Russian Journal of Linguistics
ISSN 2687-0088 (print), ISSN 2686-8024 (online)

2022 Vol. 26 No. 3 625–644
http://journals.rudn.ru/linguistics

https://doi.org/10.22363/2687-0088-27752

Research article / Научная статья

A functional analysis of lexical bundles in the discussion sections of applied linguistics research articles: A cross-paradigm study

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Abstract
Lexical bundles, as "building blocks of discourse" (Biber & Barbieri 2007: 263), vary across disciplines and genres. Mastery of lexical bundles signals professionalism and helps identify writers and speakers as members of specific discourse communities. Despite the contribution of lexical bundle research to our understanding of disciplinary variation, the constraints placed by the genre conventions of quantitative, qualitative, and mixed-methods approaches to research writing on the use of lexical bundles remain under-researched (Le & Harrington 2015). This study aims to explore the extent to which quantitative, qualitative, and mixed methods research articles are similar or different with respect to the frequency and functional patterns of their lexical bundles. Towards answering this question, however tentatively, the present exploratory study reports on the extent to which lexical bundles function similarly or differently in the discussion sections of quantitative, qualitative, and mixed-methods research articles in the field of applied linguistics. A corpus-based analysis of discussion sections in 150 research articles culled from ten highly rated international journals in the field of applied linguistics suggest that at the level of discussion sections, different methodological paradigms are characterized by different functional uses of lexical bundles. These lexical bundles are sufficiently formulaic that it can be argued that they constrain writers' language preferences. These findings may be of interest to applied linguists, second language educators and advanced learners of academic English.
Keywords: *applied linguistics, research article, discussion section, lexical bundles, methodological paradigms*

For citation:
Richter, Kenneth G., Behruz Lotfi Gaskaree & Milad Mirzai. 2022. A functional analysis of lexical bundles in the discussion sections of applied linguistics research articles: A cross-paradigm study. *Russian Journal of Linguistics* 26 (3). 625–644. https://doi.org/10.22363/2687-0088-27752

Функциональный анализ лексических связок в дискуссионных разделах научных статей по прикладной лингвистике: Кросс-парадигмальное исследование

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Аннотация
Лексические связки, выступающие как «строительные блоки дискурса» (Biber & Barbieri 2007: 263), различаются в зависимости от дисциплины и жанра. Умение использовать лексические связки говорит о профессионализме и помогает идентифицировать авторов письменных текстов и докладчиков как членов определенных дискурс-сообществ. Несмотря на наличие исследований лексических связок, которые вносят вклад в понимание различий между дисциплинами, ограничения, накладываемые использованием количественных, качественных и смешанных методов на применение лексических связок в разных жанрах, изучены еще недостаточно (Le & Harrington 2015). Цель настоящего исследования – проследить, в какой степени научные статьи, в которых применяются количественные, качественные и смешанные методы, сходны или различны в отношении частотности использования лексических связок и их функциональных моделей. Корпусный анализ разделов «Дискуссия», состоящий из 150 текстов, взятых из научных статей 10 высокорейтинговых международных журналов по прикладной лингвистике, показывает, что различные методологические парадигмы в этих разделах характеризуются разным функциональным использованием лексических связок. Эти лексические связки достаточно шаблонны, поэтому вряд ли можно утверждать, что они ограничивают языковые предпочтения авторов текстов. Полученные результаты могут быть интересны специалистам в области прикладной лингвистики, преподавателям иностранных языков и тем, кто изучает академический английский на продвинутом уровне.
Ключевые слова: *прикладная лингвистика, научная статья, лексические связки, методологические парадигмы*

Для цитирования:
Richter K.G., Lotfi Gaskaree B., Mirzai M. A functional analysis of lexical bundles in the discussion sections of applied linguistics research articles: A cross-paradigm study. *Russian Journal of Linguistics.* 2022. V. 26. № 3. P. 625–644. https://doi.org/10.22363/2687-0088-27752

1. Introduction

Lexical bundles (hereinafter LBs) have been defined as "extended collocations which appear more repeatedly than expected by chance" (Hyland & Jiang 2018: 383). Research has shown that the meaning and the coherence of academic texts is heavily influenced by the use of LBs (Hyland 2008a, Hyland & Jiang 2018). LB studies have informed our understanding of disciplinary variation (e.g. Abdollahpour & Gholami 2018, Durrant 2015, Hyland 2008b, Johnston 2017), genre distinctions (e.g. Hyland 2008a, Jalali 2013, 2017), mode specification (e.g. Biber, Johansson, Leech, Conrad & Finegan 1999, Biber & Barbieri 2007, Biber, Conrad & Cortes 2004), and rhetorical moves (e.g. Cortes 2013, Le & Harrington 2015, Mizumoto, Hamatani & Imao 2017, Omidian, Shahriari & Siyanova-Chanturia 2018).

Despite an ample literature on lexical bundles, there continues to be a relative paucity of research that focuses on the distinct functional meanings of LBs in academic texts. The current paper addresses a particular gap in the literature (Le & Harrington 2015): how LBs function across quantitative, qualitative, and mixed-methods paradigms in research articles[1]. A number of functional typologies have been elaborated for dealing with texts (e.g., Biber, Conrad, & Cortes 2004). In this study, we have chosen to use Hyland's (2008b) taxonomy because it is mostly focused on academic texts.

In the hopes of contributing to a better understanding of how lexical bundles operate in academic texts (specifically, how LBs contribute to intradisciplinary and intrageneric variation among the different methodological paradigms), the present study compares the functions of four-word LBs in the discussion sections of quantitative, qualitative, and mixed-methods RAs within the field of applied linguistics. The study was guided by the following research questions:

1. What sets of LBs are most frequently encountered in the discussion sections of quantitative, qualitative, and mixed-methods RAs in applied linguistics?

2. To what extent do the functional meanings of these lexical bundles differ across methodological paradigms?

2. Literature review

A large number of studies have examined the use and characteristics of LBs in academic texts. The functions of lexical bundles in creating disciplinary variation

[1] Henceforth, the terms 'methodological paradigms', 'methodological approaches,' 'research paradigms' and 'research approaches' are used interchangeably

(e.g. Durrant 2017, Hyland 2008b, Johnston 2017), genre distinction (e.g. Hyland 2008a, Jalali 2013), and mode specification (e.g. Biber et al. 1999, Biber & Barbieri 2007) have been the primary foci of these studies. The relationship between LBs, moves, and steps (e.g. Cortes 2013, Le & Harrington 2015) and the use of LBs in the discussion sections of research papers (e.g. Basturkmen 2009, Hashemi & Gohari Moghaddam 2016, Le & Harrington 2015, Ruiying & Allison 2003) have also been explored.

Johnston (2017), Durrant (2017), and Hyland (2008b) have demonstrated that LBs are central to disciplinary variation within academic discourse. For instance, in his study of the functional uses of LBs in academic writing, Hyland (2008b) found that text-oriented bundles (i.e., bundles that serve to organize, link, and contextualize textual elements) were used more frequently in applied linguistics and business studies as compared to electrical engineering and biology. The literature has also contributed to our understanding of generic variation of LBs in academic disciplines (Hyland 2008a, Jalali 2013). Hyland (2008a), for example, found that LBs used in the genre of research articles in the fields of biology, electrical engineering, applied linguistics, and business studies were different from the bundles used in the genre of PhD dissertations in these same disciplines. Functional analysis of the LBs showed that text-oriented bundles are used most frequently in the genre of research articles whereas research-oriented bundles (i.e., those that help structure and report accounts of research activities) are used most frequently in master's theses. Similarly, Jalali (2013) showed variations in master's theses and doctoral dissertations in terms of LB use (frequency, distribution and functions) in applied linguistics.

A few studies have focused on the relationship between lexical bundles and the patterns of moves and steps in research articles. Cortes (2013) found variation of LBs across moves and steps in the introductory sections of RAs in various disciplines. Le and Harrington (2015) focused on the discussion sections in quantitative RAs in applied linguistics. Highlighting variation in LBs, they demonstrated that in a single move (the *commenting on results* move), different sets of LBs were used to form the steps of *interpreting results* and *accounting for results.*

The literature has also examined LB use from a pedagogical perspective. These studies have demonstrated that LB use may indicate both a writer's expertise level and distinguish native-speaker students from non-native speaker students. In the disciplines of biology and history, for instance, LBs appear relatively rarely in student writing (Cortes 2004). Ucar (2017), Adel and Erman (2012), and Chen and Baker (2010) found that non-native writers tend to employ LBs less frequently than native writers and that the variation of the LBs in their writing was less diverse.

Different subgenres of academic RAs have been the foci of a great number of studies (Hashemi & Gohari Moghadam 2016, Juan & Tao 2013, Lim 2006, Tanko 2017, Yang & Allison 2003). However, only a small handful of studies have examined discussion sections in academic texts (e.g. Basturkmen 2009, Hashemi &

Gohari Moghaddam 2016, Le & Harrington 2015, Ruiying & Allison 2003). These studies all focused on exploring rhetorical moves, with the exception of Le and Harrington's (2015) study, which looked at the distribution of LBs in single move (*commenting on result*s) and its associated steps in the discussion sections of quantitative RAs in the field of applied linguistics. Their results demonstrated that different LBs are characteristically used in the steps *interpreting results* and *accounting for results*.

3. Methods

3.1. The corpus

The employment of language corpora allows researchers to mine for data on the frequency and use of particular linguistic items that are generally invisible to methods relying on linguistic intuition alone, thus allowing for objective measures of writerly preferences (Grabowski 2018). The current article reports findings from the analysis of a corpus made up of discussion sections taken from a sample of 150 quantitative, qualitative, and mixed-methods RAs published in ten high-impact journals within the field of applied linguistics: *Applied Linguistics, Journal of English for Academic Purposes, Journal of English for Specific Purposes, Language Learning, Language Teaching Research, RELC, TESOL Quarterly, The Modern Language Journal, Second Language Writing, and System.* Approximately 15 textual samples were culled from each of these journals. The least sampled journal was *Language Learning*, from which 10 articles were selected. The most heavily sampled was *System*, from which 20 samples were taken. To control for possible changes in genre style over time (Guinda 2015), only articles published between 2015 and 2018 were included in the corpus.

3.2. Procedure

First, research articles that explicitly identified their discussion sections with a heading were selected for possible inclusion in the study (sections with hybrid headings such as *Results and Discussion* or *Discussion and Conclusion* were excluded from the analysis so as to avoid genre intermingling). From this initial pool, discussion sections were chosen on the basis of the methodological paradigms their articles employed (i.e., quantitative, qualitative, and mixed-methods). The methodological paradigm of each article was determined by both the explicit descriptions found in the articles' methods sections and by a careful examination of the studies themselves. In this way, three corpora, each comprised of 50 discussion sections, were formed.

Once the texts had been selected, a separate Microsoft Word document (.docx format) was generated for each discussion section. After converting the texts into software-analyzable text files, each of the paradigm-specific corpora was subjected to analysis using Anthony's (2018) AntConc software. The application was set to identify four-word lexical bundles within the three corpora. Only four-word bundles

were considered since four-word bundles are far more common than other types (Cortes 2013, Hyland 2008b, 2012) and because four-word bundles obviously entail three-word bundles (Cortes 2004: 401).

In order to determine which lexical phrases count as legitimate objects of study, minimal frequency and distribution thresholds were determined. 'Frequency' refers to the number of times a particular lexical bundle appears in a specific text. 'Distribution' is defined as the number of times a LB appears across various texts in a corpus. Establishing criteria for determining frequency and distribution thresholds for LBs is rather arbitrary (Adel & Erman 2012), differing "from one study to another, primarily depending on corpus size and mode of language" (Esfandiari & Barbary 2017: 22).

As the three individual corpora examined in this study were small (the quantitative corpus consisted of 67,635 words, the qualitative corpus consisted of 56,838 words, and the mixed-methods corpus consisted of 59,508 words), a normalization procedure was used to determine LB frequency. This is considered standard procedure when corpora are composed of fewer than one million words (Biber & Barbieri 2007, Chen & Baker 2010). The frequency value obtained through the normalization process was 3 for each group of discussion sections; that is, any lexical phrase appearing at least three times in a given sub-corpus was identified as a lexical bundle.

The distribution threshold (Biber & Barbieri 2007) was also determined by normalizing the three corpora. According to Biber and Barbieri (2007), a word combination can be considered a LB when it occurs in three or more texts in a corpus of 50,000 to 100,000 words. Due to the small size of our corpora, the distribution threshold of 3 was adopted for each of the three paradigm-specific corpus. In summary, four-word clusters had to appear at least three times in three different texts in each corpus in order to be considered a true LB. After determining the LBs, each bundle was recorded individually. Next, the bundles were classified according to their functional patterns. To do this, the functional taxonomy developed by Hyland (2008b) was employed (see Table 1). The three corpora were compared to each other in order to determine differences in terms of LB frequency and the functional roles that the LBs played in each. A small number of LBs were excluded from the study. These included random patterns of words with no semantic meaning (e.g. *writing on the other*, *et. al found that*).

Table 1. Hyland's (2008b: 13–14) functional classification of lexical bundles.

Functions	Sub-categories	Description (*example*)
Research-Oriented	**Location**	Indicate time/place (*at the beginning of*)
	Procedure	Provide rationale or function (*the purpose of the*)
	Quantification	Related to measurement (*one of the most*)
	Description	Related to depiction of features (*the structure of the*)
	Topic	Related to the field of research (*in the Hong Kong*)
Text-Oriented	**Transition signals**	Establish additive or contrastive links between elements (*in addition to the*)

Functions	Sub-categories	Description (*example*)
	Resultative signals	Indicate inferential or causative relationships between elements (*these results suggest that*)
	Structuring signals	Text-reflexive markers which organize stretches of discourse or direct the reader elsewhere in the text (*in the next section*)
	Framing signals	Situate arguments by specifying limiting conditions (*with respect to the*)
Participant-Oriented	**Stance features**	Convey the writer's attitudes and evaluations (*are likely to be*)
	Engagement features	Address readers directly (*it should be noted*)

4. Results

The results of the study are presented in the order of the research questions posed above.

4.1. Frequently used lexical bundles

In the quantitative, qualitative and mixed-methods corpora, 168, 78 and 123 distinct LBs were identified, respectively (Figure 1), totaling 369 in all.

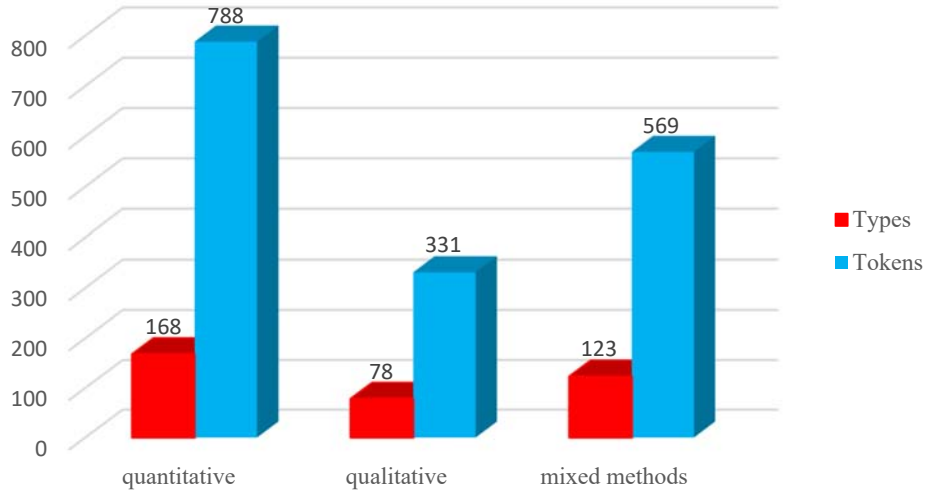

Fig. 1. Types and tokens of LBs in all three research approaches

Quantitative RAs contained the most lexical bundles, both in terms of types and tokens; the qualitative RAs contained the least. Many lexical bundles appeared in more than one corpus.

On the other hand, in the present study, and *in the current study* were the most frequent LBs found in the discussion sections of both quantitative and mixed-methods RAs. *On the other hand* occurred 28 times and appeared in more than one third of the texts in quantitative RAs. *At the same time* was the most frequent LB in qualitative RAs, occurring 13 times in 10 different qualitative texts. Results showed that 67.26% (113 tokens) of the LBs found in quantitative RAs, 61.54% (48 tokens) of the LBs found in qualitative RAs, and 55.29% (68 tokens) of the LBs found in mixed-methods RAs were unique to their particular corpus. That is, more than half

of the lexical bundles in each paradigm did not occur in the other two. More than a third of the LBs were shared across two or three research approaches. Only 18 LBs were shared by all three research approaches (Table 3).

Table 2. Top 10 LBs in quantitative, qualitative, and mixed-methods RAs

R	Quantitative	F	Qualitative	F	Mixed-methods	F
1	on the other hand	28	at the same time	13	on the other hand	22
2	in the current study	18	teachers in this study	9	in the present study	18
3	in the present study	13	in the case of	8	in the current study	13
4	the second research question	13	in the current study	8	is in line with	10
5	it is possible that	12	in the form of	8	in line with the	9
6	the fact that the	12	on the other hand	8	in terms of the	9
7	the results of the	12	as well as the	7	as a result of	8
8	to the fact that	11	in the present study	7	it is interesting to	8
9	of the current study	10	the ways in which	7	the end of the	8
10	the first research question	10	in line with the	6	the fact that the	8

Note: R= Rank; F= Frequency

Table 3. 18 lexical bundles shared across all three research approaches

	Quantitative		Qualitative		Mixed-methods	
Lexical bundles	**F**	**R**	**F**	**R**	**F**	**R**
on the other hand	28	20	8	6	22	13
in the current study	18	10	8	4	13	8
in the present study	13	11	7	5	18	13
it is possible that	12	8	4	4	5	4
the first research question	10	10	4	3	6	5
in the case of	9	4	8	7	6	5
as well as the	8	8	6	6	6	6
at the same time	6	5	13	10	6	5
is in line with	6	6	4	4	10	8
students were able to	6	4	3	3	3	3
in terms of the	5	5	4	4	9	8
in the context of	5	3	3	3	6	6
it is important to	5	4	6	6	4	4
on the one hand	5	4	4	4	4	4
a wide range of	4	4	3	3	4	4
the findings of this	4	4	3	3	3	3
in line with the	3	3	6	5	9	7
in this study the	3	3	6	5	3	3

Note: F= Frequency; R= Range

The greatest affinity between the three methodological approaches was between quantitative and mixed-methods approaches: these had 31 LBs in common. These LBs did not occur in qualitative RAs (see Table 4).

Table 4. 31 lexical bundles found in both quantitative and mixed-methods articles

	Quantitative		Mixed–methods	
Lexical bundles	**F**	**R**	**F**	**R**
the second research question	13	12	6	6
the fact that the	12	11	8	6
the results of the	12	10	5	5
to the fact that	11	9	8	8
of the current study	10	7	5	5
as a result of	7	6	8	8
be due to the	7	6	6	5
due to the fact	7	7	4	4
in light of the	7	5	7	5
in the use of	7	5	5	4
results of this study	7	5	3	3
the findings of the	7	5	6	5
the results of this	7	5	3	3
in other words the	6	5	7	6
of the importance of	6	6	4	4
over the course of	5	3	7	4
the case of the	5	4	3	3
this is consistent with	5	3	4	3
it is likely that	4	4	5	5
the other hand the	4	4	4	4
the results showed that	4	4	4	4
findings of the study	3	3	4	4
in addition to the	3	3	3	3
in the absence of	3	3	6	5
in the process of	3	3	5	5
may not have been	3	3	5	5
of the use of	3	3	5	5
research question asked whether	3	3	4	3
the end of the	3	3	8	8
the present study the	3	3	3	3

Note: F= Frequency; R= Range

Overall, the findings showed that the LBs used in the discussion sections of the quantitative, qualitative, and mixed-methods articles were largely different. In other words, each of the three paradigmatic corpora demonstrated relatively little commonality in terms of the LBs that were employed. In addition, the LBs that were shared across paradigms differed markedly in their frequencies. For instance, LBs found in both quantitative RAs and mixed-methods RAs occurred twice as often in the former than in the latter.

4.2. Functional uses of lexical bundles

The functional characteristics of LBs were analyzed using Hyland's (2008a) taxonomy, which categorizes LBs according to their typical meanings in academic writing. As was noted previously, Hyland divides academic LBs into three primary

functional categories: text-oriented, participant-oriented, and research-oriented. Text-oriented bundles are used to organize, link, and contextualize textual elements in order to express the author's understandings of research results. *On the one hand*, *results of this study*, *the first research question*, and *in the context of* are examples of this category. Participant-oriented bundles focus "on the writer or reader of the text" (Hyland 2008b: 14). *It is important to* and *it is likely that* are two examples of participant-oriented LBs, which serve engagement and stance functions, respectively. Research-oriented bundles are used to help structure and report accounts of the research activities and the world in which they take place in. *Over the course of*, *a wide range of* and *as a process of* are examples of research-oriented bundles. A comparative analysis of the LBs' functions across the three methodological paradigms is displayed in Figure 2.

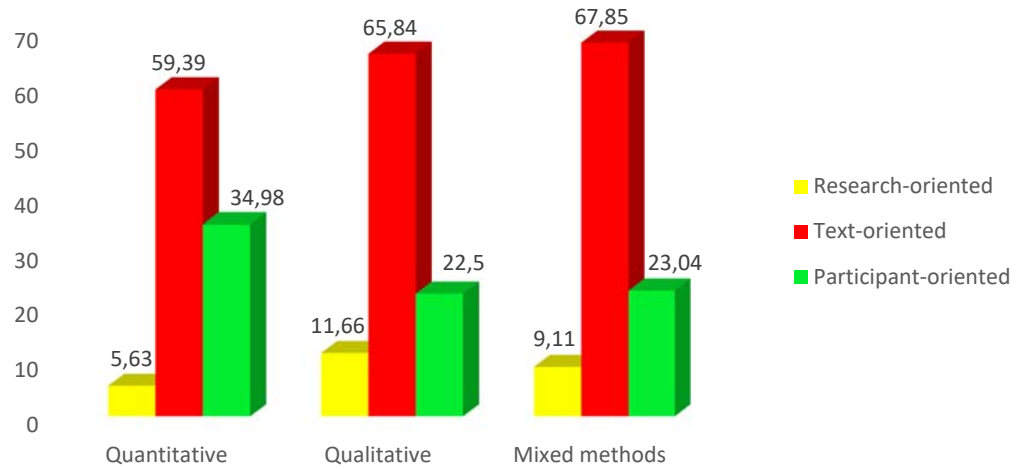

Fig. 2. Functional use of LBs in each research approach as a percentage of tokens

All three paradigms in the corpus of applied linguistics RAs had similar distributions of research-, text-, and participant-oriented bundles. Text-oriented LBs were the most frequent across paradigms, accounting for more than half of the bundle tokens in each research approach. Participant-oriented LBs ranked second across the three paradigms. Research-oriented bundles were the least prevalent in all three research approaches, accounting for less than 12% of all the bundle tokens in each.

The results showed that text-oriented LBs were most frequent in the discussion sections of mixed-methods RAs (67.85%). Participant-oriented LBs were more prevalent in quantitative RAs (34.98%). The frequency of these was comparable in qualitative and mixed-methods RAs, where they accounted for approximately 23% of bundle tokens in each paradigm. The frequency of research-oriented bundles was similar in qualitative and mixed-methods RAs, where they accounted for 11.66% and 9.11% of bundle tokens, respectively. Research-oriented bundles formed just

5.63% of the bundle tokens discovered in the quantitative RAs. A detailed analysis of each functional category and their sub-categories across the three paradigms is provided below.

4.2.1. Text-oriented lexical bundles

Text-oriented bundles are concerned "with the organization of the text and its elements as a message" (Hyland 2012: 159). The relatively high frequency of text-oriented bundles across all three paradigms indicates their relative importance in applied linguistics RAs. Hyland (2012: 159) asserts that text-oriented bundles are "the most discursively crafted and rhetorically machined genre of the three, and almost two thirds of [their] clusters present research by engaging with a literature, providing warrants, establishing background, connecting ideas, directing readers around the text, and specifying limitations." According to Hyland (2008a), text-oriented LBs can be further broken down into a number of sub-categories. Each of these is considered, below.

Framing signals

The sub-category framing signal "situates arguments by specifying limiting conditions" (Hyland 2008a: 49).

(1) *The higher level of cognitive information available to the learners (i.e., having pre-tasks for generating ideas) helped improve their performance in terms of content, focusing on meaning, but* ***at the expense of*** *accuracy.*

A comparative analysis showed that framing signals were distributed similarly between qualitative and mixed-methods RAs, accounting for 29.17% and 31.58% of the bundle tokens, respectively. Framing signals were less frequent in quantitative RAs, in which they accounted for just 14.68% of the total number of bundle tokens.

Resultative signals

Resultative signals mark "inferential or causative relations between elements" (Hyland 2008a: 49).

(2) *However, the bottom-up group was found to have undergone a larger growth in controlled productive vocabulary knowledge* ***as a result of*** *the treatment; this difference in growth between the two groups was found to be statistically significant. (****Expressing cause and effect/result relations)***

According to Hyland (2012: 159) "the number of resultative markers … shows a high degree of reader awareness as it points to the writer's interpretations and highlights the inferences the writer wants readers to draw." The cross-paradigm analysis showed that the quantitative RAs included the largest number of resultative signals (27.81% of bundle tokens in quantitative RAs). Resultative bundles in mixed-methods RAs and qualitative RAs accounted for 21.01% and 11.25% of bundle tokens respectively. Lexical bundles in this sub-category were used

primarily to present study findings (e.g. results of this study, findings of this study). Some of the resultative bundles were used to establish inferential or causative links between elements of some studies in the corpora.

Transition signals

Transition signals are used for "establishing additive or contrastive links between elements" (Hyland 2008a: 49).

(3) *It is perhaps unsurprising, thus, that due to repetitive exposure to these forms, students tended to recycle them in their writing.* ***On the other hand****, the words nevertheless and nonetheless do not appear in any of the lists of the most frequent words in the Corpus.*

The majority of the LBs used as transition signals had relatively straightforward meanings (*on the other hand*). Analysis of the transition signals showed that they were most prevalent in qualitative RAs, where they accounted for 13.75% of all bundle tokens. In both quantitative and mixed-methods RAs, transition signals accounted for about 10% of the bundle tokens.

Structuring signals

Hyland (2008a: 49) defines structuring signals as text-reflexive markers which "organise stretches of discourse" or direct readers to the text itself or to specific sections of it.

(4) *The second research question* ***in the present study*** *asked whether narrow reading contributes to productive vocabulary knowledge.*

Structuring signals were a bit more frequent in qualitative RAs in comparison with the quantitative and mixed-methods discussion sections. They accounted for 11.67% of the bundle tokens in the qualitative RAs. These signals were less frequent in the quantitative and mixed-methods RAs, where they accounted for 7.17% and 5.06% of bundle tokens, respectively. Examples of structuring signals within each paradigm are presented below. Table 5 presents a comparative analysis of text-oriented bundles across the three paradigms. Functional sub-categories were not distributed equally across the three paradigms.

Table 5. **Functional patterns of text-oriented bundles across paradigms**

Functions	Sub-categories	Quantitative	Qualitative	Mixed-methods
Text-oriented	Transition signals	9.73%	13.75%	9.88%
	Resultative signals	27.81%	11.25%	21.01%
	Structuring signals	7.17%	11.67%	5.06%
	Framing Signals	14.68%	29.17%	31.9%
Total (% of tokens)		59.39%	65.84%	67.85%

4.2.2. Participant-oriented lexical bundles

Participant-oriented bundles play a significant role in academic work as they contribute to establishing links between writers and readers: they help writers "express their positions, represent themselves, and engage their audiences" (Hyland

2005: 176). Hyland (2008b: 19) states that in his study "participant bundles were predominantly a feature of the research articles." According to Hyland (2008b: 18), participant-oriented bundles in RAs convey two main functions: (1) *stance*, which refers to "ways writers explicitly intrude into the discourse to convey epistemic and affective judgments, evaluations and degrees of commitment to what they say"; and (2) *engagement*, which he described as "the ways writers intervene to actively address readers as participants in the unfolding discourse." Table 6 shows that within the participant-oriented category of LBs, stance features were much more frequent than engagement features across all three paradigms.

Table 6. Functional patterns of participant-oriented bundles across paradigms

Functions	Sub-categories	Quantitative	Qualitative	Mixed-methods
Participant-oriented	Stance features	32.%	21.25%	20.25%
	Engagement features	2.56%	1.25%	2.79%
Total (% of tokens)		34.9%	22.5%	23.04%

Stance

All the LBs in the stance subcategory serve as hedges suggesting "a degree of tentativeness" (Cortes 2004: 410). Stance bundles in the corpora "allow writers to present information as an opinion rather than as accredited fact … [and] protect the writer from possible false interpretations, and indicate the degree of confidence that it may be prudent to attribute to the accompanying statement" (Hyland 2012: 58).

(1) *Therefore, it can be argued that though not conclusive,* ***it is possible that*** *learners' attention was drawn to form.*

The results of the current analysis demonstrated that stance bundles are much more frequent than engagement feature across the three paradigms. Findings also showed that stance bundles were most frequently found in the quantitative RAs, in which they accounted for 32.42% of all the bundle tokens in this paradigm. Qualitative and mixed–methods RAs were almost identical in terms of the number of stance tokens in each. They accounted for 21.25% and 20.25% of bundle tokens in these paradigms, respectively.

Engagement

Engagement bundles "address readers directly" (Hyland 2008a: 49). They were much less common as compared to stance bundles. They had a relatively similar distribution across the three research approaches, accounting for less than 3% of bundle tokens in each.

(2) *On the whole,* ***it is interesting to*** *point out that the patterns outlined here are reflective of these identified for the moment-by-moment changes in motivational intensity in studies investigating…….*

4.2.3. Research-oriented bundles

Research-oriented bundles "help writers to structure their activities and experiences of the real world" (Hyland 2008b: 13–14). These bundles were the least

frequent bundles among the three research approaches. Within this category, there are five sub-categories; location (which can refer to both time and physical location), procedure, quantification, description, and topic.

Table 7. Functional patterns of research-oriented bundles across paradigms

Functions	Sub-categories	Quantitative	Qualitative	Mixed-methods
Research-oriented	Location	0.51%	1.66%	6.08%
	Procedure	**0%**	**0%**	**0%**
	Quantification	4.10%	5.84%	1.77%
	Description	1.02%	4.16%	1.26%
	Topic	**0%**	**0%**	**0%**
Total (% of tokens)		5.63%	11.66%	9.11%

Results indicated that quantification bundles are the most frequent research-oriented functional sub-category in qualitative RAs; here, they accounted for 5.84% of bundle tokens. Within the quantitative paradigm, they were also the most frequent research-oriented functional sub-category, accounting for 4.10% of bundle tokens. While location bundles were the most frequent research-oriented sub-category in mixed-methods RAs (accounting for 6.08% of bundle tokens). Description bundles were a bit less frequent in the three research approaches. Procedure bundles and topic-oriented lexical bundles were both entirely absent in the discussion sections of the three research approaches.

5. Discussion

The findings of the current study help highlight intradisciplinary and intragenric variation with respect to the language features writers use to express their meanings. The study (1) identifies paradigm-specific lexical bundles in the discussion sections of applied linguistics RAs and (2) locates the commonalities and divergences among quantitative, qualitative, and mixed-method articles with respect to the functional purposes of their LBs. The implications of these findings – particularly in terms of their relation to pedagogical issues – are discussed below.

Different fields of study depend upon different methodological paradigms. Psychological, economic, and demographic studies generally favor quantitative approaches, for instance, while sociological, historical, and anthropological research tends to rely on qualitative methodologies. Of course, within the varying discourse communities of a given field, researchers may have certain methodological preferences. In the social sciences, for example, work is guided by different paradigms depending on a study's purpose (Creswell 2012). In all cases, depending on the methodological paradigm deployed, different ontological, epistemological, methodological, and axiological assumptions influence how research is designed and conducted (Denzin & Lincoln 2011). Paradigmatic assumptions also influence writerly choices. Writers – even those working in the same field – are influenced in their stylistic decisions by the research paradigm they have chosen to work with. That is, their language is influenced by and reflects

attitudes about the world, reality and knowledge that are embedded in different methodological choices.

In terms of this study, results suggest that the sets of LBs specified for each of the three paradigms considered encode preferences held by the discourse communities working within applied linguistics. The current study highlights the fact that methodological decisions create intradisciplinary variation in terms of language use. Even the most common LBs occurred with different frequencies within the three corpora. The quantitative researchers, for instance, used a larger range of LB types than did the qualitative and mixed-methods researchers. Some LBs, such as *the fact that the* and *the result of the*, occurred twice as often in quantitative RAs than in mixed-methods RAs.

Although different methodological paradigms call for different sets of LBs, analysis indicated that LBs that did cross paradigm boundaries maintained the same functional meanings regardless of which paradigm they were found in. That is, these LBs functioned similarly regardless of methodological approach. For example, text-oriented LBs were the most frequent and research-oriented LBs were the least frequent formulaic sequences across the three research paradigms.

The prevalence of text-oriented bundles is also interesting because these LBs have likewise been shown to predominate in English literature (Johnston 2017), psychology (Esfandiari & Barbieri 2017), and business (Hyland 2008b, Yin & Li 2021). This may be because within the "soft" sciences, of which applied linguistics is a part, "persuasion is more explicitly interpretative and less empiricist," and the author's voice tends to be more actively present. This can be contrasted with the "hard" sciences (Hyland 2008b: 16), in which the role of the author tends to be backgrounded in order for claims to "speak for themselves." The fact that text-oriented bundles were as pervasive in qualitative applied linguistics studies as they were in quantitative studies suggests that even on the "harder" side of the applied linguistics research spectrum, the "soft" rhetorical norms of the field continue to predominate.

Academic writing is generally characterized by its detached and impersonal style (Hyland & Jiang 2017). Yet, by selecting specific language options, academic authors do project their personas and attempt to create connections with their readers (Halliday 1985). One way they do this is through the use of participant-oriented lexical bundles. Participant-oriented LBs allow writers to create links between themselves and their readers, helping them to "express their positions, represent themselves, and engage their audiences" (Hyland 2005: 176). It is interesting, then, that the results of this study showed that participant-oriented bundles ranked second among the three paradigms in terms of their frequency of occurrence, as it highlights the extent to which academic writers project their individual voices. A familiarity with participant-oriented bundles may help novice writers focus on the ways in which accomplished academic writers present themselves in texts that are ostensibly marked by authorial evacuation.

Research-oriented bundles were shown to be used relatively infrequently in all three paradigms. Reporting on the relatively low frequency of research-oriented LBs in applied linguistics and business studies as compared to biology and electrical engineering, Hyland (2008b) argues that research bundles are generally reserved for the "hard knowledge fields," where they express and undergird a scientific ideology which "emphasises the empirical over the interpretive, minimising the presence of researchers and contributing to the 'strong' claims of the sciences." (Ibid: 15). In the same way, the interpretive ideology which informs the soft sciences call for a greater reliance on text-oriented bundles, which tend to foreground authorial involvement in the research process.

6. Conclusion

The present study is a corpus-based investigation of the frequency and functions of lexical bundles in the discussion section of quantitative, qualitative, and mixed methods RAs in applied linguistics. The primary objective of the study was to investigate the similarities and differences in functional patterns of LBs across three groups of research articles belonging to different methodological paradigms. Generally, the researchers wished to discover if and to what extent or in what ways LBs play different functional roles in different contexts.

Results reveal the intradisciplinary variation of LBs and support the view that methodological paradigms act as constraints on writers' stylistic choices. The paradigms were found to be similar in their use of LBs. The LBs in the three paradigms explored tend to follow the same functional patterns in the discussion sections of RAs. For example, text-oriented LBs were used most frequently across the three paradigms whereas research-oriented LBs were the least frequently used. However, each paradigm was found to rely on different sub-categories of LBs. While resultative signals were the most frequent functional categories used in quantitative RAs, they were the least frequent used in qualitative RAs. It is logical to argue that since LBs are treated differently (at least in terms of type and functional sub-categories) in different research paradigms, their variations need to be taken into account by academic writers working within different methodological paradigms. In addition, the reliance of all three paradigms on the same functional pattern of LBs shows that the discussion section of RAs across the three paradigms seek to use similar major functions. Drawing on the findings of this study, it can be argued that as discussion sections mainly focus on arguing and drawing conclusions, text-oriented bundles are chiefly employed to present results and to limit the writers' findings and interpretations to the study at hand.

Because an important distinguishing difference between novice and expert writers can be found in how each group employs LBs in the texts they create (Adel & Erman 2012, Chen & Baker 2010, Cortes 2004, Hyland 2008b, Ucar 2107), the study of LBs is of obvious pedagogic interest. For this reason, a number of researchers have highlighted their usefulness in EAP instruction. Swales (2019), for instance, argues that frequently occurring bundles that serve clear textual functions have particular pedagogical potential.

Theoretically, a strong case can be made for the study of LBs in ESOL academic writing classrooms. Psycholinguistically, mental access to LBs has "a processing advantage over creatively generated language" for both native and non-native speakers and writers (Conklin & Schmitt 2008: 72). This is because LBs are learned as "wholes" (Pérez Llantada 2014: 83) and stored in memory as "unanalyzed multi-word chunks" (Biber et al. 2004: 400) which can be easily retrieved for use. Once learned, they appear to contribute to more fluent language production (Biber et al. 2004, Hyland & Jiang 2018, Wray 2008). Awareness of LB clusters can, at the very least, promote noticing (Zhang 2012). That is, drawing explicit attention to lexical bundles has the potential to increase student awareness of these key features of academic language, thus increasing recognition, storage and processing of them over multiple exposures.

In practical terms, a focus on specific language features responds to the challenge posed by those mainstream genre approaches which tend to foreground meaning at the expense of the particular language forms that make meaning possible (Paltridge 2007). As previously mentioned, only 18 LBs were found in all three research approaches. This is useful pedagogical information. Teachers working in second language acquisition and TESOL programs might well wish to focus their students' attention on the formulaic aspects of writing the discussion and conclusion sections of research papers. Such teachers would certainly want to start with the 'core' 18. In fact, 18 is a relatively large number of LBs to teach and learn during a single academic writing course, in which an enormous number of writing issues vie for attention. Therefore, in a real-life classroom situation, these LBs might well be the only bundles that should be covered explicitly. The insight that all of the paradigms are highly phrasal might be useful to teachers and students, as well.

Taxonomical analysis showed that the discussion sections found in applied linguistic texts were dominated by text-oriented bundles. For pedagogical purposes, this suggests that teachers should spend time with their students working on not only how to organize texts but on how to signal organization moves to the reader.

In short, writing students can be encouraged to appreciate that their meaning-making choices are not only bound by the norms of their research community (Swales 1990), but that they are also constrained by the paradigm employed to guide their research (quantitative, qualitative, or mixed). The findings of the study unpack the constraints imposed by paradigms on language use in academic writing, therefore helping to broaden the "scope of genre… in order to serve the pedagogical purposes of the EAP practitioner" (Swales 2019: 76).

The results of this study constitute new information about the differences between the frequency and functions of LBs in the discussion sections of RAs in applied linguistics. As with any exploratory, small-scale study, the results must be highly caveated and call for the analysis of larger corpora. Nonetheless, by providing preliminary evidence concerning lexical differences in quantitative, qualitative and mixed methods articles, the present study introduces a number of

research topics that might be usefully taken up in future research. For instance, it was discovered that some LBs simultaneously served different functional purposes in a single occurrence. *In the present study,* for example, functioned both as a resultative and framing signal in the texts that were analyzed. These groups of multifunctional LBs deserve further investigation. The factors affecting the choice and use of LBs in different paradigms is another area of interest. Future research could systematically explore multifunctional LBs in professional and academic texts. Lastly, the pedagogical implications of these findings would be worthy of future attention.

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Article history:
Received: 22 October 2021
Accepted: 21 April 2022

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