu, 2015). It must be noted that, while Sarfo-Adu's (2015) study focused on nominalisation across disciplines, it was grounded in Noam Chomsky's transformational grammar. Given that the present study uses SFL as its theoretical framework, it departs considerably from Sarfo-Adu's study.

Chapter Summary

This chapter reviewed literature relevant to the present study. The review focused on four main issues: (a) the theoretical framework that guides this study, (b) research on grammatical metaphor, (c) research on disciplinarity, (c) and research onthe RA abstract. Regarding the first issue, the theory that underpins the study, the study utilized SFL. The study discussed the SFL concept of grammatical metaphor and nominalisation. Again, previous studies on disciplinary variations were reviewed, thereby, revealing discipline-specific features of texts and cross-disciplinary variations in texts. I further examined studies conducted on abstracts thematically, considering those with intra-disciplinary, cross-disciplinary, and

diachronic foci as well as those that combine these approaches with other sources of variation. Finally, I reviewed studies conducted on nominalisation in specific written academic genres.

CHAPTER THREE

METHODOLOGY

Introduction

The previous chapters have provided a background and pertinent literature that indicate how the present study fits into previous research on the subject under investigation. In this chapter, I present the methodological procedures undertaken in conducting the research. Key issues discussed in the chapter include the research design, data, data collection procedures, method of sampling, the method of analysis, and problems encountered and how they were surmounted.

Research Design

The study adopted the qualitative research design, which concerns itself with exploring people's beliefs, experiences, attitudes, behaviours, and interactions (Fraenkel & Wallen, 2000). In other words, it investigates "how people make sense of their lives, experiences, and their structures of the world" (Creswell, 1994, p. 145). Qualitative research aims to understand the process and character of social life and to arrive at meaning types, characteristics, and organisational aspects of documents as social products in their own right, as well as what they claim to represent (Altheide, 1996).

Qualitative research focuses on the social meaning people attribute to their experiences, circumstances, and situations, as well as the meanings people embed into texts, images, and other objects. The focus of qualitative research is generally words, texts, and images as opposed to the gathering of statistical data. However, this does not mean that qualitative researchers do not use numbers or that

quantitative researchers do not use words (Hesse-Biber, 2010). The main reason for choosing the qualitative design is that the present study is descriptive in nature. In choosing this study design, I, therefore, agree with Creswell (1994) that qualitative research is an appropriate approach for exploratory and descriptive research such as the present study.

Specifically, the present study employs content analysis as a qualitative research approach for the analysis. Content analysis is the study of recorded human communication (Babbie, 2013), whether written, verbal, or visual (Elo & Kyngäs, 2008). According to Babbie (2013), forms suitable for content analysis include books, magazines, web pages, poems, newspapers, songs, paintings, speeches, letters, e-mail messages, bulletin board postings on the internet, laws, and constitutions, as well as any components or collections thereof. Qualitative content analysis allows the researcher to offer a subjective interpretation of the content of a text through identification of themes or patterns (Hsieh & Shannon, 2005).

According to Kaid (1989), qualitative content analysis requires an analytical process of seven steps: (a) formulating research questions to be answered, (b) selecting the sample to be analysed, (c) defining the categories to be applied, (d) outlining the coding process, (e) implementing the coding process, (f) determining trustworthiness or credibility, and (g) analysing the results of the coding process. From these analytical steps, one realises that coding—the process of putting tags, lines, names or labels against the pieces of data—forms an integral part of content analysis. Coding enables the researcher to distil words into fewer content-related categories (Weber, 1990) which share the same meaning (Cavanagh, 1997).

Hsieh and Shannon (2005) identify three analytical approaches to content analysis: (a) conventional, (b) directed, and (c) summative. The conventional content analysis is used with a study design aimed at describing a phenomenon, when existing theory or research literature on the phenomenon is limited. In this approach, researchers avoid using pre-conceived categories; rather, researchers immerse themselves in the data to allow new insights, including categories and their names, to emerge. Directed content analysis, on the other hand, is used when there is an existing theory or prior research about a phenomenon which is incomplete or would benefit from further research. The goal of directed content analysis is, therefore, to validate or extend conceptually a theoretical framework. A researcher who uses the summative approach to content analysis begins by identifying and quantifying particular words or content and then interprets the patterns that emerge in relation to the contextual meaning of the specific words or contents. Thus, a summative approach to qualitative content analysis goes beyond mere word counts to include latent content analysis, the process of interpretation of content (Holsti, 1969).

For two reasons, I found both the directed and summative approaches to content analysis, as opposed to the conventional one, suitable for the present study. In the first place, the study is backed with a theory, with a large body of literature and existing categories, which makes directed content analysis an ideal choice. Additionally, with the aim of finding cross-disciplinary variations in terms nominalisations use, in which case it is necessary to quantify nominalisation usage, the summative approach became desirable.

Essentially, both approaches were used in analysing the data in terms of the first research question. Here, the directed approach became very useful, as it

enabled me to classify the process nominalisations into existing categories, the process types; on the other hand, the summative approach allowed me to quantify the process nominalisations identified and interpret the emerging patterns based on the contextual use of the process nominalisations identified. A combination of the two approaches, thus, helped me to bring out disciplinary differences in process nominalisation usage in the data analysed. Concerning the second research question, which was mainly to investigate the functions of process nominalisations at the discourse semantics level, only the directed content analytical approach was applied, as the aim was to provide empirical support to some theoretical claims in the existing literature, without necessarily focusing on disciplinary variations.

Data Source and Sampling Procedures

The data for the study were collected online from the websites of the journals selected through purposive sampling technique.

In this study, I built the corpus to represent language use in RA abstracts in three different disciplines—Applied Linguistics, Economics, and Biology—from 2014 to 2018. Given that the sampling technique was purposive, I used two criteria for the selection of RA abstracts: (a) availability of RA abstracts online and (b) prestige. I considered the first criterion, availability of data in electronic format, very important because it allows easy access to data. The second issue, prestige, emerges from the main characteristic of RA as a genre written by experts to be read by other experts. In other words, RAs, part of which are RA abstracts, are seen as "accredited disciplinary artefacts" (Hyland, 2004, p. 139) which are important both to the disciplines at large and to the professional reputation of individual academics. In view of this, RAs whose abstracts were selected came from journals that are held in high esteem in their respective fields. This decision was informed

by my belief that it is such journals that embody the values of the respective disciplines.

At this point, it is necessary to mention that the assessment of a journal as prestigious is highly subjective. Previous studies of this kind adopted either (or a combination) of two approaches: (a) the use of the Impact Factor (IF) and (b) by consultations with expert informants. The IF of a given journal in a particular year is a measure of the number of times articles published in that journal were cited in two years preceding the given year. For example, if a journal has an IF of 2 in 2019, it means that, averagely, each article published in that journal in 2017 and 2018 received 2 citations.

While the use of the IF has been considered objective and convenience, it also has some limitations. Swales (2004), for instance, notes that journals are cited for various reasons, and the failure of the IF to distinguish negative citations from positive ones makes its use as a measure of a journal's status questionable. In the present study, the status of journals was assessed based on two criteria: (a) their use in previous studies of this kind and (b) consultations with expert informants from the disciplines investigated. In other words, I first selected prestigious journals that have featured in similar previous studies and further confirmed the prestige of the journals from professors in the fields under investigation. I then went to the websites of the selected journals and downloaded twenty abstracts published from 2014 to 2018 from each journal.

One other important issue deserves mention. I did not consider the authorship (whether the author is a native speaker or non-native speaker of English) of the articles selected. Every abstract published in the journals sampled was considered valid for the study. I made this decision since it was not my purpose to

investigate the effects of writers' linguistic background on their language use as some studies, for instance, Ngula (2015), did. In this regard, I agree with Swales (2004), who argued that it is wrong to include in discourse analysis only texts produced by native speakers of English. Swales added that once an article gets published in an English-medium journal, it is justifiable enough to include it in any study. Table 3 below provides a brief description of the data.

Table 3: **A Brief Description of the Data**

Discipline	*Name of Journals*	*Number of RAAs*
Applied Linguistics	Annual Review of Applied Linguistics	20
	Applied Linguistics	20
Economics	The Quarterly Journal of Economics	20
	The Review of Economics Studies	20
Biology	The American Naturalist	20
	The Quarterly Review of Biology	20

As Table 3 reveals, *Annual Review of Applied Linguistics* and *Applied Linguistics* were the journals sampled from the discipline of Applied Linguistics while *The Quarterly Journal of Economics* and *The Review of Economics Studies* were the Economics journals used. Also, the Biology RA abstracts used came from *The American Naturalist* and *The Quarterly Review of Biology*. From each of these journals, 20 RA abstracts were sampled.

Method of Analysis

This sub-section discusses the analysis procedure. Basically, this involves two steps: (a) the identification of process nominalisations and (a) analysis of process nominalisations in terms of the research questions. The sub-sections here

will focus on each of these issues. It must be mentioned, however, that before I started the analysis, I coded the data collected to allow for easy identification. In the coding process, the RA abstracts that fell under each discipline were numbered. For instance, Applied Linguistics RA abstracts were labelled Applied Linguistics 1 to Applied Linguistics 40. The same applies to RA abstracts from the two other disciplines.

Identification and Counting of Instances of Nominalisation

The first step involved identification of instances of process nominalisations. From an SFL perspective, because there is no automatic way of recognising grammatical metaphor, the identification of metaphors was done manually, using criteria proposed in the literature, such as derivation and agnation (Simon-Vandenbergen *et al*., 2003). Many nominalisations come as a result of the word formation process of derivation. However, because not all derived nouns are metaphors, it became desirable to use agnation, a concept that suggests that any metaphorical form has its more congruent realisation, the agnate form. The process of rewording metaphorical forms into their congruent realisations is called unpacking. Using agnation as a guide, I excluded forms that could not be unpacked. In addition, since nominalisations construe reality as abstraction, any derived form that refers to physical entities (rather than abstract ones) was not considered as metaphors. For instance, *management*, as used in Extract 1 below was not considered an instance of process nominalisation, since it refers to a body of people and has little, if any, "sense of event being represented" (Thompson, 2010, p. 29).

Extract 1

> We show theoretically and suggest empirically that the effect captures free riding among workers, which originates from the way the **management** informs its dismissal decisions. **[Economics 24]**

All cases that met the criteria for identification of process nominalisations were counted in terms of types and token. For example, the process nominalisation, *treatment*, occurred 14 times in Economics, which counted as one type, 14 tokens. Additionally, some process nominalisations came in both singular and plural forms. Such nominalisations were counted together as one lemma.

Analysing Data with Respect to Research Question 1

The identification of process nominalisations was followed by the analysis of the semantic choices (types) of the process nominalisations identified. At this stage, Ravelli's (1988) categorization of ideational metaphors became useful. In her taxonomy, Ravelli classifies ideational metaphors based on Process types: (a) material, (b) mental, (c) verbal, (d) relational, (e) behavioural, and (e) existential. While process types involve sub-categories (see Halliday & Matthiessen, 2014), as presented in Figure 2, Ravelli, in her work, focused on the major categories without paying attention to the sub-types. In my analysis, however, I paid attention to the sub-categories where necessary. Figure 4 shows my model for the classification of process nominalisations.

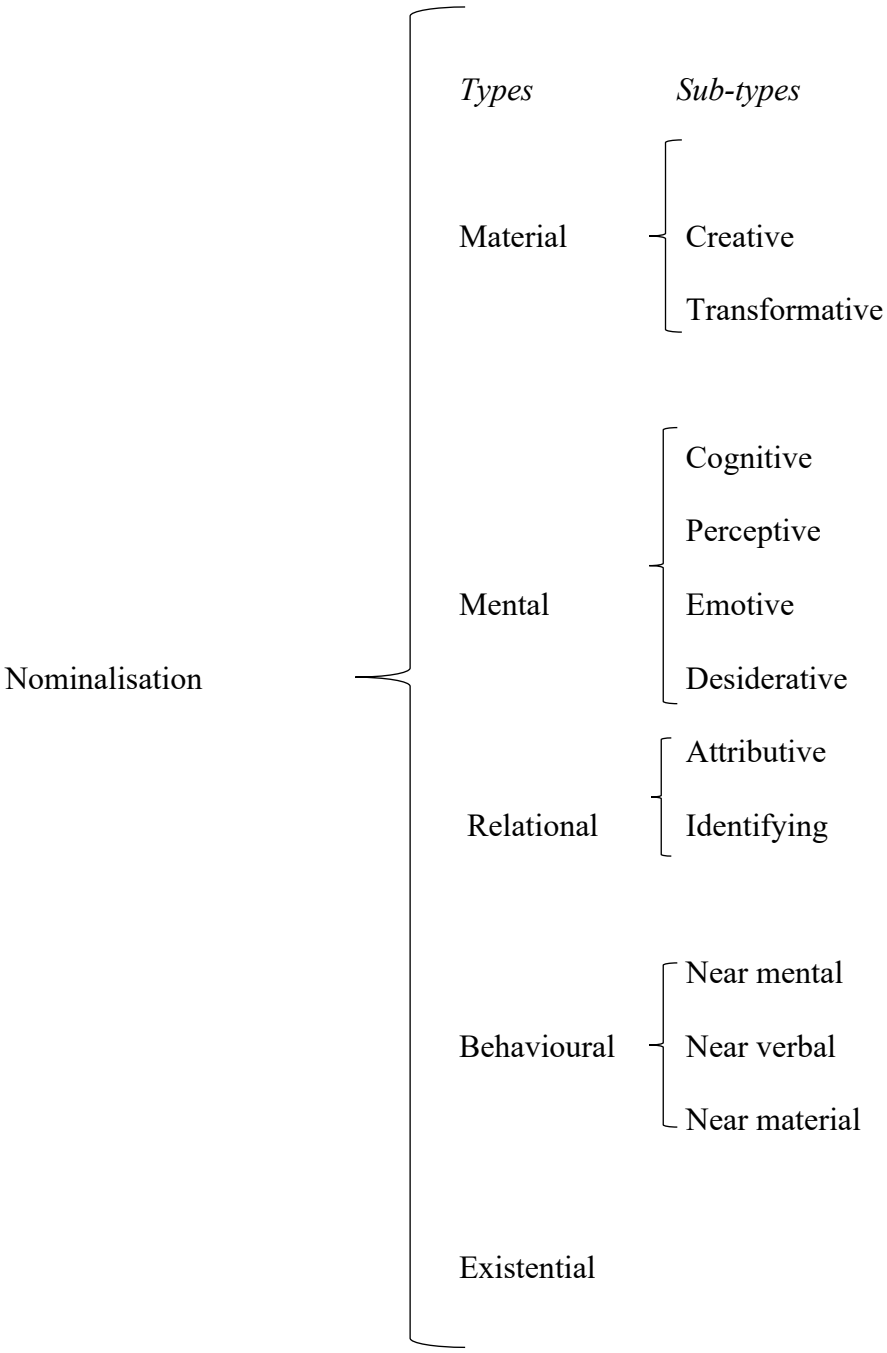

Figure 4: *Model for classifying process nominalisations*

Classifying process nominalisations into their various process types was not a straightforward matter. I made the classification by considering the context of use

of each process nominalisation identified. This became desirable because some nominalisations came with different meanings, depending on the context. One example of such nominalisations I encountered in my analysis is *development,* as seen in Extracts 2 and 3 below:

Extract 2

The **development** of the ability to throw projectiles for distance, speed, and accuracy was a watershed event in human evolution. We hypothesize that throwing first arose in threat displays and during fighting and later was incorporated into hunting by members of the Homo lineage because nonhuman primates often throw projectiles during agonistic interactions and only rarely in attempts to subdue prey. [**Biology 24**]

Extract 3

While human capital is a strong predictor of economic **development** today, its importance for the Industrial Revolution has typically been assessed as minor. To resolve this puzzling contrast, we differentiate average human capital (literacy) from upper-tail knowledge. **[Economics 14]**

While both nominalisations in these extracts (2 & 3) involve incongruent realisation of the verb, *develop*, which is a material Process verb, their meanings differ. Paying attention to the context of use, I realised that *development,* as used in Extract 2 suggests "come to have" while it means "progress" in Extract 3. This difference in meaning results from differences in the contexts of use. Paying attention to this difference in meaning, I classified its use in Extract 2 as a nominalisation of creative material process and the one in Extract 3 as nominalisation of transformative material process.

Analysing Data With Respect to Research Question 2

Data analysis on the second research question was purely qualitative, devoid of any calculations, aimed at exploring how, as grammatical metaphor, process nominalisations function in the discourse semantics stratum. In this regard, nominalisations were analysed with respect to ideational, interpersonal, and textual functions.

In the discourse semantics stratum, field of discourse comprises series of activities involving people, things, places, and qualities realised by clauses and their elements, and the nominal group functions to place entities in taxonomic relations. Taxonomic relations are established between elements, as texts unfold, and enables in the classification of elements (Martin & Rose, 2007). Classification is achieved by the nominal group because the nominal group has the potential to attract modifiers that specify the meaning of the process nominalisation functioning as Head. In analysing the data in this respect, I read through the data and identified complex nominal groups with modifiers that allow specification of meaning, as illustrated in the extract below:

Extract 4

> Overall, natural enemies disruptively select for either small or large galls, mainly along the axis of gall thickness. These results imply that predators are driving the evolution of phenotypic diversity in symbiotic defense traits in this system and that **divergence** in defensive morphology may provide ecological opportunities that help to fuel the adaptive radiation of this genus of midges on goldenrods. This enemy-driven phenotypic **divergence** in a diversifying lineage illustrates the potential importance of consumer-resource and symbiotic species interactions in adaptive radiation. **[Biology 5]**

Extract (4) above illustrates how I analysed the data with respect to how process nominalisations are used for classification. As the extract shows, the process nominalisation, *divergenc*e, is used instead of its congruent realisation, for it to be modified in order to specify its meaning. The addition of modifiers makes it possible to specify the kind of divergence being talked about, thereby placing *enemy-driven phenotypic divergence* as a sub-class of "divergence," which was introduced earlier in the extract.

Concerning the interpersonal function of process nominalisations in the discourse semantics stratum, I analysed the data, making reference to process nominalisations as resources for appraisal. Appraisal concerns evaluation. In other words, appraisal resources allow us to express our social relationships by signalling to our readers how we feel about things (Martin & Rose, 2007). In the analysis, I realised that process nominalisations could allow appraisal in two ways. In the first place, some process nominalisations have evaluative potential in them, and their use allows writers to express their attitudes towards things and sometimes propositions. Extract (5) explains this further.

Extract 5

> The first aim of this article, addressed in section 1, is to define what is meant, and not meant, by task and task-based language teaching (TBLT). The second is to summarize and evaluate 14 **criticisms** that have been made of both. [**Applied Linguistics 9**]

In this extract, I considered *criticism* as a process nominalisation that is inherently evaluative. The reason is that it is usually the reporter of a proposition who give it the label they want in order to inform their readers to interpret the linguistic status of the propositions in a particular way (Charles, 2003). Thus, concerning this extract, it can be argued that those who made those propositions

labelled by the author as *criticisms* may not have intended them to be criticisms. Again, as I have mentioned earlier, the nominal group allows expansion through modification, and this allows propositions to be evaluated by the use of modifiers. This evaluation will not be possible if process nominalisations are realised congruently. Thus, process nominalisations that have these properties were considered as performing evaluative function.

The final stage of the analysis involved investigating the textual function of process nominalisations in the discourse semantics stratum. Theoretical literature (e.g., Halliday, 2005) suggests that, in this regard, process nominalisations perform cohesive functions. Thus, at this stage of the analysis, I was guided by Halliday and Hasan's (1976) influential work on cohesion as well as Flowerdew's (Flowedew, 2005; Flowedew & Forest, 2015) work on signalling nouns. Two criteria guided me in identifying process nominalisations performing the textual function. In the first place, similar to general nouns and signalling nouns, process nominalisations served as resources for reference, creating relations of presumption between themselves and an element introduced earlier in the text. Extract (6) below illustrates this.

Extract 6

> In this article, we present *an analytical approach that focuses on how transnational and translingual learners mobilize their multilingual, multimodal, and multisemiotic repertoires, as well as their learning and work experiences, as resources in language learning*. The **approach** is that of translanguaging, which seeks to push the boundaries not only between different named languages but also between different modalities and across language scripts and writing systems. [**Applied Linguistics 2**]

In this extract, headed by the process nominalisation, *approach*, the nominal group, *the approach*, makes anaphoric reference to its first appearance in the

discourse (that is*, an analytical approach that focuses on how transnational and translingual learners mobilize their multilingual, multimodal, and multisemiotic repertoires, as well as their learning and work experiences, as resources in language learning*). It is this anaphoric reference that creates the cohesive tie.

Also, in relation to cohesion, Halliday (2005) notes that process nominalisations, when they encapsulate a stretch of discourse, sometimes, serve as the point of departure or Theme for the next clause, and this ensures logical progression of the discourse. Extract (7) explains this further.

Extract 7

> *This article reviews current research findings on how specific learning difficulties (SLDs) impact on the processes of multilingual language development*. The **review** includes studies of young language learners in instructed classroom settings, as well as of multilingual children in second language (L2) contexts. [**Applied Linguistics 5**]

In this extract, the nominal group underlined encapsulates the sentence in italics and this creates a semantic tie between them. Additionally, it serves as the point of departure of its sentence, ensuring the logical progression of the text. Thus, the process nominalisation underlined in this extract was considered as performing the textual function.

What I have done in this section is to explain how I analysed the data, with respect to the research questions. As indicated, Ravelli's (1988) classification of process nominalisations guided me in analysing the data with respect to Research Question 1. In terms of Research Question 2, I was guided by and Martin's (Martin, 1992; Martin & Rose, 2007) concept of discourse semantics, Halliday and Hasan's (1976) work on cohesion as well as other previous studies (e.g., Charles, 2003; Flowerdew & Forest, 2015).

Problems Encountered and Strategies Adopted

In conducting the research, I encountered a few problems. The first problem I encountered concerns the identification of process nominalisations. Regarding this problem, it got to a point that I was confused as to whether certain words could be considered as process nominalisations. Examples of such words I encountered are *hypothesis* and *theory*. The confusion around these words resulted from the fact that they could be used both as a noun and as a verb. For example, *hypothesis* could be considered as formed from the verb, *hypothesise*. To resolve this problem, I sought expert advice from a lecturer whose specialisation is in SLF. He argues, following Derewianka (2003, p. 195), that such words have become "technical terms" which are "generally not analysed as being metaphorical."

Another problem came with the classification of the process nominalisations identified into their semantic types. This is because some instances of process nominalisation identified "incorporate features consistent with more than one category" (Gwilliams & Fontaine, 2015, p. 3), which is not strange. In fact, Halliday and Matthiessen (2014) even note that "process types are fuzzy categories" (p. 216), since "the world of our experience is highly indeterminate" (p. 217). Also, in dealing with this problem, I consulted an expert, who indicated, in agreement with Halliday and Matthiessen, that such problems are "part of the game" and the only solution is to ensure consistency in the analysis.

Measures for Reliability

In conducting the study, I took some steps to ensure reliability of the analysis. As I indicated in the previous section, I often consulted an expert in the field of SFL anytime I encountered difficulties. Besides this, I also used inter-raters. One assistant lecturer at the Department of English, University of Ghana, and one MPhil

(English Language) student who had completed his course work were engaged. I explained the concept of grammatical metaphor to them and showed them how I undertook the analysis. I, then, gave them the raw data for them to look at my analysis and give me their degree of agreement. Table 4 shows their degree of agreement.

Table 4: **Inter-Rater Reliability Agreement**

Inter-rater	Agreement score
A	90%
B	80%

Table 4 shows my inter-raters' agreement with my analysis. As the table reveals, one inter-rater gave me 90% agreement while the other gave me 80% agreement. On average, the agreement rate is 85%, which is high.

Chapter Summary

This chapter generally outlined the methodological and analytical procedures used in conducting the study. In the first place, the chapter discussed the research design, where it was noted that this study adopted the qualitative method. The source of data and sampling techniques were also highlighted. In this regard, it was noted that the research used one hundred and twenty RA abstracts (forty from each discipline). Also, the method of analysis was discussed in the chapter. Finally, problems encountered as well as measures of reliability adopted were discussed.

CHAPTER FOUR

ANALYSIS AND DISCUSSION

Introduction

In the previous chapter, I presented the methodological procedures used in conducting the research. In this chapter, I present the analysis of the data, together with the discussion of the findings with regard to the research questions. Thus, this chapter is divided into two main sections: (a) semantic choices of process nominalisations in RA abstracts across the three disciplines and (b) discourse functions of process nominalisations.

Semantic Types of Process Nominalisations

In this section, I analyse and discuss the data in line with the first research question, which seeks to investigate the semantic choices made across the three disciplines with regard to process nominalisations. Table 5 shows the frequencies of occurrence of the semantic types of process nominalisations across the three disciplines studied.

Table 5: **Frequency Distribution of Semantic Types of Process Nominalisations Across Disciplines**

	Applied Ling		Economics		Biology		Total	
	Types	Tokens	Types	Tokens	Types	Tokens	Types	Tokens
Material	131	522	134	476	154	589	419	1587
Creative	*4*	*10*	*8*	*27*	*14*	*88*	*25*	*125*
Transformative	*127*	*512*	*126*	*449*	*141*	*501*	*394*	*1462*
Mental	16	30	14	62	14	37	44	129
Cognitive	*10*	*22*	*10*	*50*	*8*	*25*	*28*	*97*
Perceptive	*2*	*2*	*1*	*2*	*2*	*4*	*5*	*8*

Desiderative	*2*	*3*	*3*	*10*	*2*	*3*	*7*	*16*
Emotive	*2*	*3*	-	-	*2*	*5*	*4*	*8*
Verbal	3	34	6	14	4	6	13	54
Relational	2	15	3	15	5	9	10	39
Behavioural	1	6	1	4	1	7	3	17
Existential	-	-	-	-	3	6	3	6

As indicated in Table 5, nominalisations of material processes have the highest frequency of occurrence, with 419 types and 1597 tokens. Of the total number of nominalisations of material processes, the transformative type had more than 50 percent of occurrences. This supports Halliday and Matthiessen's (2014) claim that there are a wider variety of transformative material process types than the creative ones. In total, the second most frequent semantic type of process nominalisations is nominalisation of mental processes, with the cognitive type occurring more than the perceptive, desiderative, and emotive types. The more frequent use of cognitive mental processes in all the three disciplines suggests the role reasoning plays in academic knowledge construction (Hyland, 2004).

Table 5 additionally reveals that nominalisations of verbal, relational, behavioural, and existential processes respectively occurred less frequently across the disciplines. This finding disagrees with that of Norouzi *et al.* (2012) and Kazemian *et al.* (2013). The study conducted by Norouzi *et al.* revealed nominalisations of relational processes as the second most frequent type. Similarly, in their study of nominalisations in scientific texts, Kazemian and his colleagues found nominalisations of relational processes as the nominalisation type with the second highest frequency of occurrence. This difference in findings could be attributed to differences in genre. While the present study used RA abstracts as data, the study conducted by Norouzi *et al.* used a variety of scientific texts,

including textbooks, while Kazemian focused on scientific texts extracted from scientific magazines.

The focus of this section has been to offer a panoramic view of the data by providing frequencies of process nominalisations usage in the data. In the next section, I discuss in detail the semantic choices made across the disciplines under study in terms of process nominalisations usage. In so doing, I will also provide a list of some specific process nominalisations that occurred frequently across disciplines and compare their usage.

Nominalisation of Material Processes

Material clauses are clauses of doing that construe change in the flow of events as happening through some input of energy. Material processes differ from other process types in terms of how present time is presented. In this regard, the unmarked tense selection is the present-in-present rather than the simple present. Generally, material processes come in two types: (a) creative material processes and (b) transformative material processes (Halliday & Matthiessen, 2014).

In the creative type, the Actor or Goal is presented as being brought into existence with the unfolding of the event. In the creative clause, the outcome is the existence of the participant, be it the Actor or Goal, and there is no different element representing the outcome in the clause. The data analysed revealed the use of nominalisations of creative material processes. Table 6 presents the distribution of the specific process nominalisations of this kind used in each sub-corpora.

Table 6: **Nominalisations of Creative Material Process Types**

Applied Linguistics	Economics	Biology
Writing (6)	Production (10)	Evolution (45)
Construct (2)	Manufacturing (10)	Development (10)
Construction (1)	Design (3)	Flowering (6)

Making (1)	Innovation (2) Agglomeration (1) Establishment (1) Yield (1) Construction (1)	Speciation (5) Production (4) Reproduction (4) Formation (3) Emergence (3) Occurrence (2) Coevolution (2) Modelling (3) Imaging (1) Construction (1) Breeding (1)

As Table 6 reveals, *writing*, *construct,* and *making* are unique to Applied Linguistics, *manufacturing*, *design*, *innovation*, *agglomeration*, *establishment,* and *yield* are unique to Economics while *evolution*, *flowering*, *speciation*, *formation*, *emergence*, *coevolution*, *imaging,* and *breeding* are unique to Biology. Semantically, the nominalisations of creative material processes unique to Applied Linguistics have a presumed human Actor, as shown by Extracts (8) and (9) below:

Extract 8

Using 486 discussion board postings from a five-year period (2009–2013), we analyzed the extent to which native and nonnative university students' **writing** differed in 10 measures of syntactic complexity targeting the length of production unit, amount of subordination, amount of coordination, and degree of phrasal sophistication. [**Applied Linguistics 28]**

Extract 9

But while a useful tool in revealing something of the dynamic interactions which underlie persuasive claim **making**, it has little to say about the role of nouns in this process. [**Applied Linguistics 23**]

Extracts (8) and (9) are illustrations of the use of nominalised creative material processes in Applied Linguistics. In each extract, the underlined structure is the nominal group headed by the nominalisation which is in bold. Taking the nominal group*, native and nonnative university students' writing*, as used in Extract (8), for instance, its suggested congruent realisation is *native and nonnative university*

students write. In this congruent realisation, *native and nonnative students*, a human Actor, becomes the subject of the sentence. Similarly, in Extract (9), *persuasive claim making* is the nominal group in focus and it is headed by *making,* which is a nominalised creative material process. A congruent realisation of *persuasive claim making* could be *we make claim persuasively*, with *we*, a personal pronoun, being Actor.

Similarly, in the case of Economics, with the exception of *agglomeration* and *yield*, which have presumed non-human Actors, the nominalisations of creative material processes in Economics have presumed human Actors. Extracts (10) and (11) illustrate the use of nominalised creative material processes in the Economics RA abstracts analysed.

Extract 10

How does transparency, a key feature of central bank **design**, affect monetary policy makers' deliberations? [**Economics 10**]

Extract 11

To exploit urban scale economies, **manufacturing** agglomerated in relatively few, often coastal, locations [**Economics 4**]

Extracts (10) and (11) summarise the use of nominalisations of creative material processes in Economics. In Extract (10), *central bank design* is the nominal group in focus, with *design*, a nominalised creative material process, as its Head. A congruent realisation of this nominalisation may be *central bank designed it*, where the nominal, *design,* maps unto the verb, *designed*, which is a creative type of material Process. Likewise, *manufacturing*, as used in Extract (11), has as its agnate form *manufacture*. Although the Actor of this Process is not indicated in the text,

it is humans who manufacture things. Therefore, it can be concluded that the nominal, *manufacturing,* has a human Actor.

Unlike Applied Linguistics and Economics, in Biology, nominalised creative material processes construe experience as creating—or bringing into existence—through natural processes, devoid of human agency. As a result, with the exception of *modelling*, *imaging,* and *construction*, which have presumed human Actors, the nominalised creative material processes used in Biology are mostly intransitive, with the outcome being the "coming into existence of the Actor" (Halliday & Matthiessen, 2014, p. 231). Extracts (12) and (13) show how nominalised creative material processes are used in the Biology RA abstracts analysed.

Extract 12

We propose that plant foods containing high quantities of starch were essential for the **evolution** of the human phenotype during the Pleistocene. [**Biology 35**]

Extract 13

Today, extra digit **formation** plays a role in the conceptualization of gene regulation and pattern **formation** in vertebrate limb evolution. [**Biology 29**]

Extracts (12) and (13) indicate how nominalised creative material processes were used in the Biology RA abstracts analysed. In Extract (12), *the evolution of the human phenotype* can be reworded as *the human phenotype evolved*, with *the human phenotype* being the Actor and *evolved* being Process. Also, *extra digit formation* and *pattern formation*, as used in Extract (13), can agnate with *extra digit formed* and *pattern formed* respectively. With this, it can, therefore, be said that it is through the process of *formation* that *extra digit* and *pattern* came into existence.

This finding suggests that in Biology, with the use of nominalised creative material processes, experience is construed as "coming into existence" (Halliday & Matthiessen, 2014, p. 231) through natural processes, while Applied Linguists and Economists construct experience as creating through human agency. This use of nominalisations of creative material processes in Biology concurs with Banks (2003). In his exploration of the evolution of grammatical metaphor in scientific writing, Banks observes a high use of nominalised creative material processes of non-human agency. Specifically, Banks (2003), in his analysis, observed the use of *production* and *formation* in Biological Sciences. Additionally, Banks (2008, p. 124) observes: "Where these nominalised Material processes are used they tend, in the biological sector and in the early physical articles, to be related to natural processes, that is, processes of which the researcher is not the agent."

Another interesting observation is the use of *production* across Economics and Biology. While *production* is used in both Economics and Biology, in each discipline, *production* comes with a different meaning. *Production* occurs ten times in the Economics RA abstracts analysed and four times in the Biology RA abstracts analysed, with different meanings across the two disciplines. In Economics, *production* is used as a synonym of *manufacturing*, in a sense that suggests human agency. In Biology, on the other hand, the sense in which *production* is used does not suggest human agency. Extracts (14), (15), (16), and (17) further explain this point.

Extract 14

The subsidies led to substantial reallocation of ship **production** across the world, with Japan, in particular, losing significant market share. [**Economics 22**]

Extract 15

Second, when asked to produce an identical domestic rug using the same inputs and same capital equipment, treatment firms produce higher quality rugs despite no difference in **production** time. [**Economics 8**]

Extract 16

However, although conflicts within colonies typically arise over offspring **production**, the role of larvae as actors in social conflict has received little attention. [**Biology 18**]

Extract 17

For most mammals and humans, **production** of the intestinal enzyme lactase is a life-history trait that corresponds roughly to the duration of nursing. [**Biology 22**]

The extracts above illustrate the difference in meaning of the nominal *production* across Economics and Biology. In Extracts (14) and (15), we have *ship production* and *production time* as the respective nominal groups. In Extract (14), *production* functions as the Head of the nominal group while in Extract (15), it functions as a modifier. Looking at the nominal group, *ship production*, one can easily observe that the Actor is human, because human agency is needed to produce ships. In Extract (15), human agency can be attributed to *treatment firms*. In each case, *production* is synonymous to *manufacturing*. On the contrary, in Extracts (16) and (17), *production* and *manufacturing* cannot be used interchangeably. For example, *offspring production*, as used in Extract (16) refers to the natural process through which offspring are brought into existence, and this cannot be replaced with *offspring manufacturing*.

On the contrary, the transformative type of material process has an outcome which is the change of some aspect of an already existing Actor or Goal. Thus, unlike creative clauses, transformative ones can have a separate element representing the outcome of the process, and even where the outcome is inherent in the Process, it may be indicated by the particle of a phrasal verb (Halliday & Matthiessen, 2014). Examples of nominalisations derived from the transformative type of material process verbs, as used in the data, are presented in Table 7 below:

Table 7: **Most Frequent Nominalisations of Transformative Material Processes in Applied Linguistics, Economics and Biology RA Abstracts**

Applied Linguistics		Economics		Biology	
Study	(48)	Treatment	(14)	Selection	(29)
Research	(34)	Change	(13)	Effect	(22)
Learning	(27)	Transfer	(13)	Interaction	(21)
Practice	(16)	Rate	(13)	Variation	(20)
Performance	(15)	Experiment	(13)	Study	(17)
Interaction	(15)	Increase	(12)	Process	(17)
Effect	(15)	Impact	(10)	Divergence	(15)
Measure	(14)	Choice	(10)	Response	(11)
Development	(14)	Distribution	(9)	Adaptation	(11)
Use	(13)	Study	(8)	Throwing	(11)
Experience	(12)	Management	(5)	Predation	(8)
Acquisition	(11)	Spending	(5)	Competition	(8)
Practice	(10)			Transition	(8)
Process	(8)			Diversification	(7)
Engagement	(6)			Function	(7)
Dominance	(5)			Approach	(7)
Exposure	(5)			Change	(6)
				Research	(6)
				Hunting	(6)
				Defence	(6)
				Shift	(5)
				Combat	(5)
				Dispersal	(5)
				Regulation	(5)

Table 7 reveals that the nominal, *study,* occurs across all the three disciplines, with forty-eight (48), eight (8), and seventeen (7) occurrences in Applied Linguistics, Economics, and Biology respectively. This is not surprising, as *study* occurred among the top 100 lexical words in Coxhead's (2000) Academic Word List

(AWL). Also, the high use of *study* in Applied Linguistics could be explained by the reason given by Jiang and Hyland (2017) that academic writers use the nominal *study* to stress the "novelty and worthiness of their study" (p. 7). The table additionally reveals that *study, research, learning, practice, performance, interaction, effect, measure, development,* and *use* are the top ten (10) nominalisations of transformative material processes used in Applied Linguistics. This finding resonates with what was found by some previous studies (Jalilifar *et al.*, 2017; Vongpumivitch, Huang, & Chang, 2009). Vongpumivitch *et al*. (2009), for instance, found *research* to be among the top hundred (100) words in their Applied Linguistics Research Article Corpus (ALRC). In their study of nominalisations in the Introduction and Methodology sections of Applied Linguistics RA abstracts, Jalilifar *et al*. (2017) also found *study*, *research*, *learning, interaction,* and *use* among the most frequent nominalisations.

Also, the top ten (10) nominalisations of transformative material processes found in the Economics RA abstracts studied are *treatment, change, transfer, rate, experiment, increase, impact, choice, distribution,* and *study*. On the other hand, *selection, effect, interaction, variation, study, process, divergence, response, adaption,* and *throwing* were among the most recurring nominalised transformative material processes in the Biology RA abstracts analysed. Moreover, the nominal, *process,* occurred among the top nominals in the Biology RA abstracts analysed. This seems to support an observation made by Hyland and Tse (2007) that the word *process* is likely to occur in Engineering as a noun than in Social Science and attributed this to the nomininalisation—or grammatical metaphor—which allows writers in the Sciences to convert experiences into abstractions. While the study by Hyland and Tse differs from the present study in

terms of the specific disciplines studied, this finding is not surprising, since both Biology and Engineering are Sciences disciplines.

Extracts (18) to (23) below summarise the use of nominalised transformative material processes in the data analysed.

Extract 18

This article focuses on educational language policy **implementation**, how language use and social identification change in an evolving policy context. [**Applied Linguistics 13**]

Extract 19

In spite of the preference within a range of discourse analytical paradigms for 'naturally occurring' data, we argue that not only does the term prove conceptually problematic, but in certain contexts, and particularly in the applied forensic context described, a **rejection** of experimentally elicited data would limit the possible types and extent of analyses. [**Applied Linguistics 30**]

Extract 20

Previous time series studies of tax returns data have found little evidence for income responses to taxes outside the top of the income **distribution**. [**Economics 1**]

Extract 21

Systematic **use** of fertilizer and hybrid seed is a pathway to increased productivity, but adoption of these technologies remains low. [**Economics 6**]

Extract 22

We discuss the implications of this result for empirical studies of predation in small study areas and for the **management** of small nature reserves. [**Biology 15**]

Extract 23

Our model shows that <u>forest **destruction**</u> can increase defoliator density when parasitoids disperse much farther than defoliators because the benefits of reduced defoliator mortality due to increased parasitoid dispersal mortality exceed the costs of increased defoliator dispersal mortality. [**Biology 16**]

The extracts above contain nominalisations of transformative material processes, as used in the data analysed. In the extracts, the underlined structures are the nominal groups with the nominalisations in bold serving as the Head. In Extract (18), *educational language policy implementation* is the nominal group with the nominalisation, *implementation,* as its Head. A congruent realisation of that nominal group may be *we implemented educational language policy.* With this congruent realisation, we realise that the educational policy was already there before its implementation, making it a transformational type of material process verb. We may, therefore, argue that *implement*, the material process verb from which the nominalisation *implementation* is derived, is a transformative type of material process.

In a similar vein, *a rejection of experimentally elicited data*, as used in Extract (19), is a nominal group with the nominalisation *rejection* as its Head. Its congruent realisation may be *they rejected experimentally elicited data*. With this congruent realisation, it is realised that the data, which was already in existence, was rejected, making the Process a transformative type of material process. Likewise, Extract (20), which comes from the field of Biology, also has the nominalisation, *distribution,* as the Head of the nominal group, *the income distribution*. A congruent realisation of this may be *they distributed income*. With this, it is clear that the income was in existence before its distribution. Thus, we

can conclude that *distribution* is derived from the verb, *to distribute*, which is a transformative type of material process verb.

Also, in Extract (21), we have the nominalisation, *use,* heading the nominal group, *Systematic use of fertilizer and hybrid seed.* Congruently, this nominal group could be realised as *they use fertiliser and hybrid seed systematically*. What this suggests is that the fertiliser was already in existence before it was used. It is, therefore, clear that *use* as a nominalisation is derived from *use*, a transformative material process verb. Similarly, in Extract (22), *the management of small nature reserves* is the nominal group in focus. It has *management*, a nominalisation, as its Head. This nominal group can be congruently reworded as *they managed small nature reserves,* with the nominalisation, *management,* mapping unto the verb *managed.* With this, we realise that it was not the unfolding of the process that brought into existence the *small nature reserves.* Thus, *manage* can be said to be a transformative material process verb. In a similar vein, *forest destruction* in Extract (23) is a nominal group with *destruction* as its Head. Its congruent form may be *they destroyed the forest*, where the verb *destroyed* maps unto *destruction*. *Destroy*, therefore, is a transformative material process, as it is only what already exists that can be destroyed.

In this section, I discussed how nominalisations of material processes, both creative and transformative types, were used in the data analysed. In terms of nominalisations of creative material processes, it was revealed that such nominalisations project Applied Linguistics and Economics are construing reality as happening through human agency while Biology construes reality as a natural process devoid of human agency. This observation is especially evident in the use of the nominalisation, *production,* across Economics and Biology, where the

nominal is used as a synonym of *manufacturing* in Economics but used in Biology to designate a natural process. The use of transformative material processes in the data also reveals some interesting findings. For example, the nominalisation, *study,* occurs across all the three disciplines with high but varying frequencies, a finding that agrees with findings of some previous studies (e.g., Coxhead, 2000; Jiang & Hyland, 2017). On the other hand, the study reveals frequent use of some transformative material processes in each discipline. Principal among them is the nominalisation, *process,* which was used in Biology. In the next section, I analyse and discuss the use of nominalised mental processes.

Nominalisation of Mental Processes

Nominalisations of mental processes are nominalisations of the verbs in mental clauses. What this means is that nominalisations of mental processes result from incongruent realisation of mental clauses. Mental clauses are used to construe experiences of our consciousness. The process is either construed as impinging on one's consciousness or flowing from it. The unmarked present tense of mental clauses is the simple present rather than the present-in-present that characterises material clauses. The subject of a mental clause is usually a conscious being while the complement can be realised by nominal groups denoting a wide variety of entities such as animals and even abstractions (Halliday & Matthiessen, 2014; Thompson, 2013). Mental clauses come in four types: (a) the cognitive, (b) perceptive, (c) desiderative, and (d) emotive types. Table 8 gives a list of the various nominalised mental processes used in the data. The nominalisations are classified under the four types of mental processes.

Table 8: **Nominalisations of Mental Processes**

	Applied Linguistics	Economics	Biology

Cognitive	Analysis (14) Knowledge (8) Assumption (3) Examination (3) Knowing (2) Appreciation (1) Belief (1) Consideration (1) Recall (1) Surprise (1) Thinking (1)	Belief (15) Analysis (7) Prediction (7) Estimate (5) Knowledge (5) Reasoning (5) Expectation (3) Puzzle (3) Thinking (3) Estimation (2) Understanding (2)	Consideration (22) Analysis (10) Prediction (10) Estimate (5) Understanding (4) Assessment (1) Expectation (1) Puzzle (1) Speculation (1)

Table 8 continued

Perceptive	Feeling (1) Perception (1)	Taste (2)	Observation (3) View (1)
Desiderative	Need (4) Agreement (2) Desire (1)	Decision (8) Plan (1)	Decision (2) Plan (1) Preference (1)
Emotive	Interest (2) Enjoyment (1)		Care (4) Attraction (1)

Cognitive mental processes designate processes of deciding, knowing, understanding, etc. Cognitive mental processes bring ideas into existence through projection of other clauses (Thompson, 2013). In other words, cognitive mental processes project propositions, for example, through the act of thinking (Halliday & Matthiessen, 2014). A high number of nominalisations of cognitive mental processes were used in the Applied Linguistics Abstracts analysed. Extracts (24) and (25) below show how such nominalisations were used in the Applied Linguistics RA abstracts analysed:

Extract 24

Qualitative analyses revealed that both learners and natives alike engage in negotiations for meaning throughout the program, which for learners resulted in successful **recall** on tailor-made quizzes. [**Applied Linguistics 1**]

Extract 25

Results drawn from a focus group show that attitudes towards the two languages are shaped both by the **consideration** of the audience's

bilingualism and the socio-psychological features the languages carry. [**Applied Linguistics 35**]

Like previous extracts, these extracts have their nominal clauses with nominalisations as Head underlined while the nominalisations are in bold. Starting with the Applied Linguistics extracts (Extracts [24] and [25]), we realise that *recall* and *consideration* are the nominalisations in focus. A congruent realisation of the nominal group, *successful recall on tailor-made quizzes,* as used in Extract (24), is *learners recalled tailor-made quizzes successfully*, with the nominalisation, *recall,* changing into the process *recalled*, a cognitive mental process. Similarly, the *consideration of the audience's bilingualism and the socio-psychological features the languages carry*, as used in Extract (25), may have *we considered the audience's bilingualism and the socio-psychological features the languages carry* as its congruent realisation. With this congruent realisation, it is realised that the nominalisation, *consideration*, maps unto the process *considered*, a cognitive mental process.

Like the Applied Linguistics RA abstracts, the Economics RA abstracts analysed also showed a considerable use of nominalisations of cognitive mental processes. Extracts (26) and (27) are illustrations of the use of nominalisations of cognitive mental processes in the Economics RA abstracts analysed:

Extract 26

Students logically revise their beliefs in response to the information, and their subjective **beliefs** about future major choice are associated with beliefs about their own earnings and ability. [**Economics 36**]

Extract 27

We also show that these objects can be consistently estimated and illustrate our analysis by performing an actual **estimation** using data from the 1999 European Parliament elections. [**Economics 27**]

In Extract (26), the underlined nominal group is a nominalisation of a cognitive mental clause. The underlined word, *belief*, is a nominalised form of the cognitive mental process, *believe*. Thus, a congruent realisation of the nominal group underlined in the extract could be *they believe future major choice subjectively,* with *believe*, which is a cognitive mental process, serving as Process. In a similar vein, *an actual estimation* in Extract (27), is a nominal group with the nominalisation *estimation* as its Head. A congruent realisation of this nominal group could be *we estimated it actually*, with the nominalisation, *estimation,* mapping unto the Process *estimated*, which is a cognitive mental process. This explains why *estimation* is a nominalisation of cognitive mental process.

The use of nominalisations of cognitive process was also evident in the Biology RA abstracts analysed. In fact, its use outnumbers the use of other types of nominalised mental processes, and this supports Banks's (2008) finding that nominalised mental processes that occur in Biology tend to be of the cognitive type. In Biology, the presumed Sensors of such nominalisations are usually members of the research community (with the authors being part or not part), as indicated in Extracts (28) and (29) below:

Extract 28

Despite evolution acting heavily on individual variability in fitness components, our **understanding** is poor whether observed heterogeneity is adaptive and how it evolves and is maintained. [**Biology 6**]

Extract 29

> Although thaliaceans have raised the curiosity of famous zoologists since the 18th century, the difficulty of observing and experimentally manipulating them has led to many controversies and **speculations** about their life cycles and developmental strategies, the phylogenetic relationship within the group and with other tunicates, and the drivers of speciation in these widely distributed animals living in a seemingly uniform environment. [**Biology 36**]

In Extract (28), *our understanding* is the nominalisation of the cognitive mental clause *we understand.* A critical look at this cognitive mental clause reveals some interesting observations. Firstly, we realise that the genitive, *our,* maps unto the Sensor *we*, which refers to researchers in the field, including the researcher. Secondly, and more importantly, it can be realised that it is the nominal, *understanding*, that transforms into the verb, *understand*, which is a cognitive mental Process. This explains why *understanding* is a nominalisation of cognitive mental process. Similar observations can be made about *speculations*, as used in Extract (29). In this instance, *speculation* maps unto the cognitive mental process *speculate*, justifying why *speculation* is a nominalisation of a cognitive mental process.

Additionally, some nominalisations of cognitive mental processes occurred across disciplines. Principal among such nominalisations are *analysis* and *prediction*. The nominalisation *analysis* occurred fourteen (14) times in Applied Linguistics, seven (7) times in Economics, and ten (10) times in Biology. This finding seems to support Hyland and Tse's (2007) observation that *analysis* is likely to appear less frequently as a noun in the Sciences, as the Sciences appear to prefer its variant *analytical*. The nominalisation, *prediction*, on the other hand, appeared in Economics and Biology, with seven (7) and ten (10) tokens respectively. Extracts (30) to (33) below show how the nominalisation, *prediction*, was used in the data.

Extract 30

We then test the model's **predictions** with an experiment. [**Economics 32**]

Extract 31

We also show that the **predictions** of our model are highly consistent, both qualitatively and quantitatively, with well-known unresolved empirical puzzles [**Economics 32**]

Extract 32

In line with our theoretical **predictions**, cannibalism levels in larvae were significantly influenced by relatedness and sex. [**Biology 18**]

Extract 33

Our **predictions** were confirmed, thus helping to explain differences in previous empirical surveys. [**Biology 23**]

The extracts above indicate how the nominalisation, *prediction,* was used across Economics and Biology RA abstracts analysed. The nominal groups are underlined, with their nominalisations in bold. An agnate form of the nominal groups in Extracts (30) and (31) could be *the model predicts* and *our model predicts* respectively. With regard to Extract (32), where we have *our theoretical predictions,* we can reconstruct the nominal group into a congruent wording, for example, *our theories predict*. In a similar way, we can reword *Our predictions* as used in Extract (33) into *We predict*. Thus, when the nominal groups underlined in the extracts above are reworded congruently, the nominalisation, *predictions*, will be realised by the verbal cognitive mental process, *predict*. It must be noted that, with the exception of Extract (33), where we have a personal pronoun as the Sensor, the act of "sensing" was attributed to a theory. Attributing the act of saying to a non-human entity as used in Extracts (30) to (32) is what Halliday and Matthiessen (2014, p. 245) call "some kind of personification."

The discussion thus far has been on the cognitive type of nominalisations of mental processes. However, the data analysed revealed the use of other types of nominalisations of mental processes. One other type of nominalisation of mental processes is the perceptive type. Perceptive mental processes encode processes of hearing, seeing, etc. (Thompson, 2013). The use of nominalisations of perceptive mental processes also reveals some disciplinary variations. In Applied Linguistics, *perceptions* and *feelings* were used while *taste*, on the one hand, and *observation* and *view*, on the other hand, were used in Economics and Biology respectively, as shown by the extracts below:

Extract 34

Closer examinations of the pragmatic trajectories of two learners show that learners' **perceptions** of request imposition or their desire to be accepted in the community in which they find themselves may explain pragmatic changes. [**Applied Linguistics 7**]

Extract 35

Ethnic identity refers to the subjective experience embracing the **feelings**, experiences, and behaviors through which people position their membership in a single or multiple ethnic groups. [**Applied Linguistics 16**]

Extract 36

While expected earnings and perceived ability are a significant determinant of major choice, heterogeneous **tastes** are the dominant factor in the choice of major. [**Economics 36**]

Extract 37

Here, we combine an individual-based model of microbial communities with a well-established framework of genetic specificity that matches empirical **observations** of bacterium-phage interactions. [**Biology 21**]

Extract 38

> These data contradict the **view** held by many commentators that socialization rather than innate sex differences in ability are primarily responsible for male throwing superiority. [**Biology 24**]

Extracts (34) to (38) are illustrative of the use of nominalisations of perceptive mental processes across the disciplines. As shown in Extracts (34) and (35) respectively, *perceptions* and *feelings* were the nominalisations used in Applied Linguistics RA abstracts. In Extract (34), a congruent realisation of the nominal group underlined (*learners' perceptions of request imposition*) could be *learners perceive request imposition*, where the nominalisation, *perceptions,* corresponds to the congruent form, *perceive*, which is a perceptive mental process. Also, in Extract (35), the nominalisation, *feeling,* would map unto the perceptive mental process *feel,* which is its congruent realisation. On the other hand, the nominalisation, *taste,* as used in Extract (36), is an illustration of the use of nominalisations of perceptive mental processes in Economics RA abstracts. A proposed congruent realisation of the nominal group, *heterogeneous taste,* is *people taste heterogeneously*, with the nominalisation *taste* mapping unto the perceptive mental process, *taste*. In this case, the nominalisation is identical with its congruent realisation.

Conversely, *observations* and *view*, as used in Extracts (37) and (38) respectively exemplify the use of nominalisations of perceptive mental processes in Biology. The nominal group, *empirical observations of bacterium-phage interactions,* as used in Extract (37), could be congruently realised as *we observe bacterium-phage interactions empirically,* with the nominalisation, *observation*, realised as the Process, *observe*. Similarly, in Extract (38), the nominal group, *the view held by many commentators that socialization rather than innate sex differences in ability are primarily responsible for male throwing superiority,* could be congruently realised as *many commentators view that socialization rather*

than innate sex differences in ability are primarily responsible for male throwing superiority. With this congruent realisation, the nominalisation, *view*, maps unto the Process, *view*, which is its congruent realisation. It must be noted that the nominalisation, *view*, like the nominalisation, *taste*, used in Extract (36) is identical in form with its congruent realisation.

The use of nominalisations of perceptive mental processes, as revealed by the data analysed can be explained in terms of disciplinary epistemological assumptions. In this regard, Applied Linguistics may be considered a discipline that concerns itself with human irregularities, as evident in the nominalisation *perception* (with the Sensor being *learners*), compared to Biology, which concerns itself with nominalisations which point to research itself (Hyland & Paltridge, 2011), as evident in the nominalisation, *observations*.

Again, a considerable number of nominalisations of desiderative mental processes were used in the RA abstracts analysed. As revealed by the analysis, the nominalisations of desiderative mental processes, *desire* and *agreement*, are peculiar to Applied Linguistics while *preference* is unique to Economics. *Plan* and *decision* were, however, used across the disciplines of Economics and Biology, with varied frequencies. Extracts (39) and (40) below are illustrations of the use of nominalisations of desiderative mental processes in Applied Linguistics:

Extract 39

> Closer examinations of the pragmatic trajectories of two learners show that learners' perceptions of request imposition or their **desire** to be accepted in the community in which they find themselves may explain pragmatic changes. [**Applied Linguistics 7**]

Extract 40

> Although there is **agreement** regarding the importance of aptitude, findings have been mixed regarding its role in child second language acquisition (e.g. Abrahamsson and Hyltenstam 2008 vs. DeKeyser 2000). [**Applied Linguistics 40**]

In Extract (39), *desire* is the nominalisation heading the nominal group underlined while *agreement* is the nominalisation in Extract (40). A suggested congruent realisation of the nominal group, *their desire to be accepted in the community in which they find themselves* is *they desire to be accepted in the community in which they find themselves*, with *desire* as its desiderative mental process. *Agreement*, as used in Extract (40), on the other hand, could be realised congruently as *we agree*, with the nominalisation, *agreement*, being realised congruently by the Process *agree*. Again, the nominalisation, *desire*, has its Sensor being the objects of the study (*learners*), while *agreement* has its presumed Sensor being members of the research community, including the author. It is interesting to note that, while the Sensor of the nominalisation, *desire,* is explicitly maintained in the clause, that of *agreement* is eliminated. This supports the claim that nominalisation allows authors to achieve greater degree of objectivity by distancing themselves from their findings (Jalilifar *et al*, 2014).

As indicated earlier, like *desire* and *agreement*, which were particularly used in Applied Linguistics, *preference* was used in Economics only. Extract (41) below shows how *preference* was used in the data.

> **Extract 41**
>
> This article studies the non-parametric identification and estimation of voters' **preferences** when voters are ideological. [**Economics 27**]

As indicated in Extract (41) above, the nominal group headed by the nominalisation is underlined, with the nominalisation in bold. The nominal group, *voters'*

preferences, could be congruently realised as *voters prefer*, with the nominalisation, *preference*, being transformed into the Process, *prefer*, which is a desiderative process.

Having discussed nominalisations of desiderative mental processes peculiar to Applied Linguistics and Economics, I now discuss those common to Economics and Biology. As I mentioned earlier, the use of the nominalisations, *plan* and *decision*, cut across Economics and Biology. Extracts (42), (43), (44), and (45) illustrate the use of *plan* and *decision* in the data analysed.

Extract 42

We leverage a natural experiment at a large self-insured firm that required all of its employees to switch from an insurance **plan** that provided free health care to a nonlinear, high-deductible **plan**. [**Economics 7**]

Extract 43

The ovarian ground **plan** (OGP) hypothesis for caste origins predicts that these behavioral states are associated with cyclical changes in ovarian status, where females performing queenlike tasks have eggs and those performing worker-like tasks possess only small oocytes. [**Biology 2**]

Extract 44

To optimally match suites of traits to seasonally changing ecological opportunities, animals living in seasonal environments need mechanisms linking information on environmental quality to resource allocation **decisions.** [**Biology 19**]

Extract 45

We find consistent evidence of negative autocorrelation in decision making that is unrelated to the merits of the cases considered in three separate high-stakes field settings: refugee asylum court **decisions**, loan application reviews, and Major League Baseball umpire pitch calls. [**Economics 11**]

In Extracts (42) and (43) are nominal groups with the nominalisation, *plan,* as Head. While Extract (42) comes from Economics, Extract (43) comes from Biology. Extracts (44) and (45), on the other hand, show how the nominalisation, *decision,* was used across the two disciplines: (a) Economics and (b) Biology. The underlined nominal groups could be realised congruently. For instance, a congruent realisation of *refugee asylum court decisions* could be *refugee asylum court decided.* With this congruent realisation, we realise that the nominalisation, *decisions,* has the verb *decided*—which is a desiderative mental Process—as its agnate form. This similarity between Economics and Biology in terms of the use of nominalisations of desiderative mental processes echoes Wignell's (2007) claim that the Social Sciences are closer to the Sciences than they are to the humanities. According to Wignell, though the language of Social Science evolved as a hybrid of the languages of Humanities and Sciences, the language of the Sciences made a greater impact on the language of the Social Sciences than the Humanities made.

Last but not least, nominalisations of emotive processes were used in the data. Nominalisations of emotive type of mental processes were used in Applied Linguistics and Biology but not in Economics. The extracts below exemplify the use of nominalisations of emotive mental processes:

Extract 46

In the second, both participants' **interest** in verbal play and humor led to **enjoyment** as well as profoundly intercultural dialogue. [**Applied Linguistics 4**]

Extract 47

Instead, we found strongest support for the song-improvement hypothesis, since great reed warblers sang a mate **attraction** song type rather than a territorial song type in Africa, and species that sing most intensely in Africa

were those in which sexual selection acts most strongly on song characteristics; they had more complex songs and were more likely to be sexually monochromatic. [**Biology 12**]

Extract 48

These traits were also found to be associated with mating systems, suggesting that sexual asymmetry in morphology and parental **care** might be the main determinant of the evolution of sex-biased dispersal across species and not mating systems per se, as proposed in Greenwood's hypothesis. [**Biology 31**]

Extracts (46), (47), and (48) are illustrative of the use of nominalisations of emotive processes in the RA abstracts analysed. In Extract (46), *interest* and *enjoyment* are the nominalised emotive mental processes in focus. A congruent realisation of the nominal group, *participants' interest in verbal play,* is *participants are interested in verbal play*. With this congruent realisation, the nominalisation, *interest,* maps unto the Process, *are interested*. In a similar vein, the agnate form of the nominalisation, *enjoyment*, as used in Extract (46), is *enjoy*, which is an emotive mental process. Extracts (47) and (48), on the other hand, show the use of nominalisations of emotive mental processes in Biology. In extract (47), *attraction*, as used in the nominal group, *a mate attraction song type,* has the emotive mental process *attract* as its agnate form. Likewise, *care,* as used in Extract (48), is the nominalisation of cognitive mental process in focus. The nominalised group, *parental care*, has as its agnate *parents care*, with *parents* as Sensor and *care* as Process.

Generally, the use of nominalisations of mental processes reveals some observations. In the first place, nominalisations of cognitive, perceptive, and desiderative mental processes occur across all the three disciplines, with some specific ones identified in specific disciplines. Conversely, nominalisations of

emotive mental processes occurred with a comparatively lower frequency and were found in Applied Linguistics and Biology but not Economics. These observations reveal commonalities and differences across these three disciplines.

Nominalisation of Verbal Process

In the last two sections, I discussed nominalisations of material and mental processes respectively. In this section, I focus on the analysis and discussion of nominalisation of verbal processes.

Some nominalisations result from the incongruent realisations of verbal clauses. Verbal clauses are clauses of saying. The unmarked verb form serving as Process in verbal clauses is the verb, *say.* Other verbs that serve as Process in verbal clauses include *tell*, *talk, reply,* and *counter.* Verbal clauses normally have one participant (the Sayer), representing the speaker, and, sometimes, an additional participant representing the addressee. Unlike the Actor and Sensor of material and mental processes respectively, which need to be conscious, the Sayer of verbal processes may not necessarily be a conscious being—the Sayer can be anything that sends a signal. Thus, the nature of saying, as construed by verbal clauses, is symbolic. When verbal clauses are nominalised, the Process becomes the thing, which allows further modifications. Table 9 shows the use of verbal processes across the three disciplines studied.

Table 9: **Nominalisation of Verbal Processes**

Applied Linguistics	Economics	Biology
Instruction (14)	Explanation (5)	Explanation (2)
Communication (10)	Disclosure (3)	Question (2)
Conversation (6)	Question (3)	Criticism (1)
Request (5)	Communication (1)	Discussion (1)
Question (4)	Interpretation (1)	
Pronunciation (4)	Protest (1)	
Account (2)		
Criticism (2)		
Definition (1)		
Description (1)		

Explanation (1)
Expression (1)
Report (1)
Speech (1)

The dominance of nominalisations of verbal processes in Applied Linguistics abstracts may be a characteristic of knowledge construction in Applied Linguistics. In their study of verbal and mental processes in academic disciplines, Holmes and Nessi (2009) found a significant number of verbal process types (such as *argue* and *claim*) in History texts as compared to Physics texts. Another reason for the dominance of nominalisations of verbal processes in Applied Linguistics could be the need for Applied Linguistics to "elaborate a shared context" (Hyland, 2004, p. 37). Nominalisation of verbal processes in Applied Linguistics, therefore, only emphasises the role argument plays in the construction of knowledge in the field of Applied Linguistics, as suggested by Hyland (2004). The importance of its use in academic discourse, generally, is noted by Halliday and Matthiessen (2014) as enabling authors to report from other scholars. The use of nominalisations of verbal processes in Applied Linguistics and Economics is not surprising. Hyland (2002) noted that Humanities and Social Sciences are disciplines that are more discursive and examine relationships that are more subject to contextual and human irregularities. Social Sciences and Humanities, therefore, make use of nominalisations reflecting verbal explorations of such issues.

As revealed by the data, the nominalisations, *question* and *explanation,* were used with varied frequencies across all the three disciplines, whereas the nominalisation, *communication,* was used in Applied Linguistics and Economics. On the other hand, the nominalisation, *criticism,* appeared in the Applied Linguistics and Biology RA abstracts analysed. The role of explanations and interpretations in Economics is stressed by Samuels (1990): "To write about the

economy is to use language to describe, interpret and explain the economy, that is, to use one artefact to talk about another artefact" (p. 7).

A critical look at the nominalisations of verbal processes in Applied Linguistics reveals that most of them are topic-related nominalisations. Topic-related nominalisations of verbal processes concern the topic being investigated, where the assumed Sayer is not the researcher but someone or some people being talked about. Examples of such nominalisations are given in Extracts (49) below:

Extract 49

> As a follow-up investigation, the present study looked at late adolescent study-abroad learners, and it examined both the immediate effect of pragmatic **instruction** and the pragmatic trajectories that adolescent learners follow once they move from the instructional context to real email **communication.** [**Applied Linguistics 7**]

As indicated in Extract (49), the nominal groups headed by nominalisations of verbal processes are underlined. In the nominal group, *pragmatic instruction,* is the nominalisation, *instruction,* which will agnate with the verbal process, *instruct*, while *real email communication* has as its nominalisation *communication*. *Communication* is congruently realised by the verbal process, *communicate*. This finding is not surprising, given that Applied Linguistics researchers nominally focus on language-based resources, both spoken and written. The activities of the discipline are, thus, mainly, text-based. Therefore, as noted by Thompson (2010), it will be very difficult to write about certain topic without using such nominalisations.

In sum, it has been revealed that nominalisations of verbal processes were used across the disciplines. In particular, the nominalisations of verbal processes were used dominantly in Applied Linguistics, most of which were topic-related.

These topic-related nominalisations help in constructing the specific fields of study. In other words, the topic-related nominalisations help to characterise the register of the disciplines investigated.

Nominalisations of Relational Processes

While nominalisations of material, mental, and verbal processes were the dominant semantic types of nominalisations used, relational, existential, and behavioural types of nominalisations were used to a lesser extent.

Relational clauses are characterization and identification (Halliday & Matthiessen, 2014). Relational clauses project both inner and outer experience as being, rather than as doing or sensing. They construe experience as unfolding without an input of energy. The unmarked processes of relational clauses are *be* and *have*. Table 10 shows the nominalised relational, existential, and behavioural processes used in the data.

Table 10: **Nominalised Relational, Existential, and Behavioural Processes Used**

	Applied Linguistics	Economics	Biology
Relational		Cost (12) Association (1)	Cost (4) Link (2) Possession (1) Requirement (1) Exclusion (1)
Existential			Co-existence (3) Existence (2) Living (1)
Behavioural	Conversation (6)	Behaviour (4)	Behaviour (7)

A look at Table 10 reveals *cost* as the highest occurring relational process nominalisation, with 12 and 4 occurrences in Economics and Biology respectively. This is not surprising, given that Ravelli (1988) also found *cost* among the

nominalisations of relational processes in her data. Extracts 50 and 51 below show the use of *cost* as a nominalisation of relational process in Economics and Biology.

Extract 50

A fiscal backstop mitigates the **cost** of runs and allows a government to pursue a high disclosure strategy. **[Economics 28]**

Extract 51

Our model shows that forest destruction can increase defoliator density when parasitoids disperse much farther than defoliators because the benefits of reduced defoliator mortality due to increased parasitoid dispersal mortality exceed the **costs** of increased defoliator dispersal mortality. **[Biology 16]**

The extracts above summarise the use of *cost* as a nominalised relational process. The word *cost* is congruently used as a relational process. For instance, in Extract (43), *the cost of runs* could be congruently realised as *runs cost millions of dollars,* with *runs* as Token and *millions of dollars* as Value. Though the Value, millions of dollars, is not explicitly stated in the extract, its absence could be explained within the context of ellipses. Thus, the absence of Value in the metaphorical realisation does not defeat the fact of it being a nominalised relational process. A similar explanation can be offered in the case of Extract (44), which comes from the discipline of Biology.

In general, nominalisations of relational processes identified in the present study seem to allow for the construction of virtual entities (such as *cost, association,* etc.), which are then used and talked about as technical terms. Such virtual entities can then be objects of study that can be measured, tested, and theorised.

Nominalisations of Existential Processes

Existential process clauses show that something exists or happens. Textually, the Theme for existential clauses is *there*, which prepares the addressee for some new information that is about to be introduced. Existential clauses resemble relational clauses in that they both have the verb *be* as the unmarked Process. However, other verb forms occur in existential process clauses, principal among which verbs are *exist, remain, arise, occur, come about, happen, take place, follow, ensue, erupt, flourish,* and *prevail*. The data analysed revealed only three types of nominalisations of existential processes, confirming Halliday and Matthiessen's (2014) claim that existential clauses are not common in discourse. Extracts (45) and (46) summarise the use of nominalisations of existential processes in the data analysed.

Extract 52

> Recent genetic, experimental, and modeling accounts of extra digit formation highlight the **existence** of nongradual transitions in phenotypic states, suggesting a distinction between continuous and discontinuous variation in evolution. [**Biology 29**]

The nominal group underlined in Extract (52) above is the nominalised existential clause, with the nominalisation, *existence,* serving as Thing. A congruent realisation of the underlined nominal group will be *there exist nongradual transitions,* with the nominalisation, *existence,* mapping unto the process, *exist.*

Nominalisations of Behavioural Processes

Behavioural clauses depict processes of typically human physiological and psychological behaviour like breathing, coughing, smiling, dreaming, and staring. These are the least distinct of the process types as they are similar—in many

respects—to both material and mental processes. The Process is grammatically more like one of "doing". The usual unmarked present tense for behavioural processes is present in present, like the material; however, we also find a simple present in its unmarked sense, which suggests an affiliation with a mental process. The data analysed revealed the use of few nominalisations of behavioural processes. Extract (53) summarises the use of such nominalisations.

Extract 53

> This article uses a research project into the online **conversations** of sex offenders and the children they abuse to further the arguments for the acceptability of experimental work as a research tool for linguists. [**Applied Linguistics 30**]

In Extract (46) is an underlined structure indicating a nominalisation of a behavioural clause. In the structure underlined, I have written in bold the nominalised behavioural process. A congruent realisation of the structure could be *sex offenders and the children they abuse are conversing online,* with the nominal conversation mapping unto the Process, *converse*, which is a behavioural process.

In this section, I have discussed the semantic choices made across the three disciplines in terms of nominalisation usage. In the next section, I will focus on the second research question, which seeks to explore the functions of nominalisations in the three disciplines studied.

Functions of Nominalisations

In the previous section, I focused on characterising the three disciplines in terms of nominalisation usage, focusing on the types of transitivity patterns used in the RA abstracts across the disciplines. This section will investigate the functions of process nominalisations in the data analysed. Though extracts will be drawn

from RA abstracts across the three disciplines investigated, unlike the previous section, the analysis in this section is not comparative in nature. The analysis in this section will focus on three broad themes: (a)1) ideational function of nominalisations, (b) interpersonal function of nominalisations, and (c) textual function of nominalisations.

Ideational Function of Nominalisation

In English, the nominal group is a powerful tool for construing experience. This is as a result of its potential to expand to a more or less indefinite extent. Thus, unlike verbal groups that expand grammatically, with complex tenses, modalities, phases, and the like, the nominal group expands lexically, by the device known as modification. Through modification, one noun functions as a kind of keyword and other words are organised around it, having different functions with respect to this head noun. The nominal group also expands by accepting down-ranked clauses and phrases which are then transformed into words and fitted into the pre-modifying schema, as in *a four-legged animal*, where *four-legged* is Classifier; but in their (more) congruent form, as clauses or phrases, they occupy a special place in the group, as the Qualifier: an animal with four legs (phrase)/having four legs (non-finite clause)/which has four legs (finite clause).

This potential that the nominal group (which normally functions as participants in processes) has for structural expansion enables it to be used for classification or building taxonomies. This is because participants are more likely than processes to be assigned to classes and to carry attributes (Halliday, 2005). This use of nominal groups for building taxonomic relations becomes remarkably clear when one tries to transform nominalisations with many modifiers into a verbal expression. For instance, a nominal group like *a bland official announcement* can

hardly be rendered into a verbal expression without making use of noun groups as part of the adverbial (Schmid, 2010). The data analysed revealed the use of nominalisations for creating taxonomies in Applied Linguistics, as illustrated by Extracts (54), (55), (56), and (57):

Extract 54

The provision of corrective feedback during oral **interaction** has been deemed an essential element for successful second language acquisition (Gass & Mackey, 2015a). [**Applied Linguistics 1**]

Extract 55

Qualitative **analyses** revealed that both learners and natives alike engage in negotiations for meaning throughout the program, which for learners resulted in successful recall on tailor-made quizzes. [**Applied Linguistics 1**]

Extract 56

We base our arguments on a study of self-directed **learning** of Chinese via online platforms in the context of mobility and aim to demonstrate the transformative capacity of translanguaging. [**Applied Linguistics 2**]

Extract 57

To develop a comprehensive account of dual-language **experience** requires research that examines individuals who are learning and using two languages in both the first language (L1) and second language (L2) environments. [**Applied Linguistics 3**]

The extracts above are indicative of the use of nominalisations in Applied Linguistics to classify. In Extracts (54) and (55), the nominalisations in focus are in bold, underlined together with their pre-modifying adjectives. In these extracts, the adjectives (*oral* and *qualitative*) perform ideational function by adding to the meaning of the nominalisations (that is, the head noun) by classifying them, as *oral* and *qualitative* respectively. This helps to differentiate the nominalisations from

other possible categories. For instance, in Extract (55), *qualitative* classifies the *analyses* into a type, as distinguished from another type, for instance, quantitative analysis. This classification would hardly be possible if the nominalisations are transformed into verbal expressions, as participants, unlike processes, can easily be put into taxonomies and be given attributes (Halliday, 2005).

In Extracts (56) and (57), on the other hand, we have what Halliday (2005) calls "downranked clauses and phrases" fitted in the pre-modifier position. These rankshifted clauses have been transformed into words through the process of compounding. By the use of these modifiers, the writers are able to specify the meaning of the nominalisations. For instance, in Extract (56), through nominalisation, the writer is able to use the modifier, *self-directed*, to modify the nominal, specifying its meaning. The nominal is additionally modified by the prepositional group, *of Chinese*. Thus, the use of nominalisation in this extract allows for modification, indicating that the *learning* being talked about is one of a kind. A similar explanation can be offered in the case of Extract (57), where the pre-modifier, *dual-language*, is used so as to specify the meaning of *experience*. This classification is made possible by the potential of nominalisations—unlike verbs—to expand through modifications.

A similar use of nominalisations was evident in the Economics sub-corpora. Here, too, the nominalisations were modified by adjectives and downranked clauses. Extracts (58) to (61) show this use of nominalisations in Economics:

Extract 58

For early developers, structural **transformation** due to rising agricultural productivity began when transport costs were still high, so cities were localized in agricultural regions. [**Economics 4**]

Extract 59

A parsimonious set of 24 physical geography attributes explains 47% of worldwide variation and 35% of within-country **variation** in lights. [**Economics 4**]

Extract 60

The switch caused a spending reduction between 11.8% and 13.8% of total firm-wide health **spending**. [**Economics 7**]

Extract 61

This study estimates long-run impacts of a child health investment, exploiting community-wide experimental **variation** in school-based. [**Economics 9**]

The extracts above exemplify the use of nominalisations as grammatical metaphor to create taxonomic relations in Economics. In Extract (58), the adjective, *structural*, is used while in Extract (59), the rankshifted clause, *within-country*, functions as the pre-modifier. On the other hand, the pre-modifier position in Extracts (60) and (61) is occupied by a combination of adjectives and rankshifted clauses. In Extract (58), the use of the nominalisation, *transformation*, allows the writer to specify its meaning using the adjective, *structural*, indicating that the writer is talking about a particular type of transformation, differentiable from other members of the class of *transformations,* for example, the one that is not structural.

Also, in Extract (59), *within-country* is used to specify the meaning of *variation*, indicating that the writer is talking about a particular type of variation. This is made possible by the use of the nominalisation, *variation,* which allows modifications of this kind, unlike its verb form, *vary*. What this implies is that there would be some difficulty when one tries to modify the verb*, vary*, the way the nominalisation, *variation*, can be modified. This point can be made clearer in the

case of Extracts (60) and (61), where there are many modifiers. For instance, in Extract (60), the use of the string of modifiers, *total firm-wide health*, makes the nominal group more informative than the nominalisation, *spending* (when used alone). A similar explanation can be given in the case of Extract (61), where the modifiers, *community-wide* and *experimental,* are used to modify the nominal, *variation,* thus putting it into a class.

Nominalisation usage in the Biology sub-corpora also allowed writers to classify, as shown in Extracts (62) to (65):

Extract 62

Dispersal is central in ecology and evolution because it influences population regulation, adaptation, and speciation. In many species, dispersal is different between genders, leading to sex-biased **dispersal**. [**Biology 31**]

Extract 63

For almost 40 years, studies of whole-organism **performance** have formed a cornerstone of evolutionary physiology. [**Biology 38**]

Extract 64

These results imply that predators are driving the evolution of phenotypic diversity in symbiotic defense traits in this system and that divergence in defensive morphology may provide ecological opportunities that help to fuel the adaptive radiation of this genus of midges on goldenrods. This enemy-driven phenotypic **divergence** in a diversifying lineage illustrates the potential importance of consumer-resource and symbiotic species interactions in adaptive radiation. [**Biology 5**]

Extract 65

Here we present field and experimental evidence for herbivore-mediated frequency-dependent **selection** that promotes the maintenance of trichome-

producing (hairy) and trichomeless (glabrous) plants of Arabidopsis halleri subsp. [**Biology 7**]

The extracts above illustrate how nominalisations used in the Biology abstracts allow the creation of taxonomic relations. The nominalisation, *dispersal*, as used in Extract (62), is pre-modified by *sex-biased,* which specifies its reference. Thus, the use of the pre-modifier, *sex-biased*, locates the dispersal being talked about as a particular type. With this, *sex-biased dispersal* can be differentiated from other kinds of dispersal which are found within the *dispersal* class of items, for instance, *non-sex-biased dispersal.* The nominalisation used in Extract (63) is used in a much similar manner. Here too, the hyphenated pre-modifier, *whole-organism*, specifies the meaning of *performance.* In other words, the modifier performs ideational function by adding more information to *performance,* classifying it as a *whole-organism* type of performance. This classification would hardly be possible if the expression was realised congruently.

The nominalisation used in Extract (64), unlike the one used in Extract (63), has a rather more complex modification; it has the demonstrative pronoun, *this*, together with the hyphenated modifier (which appears to be a downranked clauses), *enemy-driven*, and the adjective, *phenotypic*, pre-modifying it. While the demonstrative pronoun, *this*, creates a presuming reference between the nominalisation and the stretch of discourse it encapsulates, *enemy-driven* and *phenotypic* add more information about *divergenc*e, categorising it as a particular type of *divergence*. In other words, the modifiers allow the writer to classify *divergence* as a particular type, specifically, the *enemy-driven phenotypic* kind of *divergence.* This classification is possible because of the use of nominalisation, a construct which allows modifications of this kind.

The nominalisation in Extract (65) differs from those in Extracts (62), (63), and (64), because it has, in addition to its pre-modifier, a post-modifier. In this extract, the pre-modifier, *frequency-dependent*, functions as Classifier, while the post-modifier, *that promotes the maintenance of trichome-producing (hairy) and trichomeless (glabrous) plants of Arabidopsis halleri subsp*, serves as Qualifier. Using the Classifier, *frequency-dependent*, the author is able to locate the referent of the nominalisation "systemically, by subclassifying" (Halliday, 2005, p. 196) it. Through the sub-classifications, the author is able to create taxonomic relation among entities.

In this sub-section, I have discussed the ideational function of grammatical metaphor, specifically, process nominalisations at the discourse semantics stratum, focusing on how it is used for constructing taxonomies. I have indicated that nominalisations have the potential to expand through pre- and post-modification. It is this modification that allows the construction of taxonomic relations. Since the verbal group does not allow this kind of modification, transforming the nominalisations into their agnate forms will make it difficult for one to put them into categories.

Interpersonal Function of Nominalisations

Today, academic writing is also considered a subjective enterprise, soaked with the perspective of authors who make their presence visible in the texts to interpret the data as well as persuade readers (Jiang & Hyland, 2015). The way by which authors achieve this has been variously referred to as evaluation, stance, appraisal, and metadiscourse (see Hyland, 2005; Hyland & Guinda, 2012; Martin & White, 2005). Martin (2008) has noted that nominalisations serve as resources for both positive and negative evaluation.

There is some element of stance construction inherent in nominalisations of verbal processes. This category of nominalisations comprises Francis' (2004) first category of what he calls metalinguistic nouns—*illocutionary nouns*—and some kinds of his *language activity nouns*. Francis defines illocutionary nouns as nominalisations of verbal processes, acts of communication which have cognate verbs. Examples of illocutionary nouns include *accusation, admission, advice, affront, allegation, announcement, answer, appeal, argument, assertion, charge, claim, comment, complaint, compliment, conclusion, contention*, and *criticism* while *definition*, *description,* and *talk* are some examples of language activity nouns. By using these nominalisations, writers construct stance towards verbal propositions (Jiang & Hyland, 2015) by informing their readers to interpret the linguistic status of a particular proposition in a particular way (Charles, 2003). Extracts (66) to (68) summarise the use of such nominalisations in the data analysed. As I indicated earlier, while the analysis in this section is not comparative, I draw examples from the three sub-corpora.

Extract 66

The first aim of this article, addressed in section 1, is to define what is meant, and not meant, by task and task-based language teaching (TBLT). The second is to summarize and evaluate 14 **criticisms** that have been made of both. Section 2 responds to five alleged problems with TBLT's psycholinguistic rationale, section 3 to six at the classroom level, and section 4 to three claimed problems with implementing TBLT in specific contexts. A few of the **criticisms** touch on important matters, but most, I will suggest, are nonissues. [**Applied Linguistics 9**]

Extract 67

Pay distributions fan out with experience. The leading **explanations** for this pattern are that over time, either employers learn about worker productivity

but productivity remains fixed or workers' productivities themselves evolve heterogeneously. [**Economics 39**]

Extract 68

The occurrence of supernumerary digits or toes in humans and other tetrapods has attracted general interest since antiquity and later influenced scientific theories of development, inheritance, and evolution. Seventeenth-century genealogical studies of polydactyly were at the beginning of an understanding of the rules of inheritance. Features of polydactyly were also part of the classical disputes on the nature of development, including the preformation-versus-epigenesis and the atavism-versus-malformation debates. In the evolutionary domain, polydactyly was used in the **criticism** of the gradualist account of variation underlying Darwin's theory. [**Biology 29**]

The extracts above are illustrative of the use of nominalisations of verbal processes as evaluative resources in the data. In Extract (66), the nominal, *criticism*, which heads the nominal groups, *14 criticisms that have been made of both* and *a few of the criticisms,* is the evaluative nominalisation in focus. The use of this nominalisation allows the writer to express his/her attitude towards the propositions of others. This is because the selection of a nominalisation to encapsulate the proposition of someone else may not necessarily be a reflection of the latter's intention (Francis, 2004). It follows that the author's choice of *criticism* in this extract does not necessarily encode the original illocutionary force of the "criticisers." It is rather the writer's own way of interpreting that force. The writer could have chosen another nominal, for instance, *suggestion*, instead of *criticism*, and this would have led to a different interpretation. Thus, the choice of *criticism* reveals the author's perspective on the proposition.

In a similar way, the nominal, *explanations*, as used in Extract (67), allows the writer to express his stance towards the proposition of others. This is because it is the author's own decision to encapsulate or label the propositions as *explanations.* Probably, those who made those propositions did not intend the propositions to be explanations. The author could have expressed a different attitude by, say, labelling the propositions as *pronouncements* or *suspicions*, instead of *explanation*. A similar observation can be made with regard to Extract (68), where the author chose to encapsulate the propositions of others as *criticisms.* Thus, by encapsulating the propositions as explanation and criticism, the respective authors are able to "incorporate their meaning therein" (Charles, 2003, p. 318).

Aside from the nominalisations of verbal processes, nominalisations of mental processes also carry some evaluative potential. Most nominalisations of mental processes that carry the evaluative function are of the cognitive type. They refer to cognitive processes or aspects of cognitive state arrived at as a result of the processing of thought and experience (Francis, 2004). In other words, such nominalisations concern beliefs and attitudes of mental reasoning, such as *decision, assumption, belief, doubt*, etc. By using such nominalisations, writers are able to judge propositions, for example, as a belief or attitude (Jiang & Hyland, 2016). Extracts (69) and (70) show how this category of nominalisations is used to express the author's stance in the data analysed.

Extract 69

> A key question about study abroad concerns the relative benefits and qualities of various living arrangements as sites for learning language and culture. A widely shared **assumption** seems to be that students choosing homestays enjoy more opportunities for engagement in high-quality interactive settings than do those who opt for residence halls. [**Applied Linguistics 4**]

Extract 70

Although thaliaceans have raised the curiosity of famous zoologists since the 18th century, the difficulty of observing and experimentally manipulating them has led to many controversies and **speculations** about their life cycles and developmental strategies, the phylogenetic relationship within the group and with other tunicates, and the drivers of speciation in these widely distributed animals living in a seemingly uniform environment. [**Biology 36**]

The extracts above illustrate the use of nominalisations of mental processes to express stance. In these extracts, the authors are using the nominalisations in focus to express their attitudes. For instance, in Extract (69), the author uses the nominalisation, *assumption*, and this allows him to characterise the proposition using epistemic stance towards the idea *that students choosing homestays enjoy more opportunities for engagement in high-quality interactive settings than do those who opt for residence halls*. In this extract, the nominal functions as a Value, with what it encapsulates, that is, the fact clause, being the Token (Henshall, 2015). This use of nominalisations allows writers to express their stance "towards events and state of affair in a highly subtle way" (Schmid, 2000, p. 312). Simply put, these nominalisations, used this way, allow writers to express their attitudes towards events, state of affair, and ideas expressed in the fact clause.

Similarly, in Extract (70), the author used the nominalisation, *speculation*, to characterise the mental activities. The author could have used other nominalisations, for instance, *prediction*. The choice of *speculation,* here, instead of other possible nominalisations allows the author to evaluate it negatively. Using *speculations* to evaluate the proposition negatively allows the speaker to interpret the proposition in a way that he would like to disagree with (Francis, 2004). These stance nominalisations, when used strategically, allow writers to negatively

evaluate the views of other researchers and burnish their own views (Hao & Humphrey, 2012).

In this subsection, I have discussed the evaluative potential inherent in nominalisations of verbal and mental processes. In sum, the findings in this section give credence to the observation made by Schmid (2000, pp. 308-309):

> Linguistic, and to an even greater extent, mental shell nouns like *hope*, *belief* or *plan* are always reflections of what the speaker imputes to the ORIGINAL SPEAKER'S or EXPERIENCER'S communicative intentions and thoughts. It is invariably the speaker of a reporting utterance who defines the semantic details in relation to which an utterance or idea is spelled out.

What this observation suggests is that, in defining the semantic details of a reporting utterance, the use of nominalisations allows the speaker—or writer—to express his/her stance towards it. While this observation was made in relation to shell nouns, it has been noted that shell nouns are similar to nominalisations or grammatical metaphor in many respects—they are overlapping constructs. Some studies (e.g., Henshall, 2015) even considered shell nouns as grammatical metaphor and analysed them within the SFL framework. Schmid's use of *hope, belief,* and *plan* as shell nouns gives credence to this view, as these shell nouns double as nominalisations.

Textual Function of Nominalisations

The preceding sub-section focused on the interpersonal function of process nominalisations. In this sub-section, I present a discussion on the textual function of process nominalisations.

At the textual level, process nominalisations perform a discourse-organising function (Tåqvist, 2018), by signalling that the writer is moving on to the next stage of the argument. This is done by encapsulating a preceding stretch of discourse. Thus, process nominalisations perform a topic-shifting and topic-

linking function, by introducing changes in topic or shifts within a topic and preserve continuity by placing new information in a given framework (Francis, 2004). In this capacity, process nominalisations are not used as a synonym of any preceding element; rather, they are presented as equivalent to the clause or clauses they replace, while naming them for the first time. The process nominalisations, thus, signal to the reader how a particular stretch of discourse is to be interpreted. In this regard, they can be regarded as signalling nouns which establish links across and within clauses (Flowerdew, 2003; Flowerdew & Forest, 2015).

Nominalisations performing this function are often preceded by modifiers, including a deictic (such as *this*, *that*, or *such*), and the whole nominal group functions like a reference item (Francis, 2004). In performing this function, nominalisations can be likened to what Halliday and Hasan (1976) call "general nouns." According to Halliday and Hasan, general nouns function cohesively because they are a borderline case between a lexical item and a grammatical item, adding that a combination of a general noun and a specific determiner is very similar to a reference item.

As I have indicated, nominalisations, when performing the textual function, are often preceded with a definite reference item. The data analysed revealed the use of nominalisations as cohesive devices in the Applied Linguistics sub-corpora. Extracts (71) and (72) below explain how they are used in Applied Linguistics.

Extract 71

This article reviews current research findings on how specific learning difficulties (SLDs) impact on the processes of multilingual language development. The **review** includes studies of young language learners in

instructed classroom settings, as well as of multilingual children in second language (L2) contexts. [**Applied Linguistics 5**]

Extract 72

During the early years, children's language skills are developing rapidly. For bilingual children, the **development** of both languages is highly sensitive to environmental input. [**Applied Linguistics 8**]

Extracts (71) and (72) illustrate the use of nominalisations as reference items to achieve cohesion in the Applied Linguistics RA abstracts analysed. In Extract (71), the underlined structure is the nominal group in focus. This nominal group has the nominalisation, *review*, as its Head, which is further modified by the determiner, *the*. Here, *this review* refers back to the information in the preceding sentence. In other words, it encapsulates the stretch of discourse, *This article reviews current research findings on how specific learning difficulties (SLDs) impact on the processes of multilingual language development*, making it the point of departure of the new sentence, thereby achieving lexical cohesion.

Similarly, *the development of both languages*, as used in Extract (72) performs a cohesive function. In this extract, the nominalisation, *development*, heads the nominal group in focus, which helps to encapsulate the stretch of discourse that precedes it, that is, the preceding sentence. The definite article, *the,* which serves as a determiner to *development* tells the reader that the information given is already known. In this extract, the nominalisation refers to a very small stretch of discourse, that is, a single sentence. The nominalisations used in this manner perform what Francis (2004, p. 87) calls “a very local organising role.” In these extracts, there is a relation of presupposition between the nominal groups and

the stretches of discourse they refer to, such that the nominalisations cannot be effectively decoded, unless reference is made to the encapsulated discourse. As a result, "a relation of cohesion is set up, and the two elements, the presupposing and the presupposed, are thereby at least potentially integrated into a text" (Halliday & Hassan, 1976, p. 4).

The analysis again revealed a similar use of nominalisations to establish cohesive ties in the Economics sub-corpora. This is illustrated in Extracts (73) and (74) below:

Extract 73

> This article measures the economic impacts of social pressure to share income with kin and neighbours in rural Kenyan villages. We conduct a lab experiment in which we randomly vary the observability of investment returns to test whether subjects reduce their income in order to keep it hidden. We find that women adopt an investment strategy that conceals the size of their initial endowment in the experiment, though that strategy reduces their expected earnings. This **effect** is largest among women with relatives attending the experiment. [**Economics 31**]

Extract 74

> We leverage a natural experiment at a large self-insured firm that required all of its employees to switch from an insurance plan that provided free health care to a nonlinear, high-deductible plan. The **switch** caused a spending reduction between 11.8% and 13.8% of total firm-wide health spending. [**Economics 7**]

Extracts (73) and (74) summarise the use of process nominalisations to achieve lexical cohesion in Economics. Lexical cohesion is achieved through the selection of vocabulary (Halliday & Hassan, 1976). In Extract (73), the nominalisation, *effect,* together with the demonstrative pronoun, *this*, refers to the fact *that that strategy reduces their expected earnings*. In other words, in this extract, *that the*

strategy reduces their expected earnings is the presupposed while the nominal group, *this effect,* is the presupposing. The demonstrative pronoun, *this*, serves as a directive that shows that some specific information is to be retrieved elsewhere. In this case, the information to be retrieved (that is the fact *the strategy reduces their expected earnings*) is the "referential meaning, the identity of the particular thing or class of things that is being referred to; and the cohesion lies in the continuity of reference, whereby the same thing enters into the discourse the second time" (Halliday & Hassan, 1976, p. 31) in the form of the nominal group *this effect*.

A similar effect is achieved in Extract (74), where the nominalisation, *switch,* is used. This nominalisation, accompanied by the demonstrative pronoun, *this*, refers back to the to-infinitive clause, *to switch from an insurance plan that provided free health care to a nonlinear, high-deductible plan*, and condenses the information in the nominal group. This nominal group then serves as a point of departure (Theme) for the next nominal group. Also, the use of the demonstrative, *this*, tells the reader that the information is known and can be recovered from the co-text. This link between the presupposing, in this case, *this switch,* and the presupposed, *to switch from an insurance plan that provided free health care to a nonlinear, high-deductible plan*, is what we call cohesion.

Like Applied Linguistics and Economics researchers, Biology researchers also use process nominalisations to achieve lexical cohesion, as evident in the data analysed. This is illustrated with Extracts (75) and (76) below:

Extract 75

Using individual data of a primate population, we show that density regulates the stage composition of the population but that its entropy and the generating moments of heterogeneity are independent of density. This **lack** of influence of density on heterogeneity is due to neither low year-to-year variation in

entropy nor differences in survival among stages but is rather due to differences in stage transitions. [**Biology 6**]

Extract 76

Fever, the rise in body temperature set point in response to infection or injury, is a highly conserved trait among vertebrates, and documented in many arthropods. Fever is known to reduce illness duration and mortality. These **observations** present an evolutionary puzzle: why has fever continued to be an effective response to fast-evolving pathogenic microbes across diverse phyla, and probably over countless millions of years? [**Biology 33**]

Extracts (75) and (76) show the use of nominalisations as cohesive devices in the Biology RA abstracts analysed. In each extract, the underlined structure is the nominal group with nominalisation as Head. In Extract (75), the nominalisation, *lack*, which is pre- and post-modified by the demonstrative pronoun, *this*, and the prepositional group, *of influence of density on heterogeneity*, respectively refers to the clause, *that its entropy and the generating moments of heterogeneity are independent of density*. What this means is that the use of *this* creates a relationship of presupposition between the nominalisation and the stretch of discourse it refers to. It is this tie between the presupposing nominal group and the presupposed stretch of discourse that is referred to as cohesion.

In a similar vein, there is a cohesive tie between the nominalisation in Extract (76) and its referent. Like the nominalisation in Extract (75), this nominalisation makes anaphoric reference to the sentences that precede it. The use of the demonstrative pronoun, *these*, creates two assumptions: (a) that what it refers to can be recovered from the co-text and (b) that the referent is plural in number. This reference to the stretch of discourse that precedes it creates a relationship of

presupposition between the nominal and its reference, with the nominal acting as the Theme of the next clause. According to Halliday (2005), metaphorising the Theme in this way allows writers "to carry the argument forward by 'packaging' some semantic construct from the discourse to serve as point of departure for a further step" (p. 204).

The discussion so far has focused on the use of process nominalisations as Theme to ensure logical progression of the argument. However, process nominalisations need not necessarily be in the thematic position for them to achieve lexical cohesion. In some instances, the presuming process nominalisations occur in the Rheme, as illustrated by Extracts (77) to (79) below:

Extract 77

Metadiscourse has received considerable attention in recent years as a way of understanding the rhetorical negotiations involved in academic writing. But while a useful tool in revealing something of *the dynamic interactions which underlie persuasive claim making*, it has little to say about the role of nouns in this **process**. [**Applied Linguistics 23**]

Extract 78

How do aggregate wealth-to-income ratios evolve in the long run and why? We address this **question** using 1970–2010 national balance sheets recently compiled in the top eight developed economies. [**Economics 19**]

Extract 79

The evolution of male traits that inflict direct harm on females during mating interactions can result in a so-called tragedy of the commons, where selfish male strategies depress population viability. This tragedy of the commons can be magnified by intralocus sexual conflict (IaSC) whenever alleles that reduce fecundity when expressed in females spread in the population because of their benefits in males. We evaluated this **prediction** by detailed

phenotyping of 73 isofemale lines of the seed beetle Callosobruchus maculatus [**Biology 10**]

The extracts above illustrate the use of cohesive process nominalisations in Rheme of clauses. In each extract, the presupposing nominal group is underlined, with the process nominalisation in bold, while the presupposed stretches of discourse are italicised. In Extract (77), the nominal group, *this process*, which falls within the Rheme of the clause refers to the italicised stretch of discourse, thus creating a cohesive tie. In a similar way, the nominal group, *this question*, as used in Extract (78), anaphorically refers to the question in italics, and this creates a relationship of presupposition between the nominal group and its referent, resulting in cohesion. A similar cohesive tie is created between the underlined nominal group in Extract (79) and its referent.

The discussion above reveals how process nominalisations were used to create cohesion in the RA abstracts examined. A general conclusion that can be drawn from this revelation is that process nominalisations, whether they are located in the Theme or Rheme of clauses, serve as an important resource for creating cohesive ties in texts. This is done by encapsulating a stretch of discourse and making it the Theme of another clause. This cohesive tie can also be created even if the process nominalisation is located in the Rheme of clauses. In each case, the nominal serves as a reference item and a relation of presupposition is created between the nominal and its referent.

Chapter Summary

In this chapter, I presented the analysis and discussion of the data in view of the research questions. In the first place, the study showed how the three disciplines under study are similar/different in terms of the semantic choices of

process nominalisations. Secondly, the study discussed the functions of process nominalisations within the discourse semantics stratum. In effect, the study revealed that nominalisations are used for classification, appraisal, and textual cohesion. In the next chapter, I conclude the entire study by presenting a summary of the study, key findings of the study, implications of the study, and recommendations for further research.

CHAPTER FIVE

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

Introduction

This chapter provides closure to the study. The first part provides an overview of the entire study, from the statement of the problem, through the research methodology to data analysis procedure. I then discuss the key findings, taking into account the research questions. The chapter also discusses the implications of the study, focusing on theory and pedagogy. Finally, I make suggestions for further research, paying particular attention to the findings of the study.

Summary of the Study

The objective of the study was twofold: (a) it investigated the use of process nominalisations as grammatical metaphor in RA abstracts from three academic disciplines – Applied Linguistics, Economics and Biology; (b) it investigated the functions of process nominalisations in RA abstracts. To achieve these objectives, I analysed a total of 120 RA abstracts, 40 from each discipline. The abstracts came from prestigious journals from each of the fields studied, published between 2014 and 2018. The journals included *Annual Review of Applied Linguistics* and *Applied Linguistics*, both from the discipline, Applied Linguistics, *The Quarterly Journal of Economics* and *The Review of Economics Studies*, from Economics, and *The American Naturalist* and *The Quarterly Review of Biology*, from Biology.

The study was qualitative, employing specifically directed and summative approaches to content analysis. The RA abstracts were analysed using the theory of grammatical metaphor (Halliday, 1985, 1994; Simon-Vandenbergen *et al*.,

2003), particularly focusing on the semantic choices made across the three disciplines in terms of process nominalisation and the discourse functions of process nominalisations in the RA abstracts. The semantic choices were determined using Ravelli's (1988) classification, which was based on the transitivity system of the English language. In other words, the semantic choices were analysed paying attention to the process types—material, mental, verbal, relational, existential, and behavioural—that were nominalised. Regarding the second objective of the study, content analysis was helpful in determining the discourse functions of the process nominalisations identified. Essentially, the functions of process nominalisation were discussed in relation to Martin and Rose's (2007) concept of discourse semantics as well as Halliday and Hasan's (1976) work on cohesion. Additionally, I was guided by some previous studies (e.g., Charles, 2003; Flowerdew & Forest, 2015; Schmid, 2000) and expert advice.

Key Findings

As I noted earlier, the study was driven by a two-pronged purpose: (a) to investigate the semantic choices made across the three disciplines studied in terms of process nominalisations and (b) to investigate the discourse functions of process nominalisations in the RA abstracts analysed. I now present the key findings, taking into account these two objectives.

Semantic Choices of Nominalisations

The analysis revealed nominalisation of material processes as the dominant semantic type of process nominalisations in the data, with nominalisations of transformative material processes recording about half of the total number of nominalisations. This supports Halliday and Matthiessen's (2014) view that there

are a wide variety of transformative material processes, compared to creative material processes. Nominalisations of mental processes recorded the second highest frequency of occurrence, suggesting the role of reasoning in academic knowledge construction (Hyland, 2004). The nominalisations of other process types—verbal, relational, existential, and behavioural—occurred less frequently, which disagrees with the findings of Norouzi *et al.* (2012) and Kazemian *et al.* (2013).

The findings of the study regarding the use of nominalisations of material processes are interesting. For instance, the study revealed that, in Applied Linguistics and Economics, nominalised creative material processes have presumed human actors. This suggests that, in these two disciplines, coming into existence is explained as happening through human agency. This contrasts with the use of such process nominalisations in Biology, where creation is seen as happening as a result of some natural processes, devoid of human instrumentality. This is particularly evident in the case of the nominal, *production*, which is used with a presumed human agency in Economics and a presumed non-human agency in Biology. This affirms Banks's (2008) finding that there is a high use of nominalised creative material processes with non-human agency in Biology.

Regarding the use of nominalisations of transformative material processes, the study also revealed some similarities and differences. One important similarity is that the nominal, *study,* occurred with varied frequencies in all the three disciplines, and this resonates with Coxhead (2000), who found *study* among the 100 most frequent words in his Academic Word List (AWL). With regard to the differences in terms of the use of nominalised transformative material processes, the study revealed some interesting findings. Firstly, the study revealed that *study,*

research, learning, practice, performance, interaction, effect, measure, development, and *use* are the top ten (10) nominalisations used in Applied Linguistics. It was also revealed that *treatment, change, transfer, rate, experiment, increase, impact, choice, distribution,* and *study* were among the most frequent nominalisations of transformative material processes in Economics. On the other hand, Biology had *selection, effect, interaction, variation, study, process, divergence, response, adaption, function,* and *throwing* among the nominalisations of transformative material processes that occurred with high frequency. The fact that *process* occurred frequently as a nominal in Biology echoes the observation made by Hyland and Tse (2007) that *process* occurs frequently as a noun than as a verb in Sciences, compared to Humanities.

Regarding nominalisations of mental processes, the study revealed a greater use of nominalisations of cognitive mental processes, compared to the perceptive, emotive, and desiderative types. In the case of Biology, the presumed Actors of such nominalisations are often the members of the discourse community. This finding agrees with an observation made by Banks (2008) that nominalised mental processes that occur in Biology tend to be of the cognitive type. The study also revealed the use of some nominalisations of cognitive processes across the disciplines investigated. Principal among such nominalisations are *prediction* and *analysis*. Also, the use of nominalisations of perceptive mental processes revealed some disciplinary variations. For instance, in Applied Linguistics, *perceptions* and *feelings* were used while *taste*, on the one hand, and *observation* and *view*, on the other hand, were used in Economics and Biology respectively. The analysis also revealed that the nominalisations of desiderative mental processes, *desire* and *agreement*, were peculiar to Applied Linguistics while *preference* was unique to

Economics. *Plan* and *decision* were, however, used across the disciplines Economics and Biology, with varied frequencies. More so, nominalisations of emotive type of mental processes were used in Applied Linguistics and Biology but not in Economics.

Another interesting finding of the study concerns the use of nominalisations of verbal processes. Generally, Applied Linguistics recorded the highest occurrence of nominalisations of verbal processes. The nominalisations, *question* and *explanation,* were used with varied frequencies across all the three disciplines, whereas the nominalisation, *communication,* was used in Applied Linguistics and Economics. On the other hand, the nominalisation, *criticism* appeared in the Applied Linguistics and Biology RA abstracts analysed. The role of explanations and interpretations in Economics is stressed by Samuels (1990): "To write about the economy is to use language to describe, interpret and explain the economy, that is, to use one artefact to talk about another artefact" (p. 7).

Finally, unlike the nominalisations of material, mental and verbal processes, nominalisations of relational, existential, and behavioural processes were used to a lesser extent. The analysis revealed *cost* as the highest occurring relational process nominalisation, with twelve (12) and four (4) occurrences in Economics and Biology respectively. Also, the nominalisations, *existence, living,* and *co-existence* (used in Biology only) occurred as the nominalisations of existential processes in the data analysed. Additionally, the nominalised behavioural process, *conversation,* occurred in Applied Linguistics with six (6) tokens, while *behaviour* occurred in Economics and Biology with four (4) and seven (7) tokens respectively.

Functions of Process Nominalisations in the Discourse Semantics Stratum

Regarding the functions of process nominalisations in the discourse semantics stratum, the data was analysed along three dimensions (classification, appraisal, and reference), which respectively correspond to the three metafunctions: (a) ideational, (b) interpersonal, and (c)textual.

Regarding ideational metafunction, nominalisations serve as a powerful tool for the creation of taxonomies or classifications. This is because the nominal group (unlike its congruent realisation) has the power to expand, drawing unto itself modifiers that help to specify its meaning. The use of such modifiers helps to identify the referent of the nominal group as a member of a particular class. The data analysed revealed the use of process nominalisations to create taxonomies across the three disciplines. This was done by the use of pre-modifiers such as adjectives and downranked phrases and clauses (which are mostly hyphenated), and by the use of postmodifiers such as the relative clause. Some of the classifying nominal groups identified in the data include *oral interaction*, *self-directed learning of Chinese*, and *dual-language experience* in Applied Linguistics, *structural transformation, within-country variation,* and *total firm-wide health spending* in Economics, and *whole-organism performance* in Biology.

Concerning interpersonal metafunction, process nominalisations allow writers to evaluate propositions. The findings of this research regarding the interpersonal metafunction supports the view that the selection of a process nominalisation to encapsulate the proposition of someone else may not necessarily be a reflection of the latter's intention (Francis, 2004). The analysis revealed that some process nominalisations have an inherent evaluative potential. Examples of such process nominalisations include *criticism*, *explanation*, *assumption*, and

speculation. Also, since process nominalisations have the potential to expand, they attract evaluative adjectives that help writer to evaluate propositions.

The study also revealed an interesting function regarding the use of process nominalisations for textual purposes. In this regard, the study revealed that, across the disciplines studied, process nominalisations act as general nouns to anaphorically refer to a preceding idea, creating a relationship of presumption between them. This creates a cohesive tie between the presuming (that is, the process nominalisation) and the presumed (that is, the stretch of discourse encapsulated by the process nominalisation). Here, in most cases, the process nominalisation is accompanied with a Deictic, usually a demonstrative pronoun or the definite article, *the*, which indicates that the reference of the process nominalisation could be found in the co-text. Additionally, the process nominalisation that encapsulates a stretch of discourse usually acts as Theme (a point of departure) in its sentence, ensuring the logical progression of the argument.

Implications of the Study

Based on the findings of the study, I present some implications of the study, pertaining to theory and teaching pedagogy.

In the first place, the study has implications for theory, as it provides empirical support to some theoretical claims made in the SFL literature on process nominalisations. In this regard, the study supports the claim that disciplinarity depends essentially on process nominalisation to build knowledge (Martin, 2008). Evidence from the present study clearly shows that semantic choices of process nominalisation can reveal the nature of disciplines. Closely allied to the above is the claim that process nominalisations release semantic energy that can be used for creating taxonomies and for creating sequences of argument (Halliday, 2005).

Findings from the study reveal that nominalisations can also be used to achieve ideational, interpersonal, and textual goals, and this confirms Halliday's (2005) claim.

Another theoretical implication of the study relates more closely to the investigation of process nominalisations in academic writing. As the literature review reveals, most previous studies on process nominalisation were quantitative in nature, focusing more on morphological and syntactic patterns of process nominalisation in academic writing (Guo *et al*., n.d.; Jalilifar *et al*., 2017; Thompson, 2010; Yue *et al.*, 2018). The significance of the present study, therefore, lies in its use of SFL to investigate, qualitatively, the nature of disciplines, focusing on the semantic types of process nominalisations, as well as the functions of process nominalisations within the discourse semantics stratum. Thus, by investigating process nominalisations qualitatively by the use process types, with the intention of revealing the nature of the disciplines investigated as well as the functions of process nominalisations in the discourse semantics stratum, this study provides one of the first pieces of empirical evidence on qualitative analysis of process nominalisations.

Another implication of this study is the contribution it has made to disciplinary variation studies. Over the years, studies on disciplinary variation have grown considerably, with the focus on both texts produced by experts (Al-Shujairi *et al*., 2016; Hyland, 2004; Ngula, 2015) and those produced by novices (Afful, 2005; Afful, 2016; Musa, 2014). The present study considered Applied Linguistics, Economics, and Biology. In terms of the semantic types of process nominalisations, to the extent that these disciplines had not been compared by previous studies, the present study contributes to disciplinary variation studies.

In terms of writing pedagogy, firstly, to the extent that the data for the present study is an academic one, the findings of the study will be of immediate relevance to academics in the field of English for Academic Purposes (EAP) and post-graduate pedagogy. Since students need to understand disciplinary knowledge and its influence on disciplinary writing in order for them to be successful in their specific fields of study (Coffin *et al*., 2003), the findings of the present study may aid in the development of teaching and learning materials (TLMs) for EAP courses, especially at the post-graduate level. This is particularly important because any serious investigation into academic writing, such as the present study, promises to reveal findings useful for teaching undergraduates and postgraduates, as academic assignments are loosely related to the writings done by experts (Bazerman, 1988).

Recommendations for Further Research

Based on the findings of this study, I make the following recommendations for further studies.

First, I recommend that a similar study be conducted on abstracts written by novices. Since this study focused on abstracts written by experts, a study focusing on abstracts written by novices, specifically undergraduates or post-graduates, will be important in revealing the use of process nominalisations at that level. This is important because, while I agree with Hyland (2004) that expert writing sets the standard for disciplinary academic writing, I also believe that a proper acculturation of students into their various discourse communities demands a systematic investigation into their writing practices.

The present study limited its focus to three disciplines as representatives of the three broad knowledge domains (Humanities, Social Sciences, and the Sciences). However, what pertains in each of the three disciplines investigated may

not be reflective of the entire broad knowledge domains. For instance, as Ngula (2015) reveals, there is a likelihood for disciplines that fall in the same knowledge domain to show some variations in terms of language use. I, therefore, recommend that a more inclusive study be conducted, focusing on more disciplines. Such a study could, for example, focus on disciplines in one broad disciplinary domain, so as to reveal intra-disciplinary variations in process nominalisations use.

Finally, the present investigation focused on process nominalisation as (ideational) grammatical metaphor. However, there are other types of grammatical metaphor that can be explored. I, therefore, recommend that a further study be conducted on other forms of grammatical metaphor in academic writing. Such a study can investigate, for instance, interpersonal grammatical metaphor or textual grammatical metaphor. Relatedly, further study could be conducted on other forms of ideational grammatical metaphor, for example, adjectival nominalisation, as that area too remains largely unexplored.

Chapter Summary

The focus of this chapter has been to present a summary of the study, key findings of the study, implications of the study, and suggestions for further research. This study was triggered by the aim to investigate the semantic choices made across Applied Linguistics, Economics, and Biology in terms of process nominalisations usage in RA abstracts, and to explore how process nominalisations function in the discourse semantics stratum. In this chapter, the key findings have been summarised in terms of the research questions. In this regard, I have noted that, within the discourse semantics stratum, process nominalisations perform ideational, interpersonal, and textual functions. The chapter has also presented

implications of the study, focusing mainly on theoretical and pedagogical implications. Finally, three suggestions have been made for further research.

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APPENDICES

Appendix A: List of Sources of Applied Linguistics RAs

Alcón-Soler, E. (2017). Pragmatic development during study abroad: An analysis of Spanish teenagers' request strategies in English emails. *Annual Review of Applied Linguistics, 37*, 77-92. **[Applied Linguistics 7]**

Bell, P. K. (2017). Explicit and implicit learning: Exploring their simultaneity and immediate effectiveness. *Applied Linguistics, 38*(3), 297-317. **[Applied Linguistics 25]**

Birdsong, D. (2014). Dominance and age in bilingualism. *Applied Linguistics*, *35*(4), 374-392. **[Applied Linguistics 37]**

Bryfonski, L. & Sanz, C. (2018). Opportunities for corrective feedback during study abroad: A mixed methods approach. *Annual Review of Applied Linguistics, 38*, 1-32. **[Applied Linguistics 1]**

Cekaite, A. (2017). What makes a child a good language learner? Interactional competence, identity, and immersion in a Swedish classroom. *Annual Review of Applied Linguistics, 37*, 45-61. **[Applied Linguistics 6]**

Creese, A. & Blackledge, A. (2015). Translanguaging and identity in educational settings. *Annual Review of Applied Linguistics, 35*, 20-35. **[Applied Linguistics 14]**

Diao, W. (2014). Peer socialization into gendered L2 Mandarin practices in a study abroad context: Talk in the dorm. *Applied Linguistics*, *37*(5), 599-620. **[Applied Linguistics 31]**

Foster, P. & Wigglesworth, G. (2016). Capturing accuracy in second language performance: The case for a weighted clause ratio. *Annual Review of Applied Linguistics, 36*, 98-116. **[Applied Linguistics 11]**

Granena, G. (2014). Language aptitude and long-term achievement in early childhood L2 learners. *Applied Linguistics*, *35*(4), 483-503. **[Applied Linguistics 40]**

Grant, T. & Macleod, N. (2016). Assuming identities online: Experimental linguistics applied to the policing of online paedophile activity. *Applied Linguistics*, *37*(1), 50-70. **[Applied Linguistics 30]**

Gu, M. M. & Canagarajah, S. (2017). Harnessing the professional value of a transnational disposition: Perceptions of migrant English language teachers in Hong Kong. *Applied Linguistics, 39*(5), 718-740. **[Applied Linguistics 24]**

Hallin, A. E. & Van Lancker Sidtis, D. (2015). A closer look at formulaic language: Prosodic characteristics of Swedish proverbs. *Applied Linguistics*, *38*(1), 68-89. **[Applied Linguistics 27]**

Ionin, T. & Zyzik, E. (2014). Judgment and interpretation tasks in second language research. *Annual Review of Applied Linguistics, 34*, 37-64. **[Applied Linguistics 19]**

Jakonen, T. & Morton, T. (2013). Epistemic search sequences in peer interaction in a content-based language classroom. *Applied Linguistics*, *36*(1), 73-94. **[Applied Linguistics 36]**

Jiang, F. K. & Hyland, K. (2016). Nouns and academic interactions: A neglected feature of metadiscourse. *Applied Linguistics, 39*(4), 508-531. **[Applied Linguistics 23]**

Kim, H. & Billington, R. (2016). Pronunciation and comprehension in English as a lingua franca communication: Effect of L1 influence in international aviation communication. *Applied Linguistics, 39*(2), 135-158. **[Applied Linguistics 22]**

Kinginger, C. & Wu, Q. (2018). Learning Chinese through contextualized language practices in study abroad residence halls: Two case studies. *Annual Review of Applied Linguistics, 38*, 102-121. **[Applied Linguistics 4]**

Kormos, J. (2017). The effects of specific learning difficulties on processes of multilingual language development. *Annual Review of Applied Linguistics, 37*, 30-44. **[Applied Linguistics 5]**

Kroll, J. F., Dussias, P. E., & Bajo, M. T. (2018). Language use across international contexts: Shaping the minds of L2 speakers. *Annual Review of Applied Linguistics, 38*, 60-79. **[Applied Linguistics 3]**

Li, S., Ellis, R., & Zhu, Y. (2016). Task-based versus task-supported language instruction: An experimental study. *Annual Review of Applied Linguistics, 36*, 205-229. **[Applied Linguistics 12]**

Long, M. H. (2016). In defense of tasks and TBLT: Nonissues and real issues. *Annual Review of Applied Linguistics, 36*, 5-33. **[Applied Linguistics 9]**

Louw, S., Watson, T. R., & Jimarkon, P. (2014). Teacher trainers' beliefs about feedback on teaching practice: Negotiating the tensions between authoritativeness and dialogic space. *Applied Linguistics*, *37*(6), 745-764. **[Applied Linguistics 32]**

Mancilla, R. L., Polat, N., & Akcay, A. O. (2015). An investigation of native and nonnative English speakers' levels of written syntactic complexity in asynchronous online discussions. *Applied Linguistics*, *38*(1), 112-134. **[Applied Linguistics 28]**

Melzi, G., Schick, A. R., & Escobar, K. (2017). Early bilingualism through the looking glass: Latino preschool children's language and self-regulation skills. *Annual Review of Applied Linguistics, 37*, 93-109. **[Applied Linguistics 8]**

Miličević, M. & Kraš, T. (2014). Translation between L2 acquisition and L1 attrition: Anaphora resolution in Italian by English–Italian trainee translators. *Applied Linguistics*, *38*(1), 21-42. **[Applied Linguistics 26]**

Morgan-Short, K. (2014). Electrophysiological approaches to understanding second language acquisition: A field reaching its potential. *Annual Review of Applied Linguistics, 34*, 15-36. **[Applied Linguistics 18]**

Mori, J. & Sanuth, K. K. (2018). Navigating between a monolingual utopia and translingual realities: Experiences of American learners of Yorùbá as an additional language. *Applied Linguistics, 39*(1), 78-98. **[Applied Linguistics 21]**

Mortimer, K. S. & Wortham, S. (2015). Analyzing language policy and social identification across heterogeneous scales. *Annual Review of Applied Linguistics, 35*, 160-172. **[Applied Linguistics 13]**

Moyer, A. (2014). Exceptional outcomes in L2 phonology: The critical factors of learner engagement and self-regulation. *Applied Linguistics*, *35*(4), 418-440. **[Applied Linguistics 38]**

Muñoz, C. (2014). Contrasting effects of starting age and input on the oral performance of foreign language learners. *Applied Linguistics*, *35*(4), 463-482. **[Applied Linguistics 39]**

Philp, J. & Duchesne, S. (2016). Exploring engagement in tasks in the language classroom. *Annual Review of Applied Linguistics, 36*, 50-72. **[Applied Linguistics 10]**

Sabourin, L. (2014). fMRI research on the bilingual brain. *Annual Review of Applied Linguistics, 34*, 1-14. **[Applied Linguistics 17]**

Santello, M. (2013). Advertising to Italian English bilinguals in Australia: Attitudes and response to language selection. *Applied Linguistics*, *36*(1), 95-120. **[Applied Linguistics 35]**

Schilling, N. & Marsters, A. (2015). Unmasking identity: Speaker profiling for forensic linguistic purposes. *Annual Review of Applied Linguistics, 35*, 195-214. **[Applied Linguistics 15]**

Tarone, E. (2015). Second language acquisition in applied linguistics: 1925–2015 and beyond. *Applied Linguistics*, *36*(4), 444-453. **[Applied Linguistics 33]**

Trebits, A. (2014). Sources of individual differences in L2 narrative production: The contribution of input, processing, and output anxiety. *Applied Linguistics*, *37*(2), 155-174. **[Applied Linguistics 29]**

Trofimovich, P. & Turuševa, L. (2015). Ethnic identity and second language learning. *Annual Review of Applied Linguistics, 35*, 234-252. **[Applied Linguistics 16]**

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