ASSOCIATION FOR
ACADEMIC
LANGUAGE AND
LEARNING

Reporting verb variation across disciplines: An academic corpus study

Grant Eckstein, Jacob Rawlins, Hannah Taylor, Haley Briggs, Andrea Candland

Linguistics Department, Brigham Young University, 4064 JFSB Provo, UT 84602, USA

Email: grant_eckstein@byu.edu, jacob_rawlins@byu.edu, hannahsue10@gmail.com, hgbriggs4@gmail.com, andreacandland@gmail.com

Elizabeth Hanks

Department of English, Northern Arizona University, Room 140 Building 18 Liberal Arts 705 S. Beaver St Flagstaff, AZ 86011, USA

Email: eah472@nau.edu

Sarah Hill

Independent Researcher

Email: artsah17@gmail.com

Reporting verbs are used in academic writing to establish authorial voice when referencing previous research. Although the practice is widespread, inexperienced academic writers and second-language learners may struggle to select appropriate reporting verbs within their given discipline or may overuse them in ways that signal outsider status. The present study explores the distribution of reporting verbs across six disciplines in a corpus containing 270 academic research background sections (introduction and literature review). The results illustrate that disciplines vary widely in the number and type of reporting verbs used. While common reporting verbs across disciplines include *argue*, *examine*, *report*, *show*, *suggest*, and *use*, most disciplines utilize a large number of reporting verbs that are unique only to a specific discipline. The findings reported from this study, as well as the verb lists, can be used by teachers and English language learners to expand or establish authorial voice in a way that replicates disciplinary in-group status.

Keywords: reporting verbs, discipline, variation, second language, learners.

1. Introduction

Academic writing is typified by the use of referential citations in which writers credit other authors, demonstrate support for an argument, or position a novel contribution within an existing academic discussion (Erikson & Erlandson, 2014; Harwood, 2009; Kaplan, 1965; Schoonbaert & Roelants, 1996). When introducing such citations, writers can subtly index their positive, neutral or critical impression of the cited research by using reporting verbs in phrases such as "Lee (2000) *explained ...*" or "Lee (2000) *asserted* that …". Thompson and Ye (1991) state that reporting verbs create the basis for intention in a writer's work. Others similarly view them as a function of a writer's stance in which such verbs establish the identity, credibility, and intention of both the author's and the writer's texts (Bloch, 2010; Hyland, 2002; Thompson & Ye, 1991; S. Un-udom & N. Un-udom, 2020).

Recently, researchers have studied how reporting verbs are used across disciplines. Uba (2020), for example, examined 120 academic articles across four disciplines and found that applied linguistics and accounting used the word *find* more frequently compared to engineering and medicine, which used *develop* and *demonstrate*, respectively. Furthermore, medicine and engineering showed a smaller variety of reporting verbs compared to applied linguistics and accounting. The present study expands this research by examining reporting verbs used in the background (i.e., introduction and literature review) sections of 270 published research papers across six disciplines and organizing these verbs by frequency to show how reporting verbs are differentially used. Research of this nature can help learners understand the significance of reporting verbs and use them more effectively to develop their own discipline-specific authorial voice (Bloch, 2010; Huang, 2018; Jafarigohar & Mohammadkhani, 2015; Yilmaz & Özdem Erturk, 2017). This is particularly relevant among inexperienced academic writers and second language (L2) learners whose lexical repertoires and proficiency in source use or citation competence (Ma, 2015) may be limited due to cultural and linguistic differences from an Anglophone academic context (Liu et al., 2016; Zhang, 2013).

2. Disciplinary differences in reporting verb studies

When academic writers introduce citations, their use of reporting verbs allows them to express their intention and a particular stance toward the reported research. Proficiency in this ability is known as citation competence (Ma, 2015), and a strong competence allows writers to situate their research within a particular field and emphasize the importance of their own research and academic claims (Ma & Qin, 2017). In order to develop such competence, writers must know their options for introducing reported research, particularly the kinds of reporting verb that are most appropriate for a particular discipline. Despite the importance of citation competence, L2 writers may still struggle to develop it without pedagogical interventions that expose them to elements of normalized disciplinary source use. Writers for whom English is their first language may also lack citation competence, but Liu et al. (2016) argue that L2 writers are at a disadvantage because of cultural and language differences. Yang and Lin (2009) explored the notion of cultural citation practices and explained that students with a cultural orientation toward rote learning may be unfamiliar with conventional academic citation practices which may result in writing that appears plagiaristic. Other researchers have found that L2 writers use a narrower range of reporting verbs both as students and as published academic writers compared to first language peers (e.g., Fløttum et al., 2006; Lee et al., 2018; Mansourizadeh & Ahmad, 2011). Thus, there is a need for language teachers to be familiar with citation options, including typical intra- and inter-disciplinary reporting verbs that students can use as they develop citation competence.

Researchers examining reporting verbs and writer stance have analyzed disciplinary differences in reporting verbs. Hyland (1999), for example, showed wide disciplinary variety in reporting verbs through a 500,000-word corpus of 80 published research articles spanning eight disciplines (see Table 1). The verbs *say* and *think* were almost exclusively found within philosophy papers, while 70% of the instances of *use* were found in electronics papers. He also found differences between soft and hard sciences (Biglan, 1973), wherein dialogic and negotiative verbs such as *argue*, *suggest*, and *study* were mainly found in soft sciences, while articles in hard sciences favoured factive, non-negotiative verbs such as *report*, *describe*, and *show*. The distinction between soft and hard sciences seems to be one of dialogism: soft disciplines, such as education, are more likely to open a space for dialogue with previous writers, whereas hard sciences, such as engineering, occlude dialogism (see also Hu & Wang, 2014). This distinction is likely related to epistemological differences in various disciplines (Neumann, 2001). Early work by Biglan (1973) and Kuhn (1962) suggest that hard sciences attempt to reflect objective reality by situating results within an established paradigm, while soft sciences view knowledge as subject to and a result of non-paradigmatic interpretation. North (2005) likewise observed that "science" students focused more on the reproduction of factual information while "arts" students wrote with greater emphasis

on structure and interpretation, suggesting early socialization into disciplinary epistemologies that distinguish factive from dialogic stances.

Table 1. Most common reporting verbs in eight disciplines reported in Hyland (1999).

	Molecular Biology	Magnetic Physics	Marketing	Applied Linguistics
Reporting verbs per paper	26.2	6.6	32.7	33.4
	describe	develop	suggest	suggest
	find	report	argue	argue
	report	study	demonstrate	show
	show		propose	explain
	suggest		show	find
	observe			point out
	Philosophy	Sociology	Mechanical Engineering	Electronic Engineering
Reporting verbs per paper	57.1	43.6	11.7	17.4
	say	argue	describe	propose
	suggest	suggest	show	use
	argue	describe	report	describe
	claim	note	discuss	show
	point out	analyse		publish
	propose	discuss		
	think			

In addition, Fløttum et al. (2006) used the KIAP (Cultural Identity in Academic Prose) corpus to investigate authorial voice across disciplines (see Table 2). The KIAP corpus consists of 450 research articles divided into the three disciplines of economics, linguistics, and medicine, and is further subdivided into English, French, and Norwegian to produce nine subcorpora of 50 articles each. The researchers identified over 3,000 reporting verbs found in subject position references and 869 different verbs, indicating considerable lexical and disciplinary variation.

Table 2. Most common reporting verbs in three disciplines in English reported in Fløttum et al. (2006).

	Economics	Linguistics	Medicine
Subject position references per subcorpus	364	713	233
Number of different verbs	93	167	51
Reporting verbs per paper	7.28	14.26	4.66
	find	argue	report
	show	note	find
	provide	show	show
	report	propose	demonstrate
	argue	point to/out	suggest

Finally, Hu and Wang (2014) similarly examined reporting verbs between applied linguistics and medicine (see Table 3). Using a corpus of 84 research articles, researchers found predictable disciplinary differences in that the applied linguistics verbs tended to "[open] up a dialogic space for alternative viewpoints" (p. 24) while the medical verbs tended to factively report or describe prior observations in a non-dialogic way. Tables 1–3 show the main findings of these researchers, including the most frequent reporting verbs within each discipline.

Table 3. Most common reporting verbs in two disciplines across languages reported in Hu and Wang (2014).

Applied Linguistics	Medicine
argue	report
claim	show
explain	find
note	indicate
point out	demonstrate
propose	describe
state	
suggest	

Despite the variation of reporting verbs across disciplines, some disciplinary distinctions are erased when comparing similar subfields of a particular discipline. Suntara and Usaha (2013), for example, did not locate a compelling distinction between the reporting verbs used in linguistics and applied linguistics articles. However, Huang (2018) did not discover such similarities between the marine engineering subdisciplines he studied.

Overall, there appears to be a considerable difference between the occurrence of reporting verbs across disciplines (Hyland, 2002; Uba, 2020), especially with disciplines that differ substantially from one another. "Hard disciplines" like engineering and biology, for example, tend to use considerably fewer reporting verbs than "soft disciplines" like applied linguistics (Uba, 2020; Hyland, 2002), and this is probably a reflection of unique epistemological orientations within disciplines (North, 2005). The varying choice of reporting verbs by discipline reflects differences in accepted lexicons and patterns of reporting verb usage that signal accepted in-group norms. However, academic writers may be unaware of how their reporting verb selection contributes to their in-group status. Similarly, emerging and established scholars may be unaware of cross-disciplinary differences in reporting verb lexicons. Consequently, understanding such differences can benefit those who teach academic writing across disciplines as well as disciplinary writers who can better conceptualize their own field by contextualizing reporting verb usage with neighbouring disciplines. For these reasons, we embarked on a research study to examine reporting verb usage across six disciplines. Our research was guided by the following questions in relation to research background sections (introduction and literature review):

1. How does the number of reporting verbs per background sections of papers differ across six disciplines (e.g., do some disciplines have more reporting verbs overall)?
2. What are the most common reporting verbs used in each discipline?
3. How are reporting verbs distributed across disciplines (e.g., which are most common across disciplines or unique to just one discipline)?

3. Methodology

We collected data using Gray's (2011) *Academic Journal Registers Corpus* (AJRC), which was originally created to reflect a wide range of disciplines, as well as the research categories typical of each. The corpus contains 270 articles with 1,952,568 tokens and 48,403 types across six disciplines, including applied linguistics (60 articles), biology (30 articles), history (30 articles), philosophy (30 articles), physics (60 articles), and political science (60 articles). Disciplines are represented in the corpus through articles of various research categories based on standards in their respective fields: applied linguistics includes 30 qualitative and 30 quantitative articles, biology includes 30 quantitative articles, history includes 30 qualitative articles, philosophy includes 30 theoretical articles, physics includes 30 quantitative and 30 theoretical articles, and political science includes 30 qualitative and 30 quantitative articles (see Table 4). Gray included theoretical articles in two disciplines (philosophy and physics), explaining that such articles aim to "propose, explore, and advance theoretical arguments" as opposed to empirical research that "present[s] the analysis of observed data" (p. 6). All six disciplines in the corpus include articles that range across several academic areas (see Gray (2015) for full corpus details).

The articles for the AJRC were obtained by Gray (2011) by first selecting high-quality peer-reviewed journals that covered general topics in the field and were prototypical representations of the field. Journals were chosen by consulting experts in each discipline, who also advised about the research category of articles selected for the corpus. Articles were randomly chosen from three journal issues (2006, 2007, and 2008) and added to the corpus if they fit the type of research expected for their respective discipline (Gray, 2015).

The AJRC is ideal for answering our research questions because it features six distinct disciplines along with their respective subdisciplines, thereby creating a more complete representation of each discipline as a whole. The disciplines included also range from hard to soft sciences, which allows for breadth in the investigation, even though comparing hard and soft sciences is not one of our stated research goals.

We divided the AJRC into a subcorpus containing only the background sections of each article, which were the relevant sections for the present study. This resulted in a subcorpus containing 292,547 tokens and 19,569 types. We chose to include only the background sections – thereby excluding abstracts, methods, and other sections – because writers tend to interact the most with authors' work by citing sources and introducing material with reporting verbs in the background. In most disciplines in the AJRC, the methods, results, and discussion sections contain very few or no interactions with other works. However, some articles, especially those from history and philosophy, did not contain clearly delineated background sections. In these cases, we read the article closely and tagged up until the background information ended and the analysis began. An overview of the disciplines, article categories, and number of tokens included in the background sections of the AJRC corpus is shown in Table 4.

Table 4. Overview of Background Sections in the AJRC.

Discipline	Tokens in Article Categories		
	qualitative	quantitative	theoretical
Applied Linguistics	46,484	54,336	–
Biology	20,750	–	–
History	26,341	–	–
Philosophy	–	–	19,296
Physics	–	19,932	30,292
Political Science	25,461	36,950	–

4.1. Data Collection

We tagged all articles in the corpus using Dedoose, a qualitative analysis platform for collaborative data analysis. We uploaded articles to Dedoose in plain text format, after which researchers could highlight and tag segments. Seven members of the research team (including two faculty, one graduate student, and four undergraduate students) manually highlighted each reporting verb after examining its use in context of the entire sentence since a larger context is necessary to determine both author and writer intentions (Hu & Cao, 2011; Jafarigohar & Mohammadkhani, 2015; Thompson & Ye, 1991).

We established tagging guidelines, which included standards for tagging reporting verbs, as well as other features of authorial stance, including moves, pronouns, and citations. The present study deals only with our method and the findings related to the reporting verbs (described further below). We solidified these guidelines by tagging sample articles over a period of two months, in which we met regularly to discuss (dis)agreements and ensure interrater reliability.

Four undergraduate researchers assisted in tagging the bulk of the 270-article corpus. One of these research assistants was a linguistics major with a minor in computational linguistics who had training in corpus linguistics and text analysis, two were studying editing and publishing, and the last was a statistics major. All four received more than 5 hours of initial training, tagged at least 12 practice articles, and continued to meet weekly with the entire research team to review the tags and resolve ambiguities as a group. All researchers engaged in tagging the corpus obtained an initial interrater reliability score of .89. The researchers tagged all background sections in the corpus by following the tagging guidelines closely and bringing any doubts or questions to our weekly meetings. This process took eight months, after which we had more than 24,000 tagged items, including 2,127 tagged reporting verbs. After research assistants completed tagging each background section in the corpus, we exported the data to Excel from Dedoose for analysis.

3.1. Reporting verbs tagging guidelines

Following Jun's (2020) definition of reporting verbs as a way for writers to create "interactions between sources and [their own] ideas" (p. 29), we tagged all verbs that attribute findings to researchers, either specifically or generally, as reporting verbs. We accomplished this by reading each background section and tagging the verbs by hand. While other studies have used automatic search functions to find verbs connected to specific researchers (Hyland, 2002), direct quotations (Jafarigohar & Mohammadkhani, 2015), or a pre-existing list of verbs (Un-udom & Un-udom, 2020; Yilmaz & Özdem Erturk, 2017), tagging by hand allowed us to examine a broader range of reporting verbs that may not have been identified through computer software. Although reporting verbs often follow the author's name and/or general terms such as 'researchers', some reporting verbs in our corpus were more difficult to identify and tag.

In the present study, all auxiliary verbs in a reporting verb phrase were included as reporting verbs. For example, the complete verb phrase "have been trying to address" was tagged as a single reporting verb. Also, copular verbs such as *be* were tagged along with the subject complement (adjective or noun) that follows it. For example, "is consistent with" in the sentence, "This idea is consistent with the connectionist view of language learning in Lee (2000)", would be tagged as one reporting verb. Finally, we tagged reporting verbs that introduced cited material, even if they were not connected to specific in-text citations. For example, the verb phrase *shown* in the sentence, "Cross-linguistic research has shown that literacy may transfer more easily between languages that share the same orthography", was coded as a single reporting verb. We made these choices in order to collect more information about verb tense, aspect, and voice, in case these factors were relevant in the final disciplinary findings.

3.2. Data analysis

All reporting verbs were extracted from the corpus along with metadata about the discipline from which they came. We grouped similar tokens together and manually lemmatized them in Excel.

Because verb tense, aspect, and voice did not vary significantly across disciplines or reporting verbs themselves, most verbs were lemmatized simply by removing tense and aspect. For example, all reporting verbs containing the root *agree*, such as *agreed*, *are agreeing*, and *have agreed*, were lemmatized as AGREE. One hundred and eighty-one verbs, accounting for about 8% of the dataset, were slightly more complex to lemmatize, and thus we adopted the following conventions. We included only the head word of each verb phrase, which means that verb phrases with modals and passives retained only the head verb along with any negation that may have been present. For instance, *are understood* and *can understand*, were lemmatized as UNDERSTAND, and *cannot understand* was lemmatized as NOT UNDERSTAND. Other forms of negation found in a verb phrase, such as *fail* in *fail to establish*, were lemmatized as not + head verb, in this case NOT ESTABLISH. Additionally, verbs followed by noun phrases as direct objects were consolidated as a single verb when lemmatized: *give a description* was lemmatized as DESCRIBE, and *come to a conclusion* was lemmatized as CONCLUDE. Copular verbs followed by an adjective such as *is consistent with* were lemmatized as the full verb and predicate: BE CONSISTENT WITH.

Following lemmatization, we counted all instances of each verb within each discipline. Because some disciplines contained 30 papers and others 60, we normalized all verbs to 100 papers by dividing the verb counts by the number of papers in a discipline and multiplying this figure by 100. Normalized counts per 100 papers are reported in the results below. We based our analysis on counts normalized per paper as opposed to per million words in order to focus on linguistically meaningful units of text, which can be more easily interpreted (Egbert et al., 2020). Normalized frequencies per million words were calculated as an additional measure and can be found in the appendix (see Table 7). Research data can be accessed here: http://bit.ly/reporting_verb_data

4. Results and discussion

Our first research question was designed to investigate whether the number of reporting verbs differed across disciplines. The results in Figure 1 show that political science and applied linguistics used a larger number of reporting verbs according to normalized ratios compared to the other disciplines. Biology showed the fewest reporting verbs – an average of less than 1 reporting verb per background[1] – while political science had the most with almost 20 verbs per background on average.

This range implies variability in the rhetorical structure of disciplinary background sections with political science and applied linguistics papers establishing a sophisticated reporting structure in their backgrounds and with philosophy and biology offering little reporting information when referencing previous research. However, the number of reporting verbs classified in our analysis contrasts sharply with those of Hyland's work. For instance, Hyland (1999) found that molecular biology papers contained more than 26 verbs per paper, whereas our analysis showed less than one per background; Hyland found philosophy papers to include 57 verbs per paper compared to our results of 3.6. The only discipline where our results agreed was that of physics, in which Hyland claimed that there were 6.6 verbs per paper, and we found 6.8. However, the frequency counts normalized per million words (see Figure 2 in the appendix) show that physics incorporated more reporting verbs overall than other disciplines, which would in fact contradict Hyland's (1999) findings. The discrepancy in numbers is likely attributable to the methodological approach for counting verbs. Whereas Hyland quantified all main author-relevant verbs in each paper through corpus inquiry, our scope was limited to just background sections and utilized hand coding in a discourse-analytic framework. Thus, discrepancies may arise from the sampling approach or perhaps even the specific discipline or subdiscipline sampled (e.g., molecular biology versus

---

[1]This low number occurs because biology favours a non-integral numerical referencing system which appears to present background information as objective fact rather than attributing findings to other researchers (e.g., "The fatty acid uptake as well as the contribution of lipids for the energy yield are less in the arms (27).").

more general biology). Additionally, differences are likely related to where the reporting verbs are found. It may be that biology writers offer almost no reporting verbs in their background sections but then offer numerous such verbs in the methods, results, and/or discussion sections where they may attribute widely. This would explain why Hyland's counts are consistently higher than our own, but additional research is certainly needed to confirm this possibility, and a future study should investigate how reporting structures change in different sections of an academic paper across disciplines.
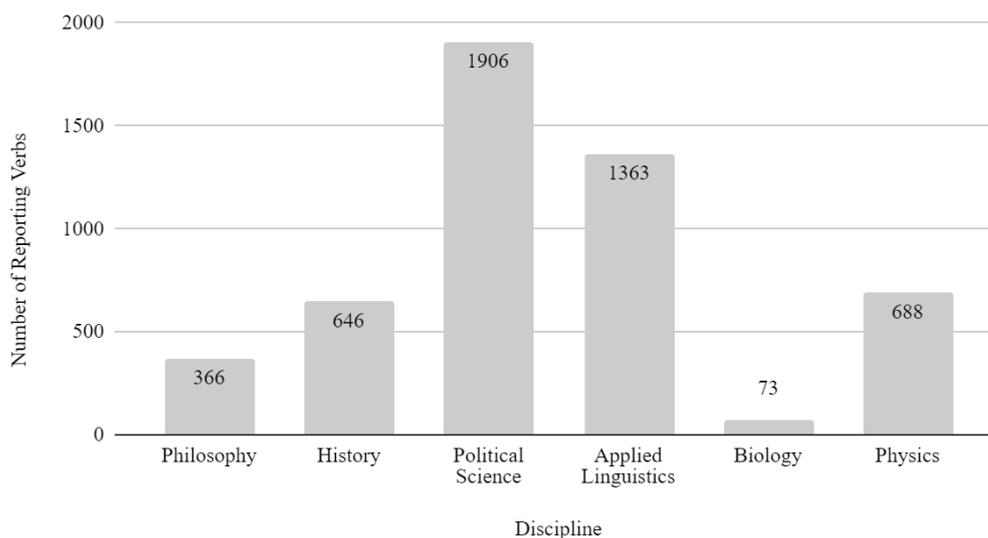

Figure 1. Reporting verbs across disciplines normalized to 100 papers.

Our second research question sought to describe the most common reporting verbs in each discipline studied. This is a common task among reporting verb reports (see Fløttum et al., 2006; Hu & Wang, 2014; Hyland, 1999), though we chose to report the top 20 reporting verbs for each discipline. Table 5 shows this list and further indicates the normalized number of verbs and percent of coverage of the 20 most frequent reporting verbs in background sections in each discipline.

These results confirm findings from previous researchers such as Hyland (1999), who explained that there were substantial disciplinary differences in the use of reporting verbs. Further, the reporting verbs in our analysis overlap largely with reports from other researchers who also show that verbs like *argue*, *show*, and *suggest* are common in applied linguistics (Fløttum et al., 2006; Hu & Wang, 2014; Hyland, 1999). However, lists from various researchers tend not to match perfectly from study to study, likely an artifact of the specific papers each study examines, the specific subdiscipline, and the methodology employed for identifying reporting verbs within a paper.

Our final research question sought to identify overlapping and unique reporting verbs across disciplines. Table 6 illustrates the five most common reporting verbs in disciplinary background sections and highlights in gray those verbs that are found in more than one discipline. The verb *argue* is the most used verb and is found in the four soft sciences, while *show* is one of the top used verbs in the hard sciences (biology and physics) but is used less frequently in the soft sciences. The verb *suggest* is also used as one of the five most frequent verbs in four disciplines and one of the top 20 in philosophy. Only physics does not feature *suggest.*

The information in Table 6 can be helpful for language teachers and students they teach who are planning a career that uses academic writing but are not prepared to specialize in one field or another. Verbs such as *argue*, *use*, *examine*, *report*, *show*, and *suggest* have broad overlap among disciplines and thus represent the best reporting verbs for students to learn early and use cross-disciplinarily.

G. Eckstein, J. Rawlins, H. Taylor, H. Briggs, A. Candland, E. Hanks, & S. Hill

Table 5. Top 20 reporting verbs by discipline normalized to 100 papers

Philosophy		History		Political Science		Applied Linguistics		Biology		Physics	
argue	103.3	argue	36.7	suggest	150	argue	111.7	establish	6.7	show	83.3
believe	23.3	suggest	33.3	argue	136.7	suggest	110	examine	6.7	study	46.7
think	13.3	write	30	show	123.3	show	90	suggest	6.7	report	33.3
address	10	describe	23.3	use	70	report	66.7	analyse	3.3	propose	28.3
assume	10	note	23.3	explore	50	examine	55	compare	3.3	investigate	26.7
call	10	call	20	focus on	46.7	note	51.7	conduct	3.3	use	26.7
regard	10	see	20	note	46.7	describe	45	demonstrate	3.3	suggest	23.3
say	10	use	16.7	consider	36.7	investigate	41.7	find	3.3	know	18.3
suggest	10	demonstrate	13.3	indicate	36.7	claim	38.3	implicate	3.3	analyse	16.6
advocate	6.7	characterize	10	think	36.7	propose	36.7	isolate	3.3	discuss	15
agree	6.7	point out	10	examine	26.7	point out	35	maintain	3.3	describe	13.3
appear to think	6.7	recognize	10	include	26.7	demonstrate	31.7	propose	3.3	develop	13.3
claim	6.7	accept	6.7	see	26.7	conclude	30	raise	3.3	indicate	13.3
conduct	6.7	believe	6.7	assume	23.3	indicate	30	recognize	3.3	calculate	11.7
hold	6.7	call into question	6.7	conclude	23.3	compare	28.3	report	3.3	consider	11.7
not establish	6.7	challenge	6.7	focus	23.3	focus	28.3	reveal	3.3	establish	11.7
present	6.7	claim	6.7	confirm	20	define	26.7	review	3.3	perform	11.7
propose	6.7	consider	6.7	investigate	20	explain	25	show	3.3	conclude	10
show	6.7	critique	6.7	point out	20	provide	21.7	take	3.3	present	10
suppose	6.7	discuss	6.7	report	20	address	20			reveal	10
Total (top 20)	273.6		300.2		963.5		923.5		72.9		434.9
Coverage	75%		46%		51%		68%		100%		63%

Note: Coverage explains the percentage of reporting verbs in that discipline covered by the top 20 listed verbs.

Table 6. Overlapping reporting verbs among the top five verbs across disciplines normalized to 100 papers.

Philosophy		History		Political Science		Applied Linguistics		Biology		Physics	
argue	103	argue	37	suggest	150	argue	118	establish	7	show	83
believe	23	suggest	33	argue	137	suggest	110	examine	7	study	47
think	13	write	30	show	123	show	90	suggest	7	report	33
address	10	describe	23	use	70	report	67	analyse	3	propose	28
assume	10	note	23	explore	50	examine	55	compare	3	investigate	27

5. Conclusions

Through examining reporting verbs in background sections from 270 articles in six main disciplines, this study demonstrates that the number and type of reporting verbs vary by discipline. Political science uses the most reporting verbs at about 20 per background section, while biology uses the least at about one per background. The lexicon of reporting verbs also varies: While a few verbs are written regularly in multiple disciplines (namely, *argue*, *examine*, *report*, *show*, *suggest*, and *use*), each discipline boasts several reporting verbs that are unique to that discipline alone. Political science uses the most unique reporting verbs (63 verbs that are not used in other disciplines), and biology uses the fewest unique reporting verbs (two verbs that are not used in other disciplines), with the remaining four disciplines utilizing between 16 and 38 unique reporting verbs.

5.1. Implications

The above results illustrate that (1) researchers use a wide variety of reporting verbs, and (2) disciplines have varying lexicons for reporting verbs that occasionally overlap with other disciplines. However, without explicit instruction, students, particularly language learners, may not be aware of these characteristics. In fact, inexperienced and L2 writers use a more limited set of reporting verbs than advanced writers (Fløttum et al., 2006; Lee et al., 2018; Mansourizadeh & Ahmad, 2011; Staples & Reppen, 2016) and typically overuse a few verbs such as *argue*, *find*, and *show* (Charles, 2006).

Academic writing and second language teachers can explicitly teach reporting verbs, their meanings and their uses in order to build students' citation competence in English academic writing. That competence can lead to student improvement in applying appropriate reporting verbs patterns (Jun, 2020), which ultimately enables students to establish themselves as members of the broader research community (Martín & Pérez, 2014). Increased citation competence has the potential to reduce cultural and linguistic hurdles to effective source integration in L2 academic writing. Learning about reporting verbs may also benefit English language learners who are not pursuing academia as a career as Huang (2018) states that reporting verb instruction can help L2 students learn English contextually as well as expand students' vocabulary. Teachers can introduce students to features of reporting verbs through awareness-raising activities such as highlighting the reporting verbs used in articles, especially articles in their projected fields, or conducting their own exploratory research of reporting verbs online. Teachers may also provide word lists, such as the lists provided here, for students to practice with (Huang, 2018).

5.2. Limitations and future research

Some limitations of our study open opportunities for future research. When analyzing the data for the present study, we included passive and active verb constructions as the same lemma. Although

this allowed us to compare verbs across disciplines, it did not account for variations in verb form that may have occurred. Future studies could go further to investigate the tendency of writers across disciplines to use passive verb constructions. The findings of such research could provide writers with a grammatical strategy to establish authority in their fields.

Additionally, because this study focused on the lexicon of reporting verbs, we did not analyze the stance they convey. Future research that investigates the stance of reporting verbs across disciplines (i.e., positive, critical, tentative, or neutral stance, as proposed by Hyland (2002)) could expand the current body of literature about how writers establish their identity. Such research could reinforce reporting verbs as a method of establishing authorial stance, along with hedges (Koutsantoni, 2006), citation types (Peng, 2019), self-citation (Hyland, 2001), and first-person pronoun usage (Taylor & Goodall, 2019).

We also compared reporting verbs from only the background sections of all disciplines. Although this section tends to include many of the citations and therefore reporting verbs, other sections of published articles also include some references to previous literature, and the amount of literature referenced in each section may vary by discipline (Lin & Evans, 2012). Our study did not account for the reporting verbs that may occur in other sections of the article, which may have led to different results in terms of the number of reporting verbs in each discipline as well as the typical lexicon of reporting verbs across disciplines. Future research should examine the rate and type of reporting verbs used in various sections of academic articles. Doing so may help educators and students determine the most common reporting verbs used in their fields. Meanwhile, teachers and students can use the findings in this report as guidance in expanding the disciplinary use of reporting verbs and establishing an authorial voice that projects membership in a community of academic writers.

Finally, future studies may also consider instances in which reporting verbs are not used. It is possible that some disciplines that tend to incorporate fewer reporting verbs (e.g. biology and philosophy) do so because details in the background sections are stated as facts. Further research can demonstrate which factors lead to less frequent use of reporting verbs as well as which linguistic contexts preclude the use of reporting verbs. Gaining more insight as to the exclusion criteria in academic writing cross disciplinarily can likewise help students establish appropriate authorial voice for their field.
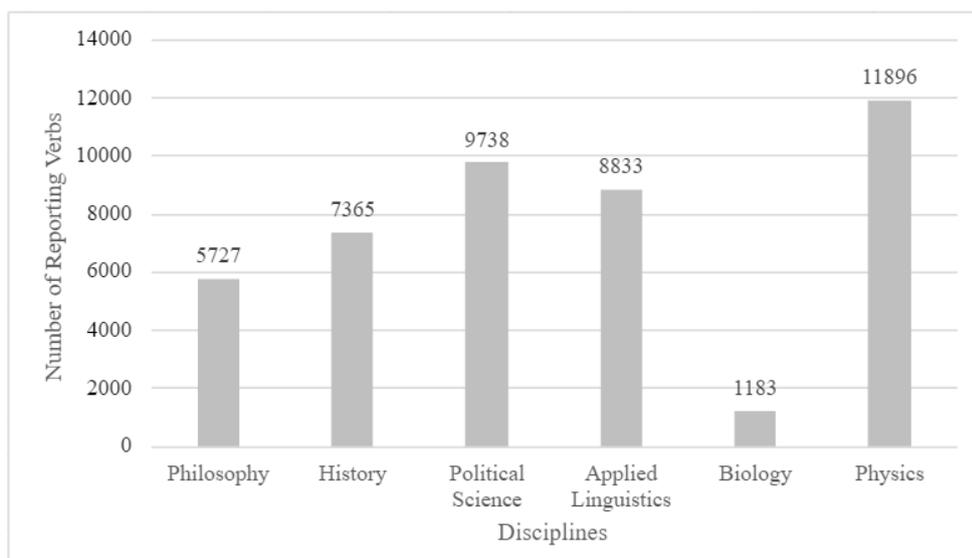
Acknowledgments

Appendix

Figure 2. Reporting verbs across disciplines normalized to one million words.

Table 7. Top 20 reporting verbs by discipline normalized to one million words.

Philosophy		History		Political Science		Applied Linguistics		Biology		Physics	
argue	1614	argue	418	suggest	766	argue	723	establish	108	show	1440
believe	364	suggest	380	argue	698	suggest	713	examine	108	study	806
think	208	write	342	show	630	show	583	suggest	108	report	576
address	156	describe	266	use	358	report	432	analyse	54	propose	490
assume	156	note	266	explore	255	examine	356	compare	54	investigate	460
call	156	call	228	focus on	238	note	335	conduct	54	use	461
regard	156	see	228	note	238	describe	292	demonstrate	54	suggest	403
say	156	use	190	consider	187	investigate	270	find	54	know	317
suggest	156	demonstrate	152	indicate	187	claim	248	implicate	54	analyse	288
advocate	104	characterize	114	think	187	propose	238	isolate	54	discuss	259
agree	104	point out	114	examine	136	point out	227	maintain	54	describe	230
appear to think	104	recognize	114	include	136	demonstrate	205	propose	54	develop	230
claim	104	accept	76	see	136	conclude	194	raise	54	indicate	230
conduct	104	believe	76	assume	119	indicate	194	recognize	54	calculate	202
hold	104	call into question	76	conclude	119	compare	184	report	54	consider	202
not establish	104	challenge	76	focus	119	focus	184	reveal	54	establish	202
present	104	claim	76	confirm	102	define	173	review	54	perform	202
propose	104	consider	76	investigate	102	explain	162	show	54	conclude	173
show	104	critique	76	point out	102	provide	140	take	54	present	173
suppose	104	discuss	76	report	102	address	130			reveal	173
Total (top 20)											
Coverage	75%		46%		51%		68%		100%		63%

Note: Coverage explains the percentage of reporting verbs in that discipline covered by the top 20 listed verbs.

Table 8. Overlapping reporting verbs among the top five verbs across disciplines normalized to one million words.

Philosophy		History		Political Science		Applied Linguistics		Biology		Physics	
argue	1614	argue	418	argue	698	argue	723	establish	108	investigate	461
assume	156	describe	266	use	358	examine	356	examine	108	use	461
believe	364	note	266	explore	255	report	432	report	54	report	576
regard	156	write	342	show	630	show	583	show	54	show	1440
think	208	suggest	380	suggest	766	suggest	713	suggest	108	study	806

Table 9. Unique reporting verbs by discipline with raw counts.

Philosophy		History		Political Science		Applied Linguistics		Biology		Physics	
adopt	1	be critical of	1	account for	1	abandon	1	implicate	1	achieve	1
affirm	1	castigate	1	allude	1	admit	3	take	1	ascribe	1
allege	1	celebrate	1	appear	1	are	2			bring up	1
appears to think	2	concede	1	associate	1	attest	2			circumvent	1
charge	1	condemn	1	attempt to map out	1	categorize	2			classify	1
defend	1	constitute	1	attempted to answer	1	caution	1			compute	2
hold	2	convince	1	attempts to account for	1	coincide	1			conjecture	1
not agree	1	exaggerate	1	base on	2	collect	1			deal	1
not believe	1	fail	1	become	1	come	1			deduce	2
not establish	2	fear	1	beginning to echo	1	comment	2			extend	1
not set	1	foresee	1	beginning to understand	1	continue	1			extrapolate	1
not suggest	1	ignore	1	bring out	1	create	1			favor	1
persuade	1	immortalize	1	build upon	1	design	2			formulate	1
predicate	1	impede	1	capture	1	detect	1			generalize	1
substitute	1	invigorate	1	cast light on	1	distinguish	2			has the belief	1
suppose	2	is consistent with	1	conceive	1	embed	2			has not explain	1
		mirror	1	conceptualize	1	encourage	1			improve	1
		mis-understand	1	concern	2	endorse	1			infer	2
		neglect	2	contribute	1	follow	2			mimic	1
		not give	1	credit	1	interview	2			not know	2

not identify	1	debate	3	judge	1	not study	1
omit	1	desegregate	1	not address	1	not vary	1
pen	1	detail	1	not discuss	1	perform	7
place	1	devote	1	not disregard	1	realize	1
play down	2	elaborate	1	play	1	record	1
presuppose	1	embrace	1	portray	1	reformulate	1
replace	1	enrich	1	profile	1	reproduce	3
scathe	1	envision	1	reach	1	result	1
speak	2	generate	1	refine	1	solve	3
tell	1	hint	1	replicate	1	speculate	1
testify	1	insist	1	research	1	synthesize	1
trace	1	inspire	1	revise	1	term	1
undermine	2	join	1	specify	1	yield	1
		label	1	surmise	1		
		link	1	survey	3		
		not consider	1	theorize	1		
		not demonstrate	1	uncover	2		
		not explain	1	work on	2		
		not explore	1				
		not offer	1				
		notion	1				
		operationalize	1				
		oppose	1				
		overlap	1				
		overlook	1				
		overshadow	1				
		perceive	2				
		prepare	1				
		quote	1				
		reaffirm	1				
		regress	1				
		reject	1				
		relate	1				
		rely on	2				
		restate	1				
		second	1				
		single out	1				
		target	1				
		track	1				
		underscore	1				
		undertake	3				
		undervalue	1				
		worry	1				

References

Biglan, A. (1973). The characteristics of subject matter in different academic areas, *Journal of Applied Psychology, 57*, 195–203.

Bloch, J. (2010). A concordance-based study of the use of reporting verbs as rhetorical devices in academic papers. *Journal of Writing Research, 2*(2), 219–246. https://doi.org/10.17239/jowr-2010.02.02.7

Charles, M. (2006). Phraseological patterns in reporting clauses used in citation: A corpus-based study of theses in two disciplines. *English for Specific Purposes, 25*(3), 310–331. https://doi.org/10.1016/j.esp.2005.05.003

Egbert, J., Larsson, T., & Biber, D. (2020). *Doing linguistics with a corpus: Methodological considerations for the everyday user*. Cambridge University Press.

Erikson, M. G., & Erlandson, P. (2014). A taxonomy of motives to cite. *Social studies of science, 44*(4), 625-637.

Fløttum, K., Dahl, T., & Kinn, T. (2006). *Academic voices: Across languages and disciplines*. Amsterdam, The Netherlands: John Benjamins.

Gray, B. E. (2011). Exploring academic writing through corpus linguistics: When discipline tells only part of the story (Doctoral dissertation, Northern Arizona University).

Gray, B. E. (2015). *Linguistic variation in research articles: When discipline tells only part of the story.* John Benjamins Publishing Company.

Harwood, N. (2009). An interview-based study of the functions of citations in academic writing across two disciplines. *Journal of Pragmatics, 41*(3), 497-518.

Hu, G., & Cao, F. (2011). Hedging and boosting in abstracts of applied linguistics articles: A comparative study of English- and Chinese-medium journals. *Journal of Pragmatics, 43*(11), 2795-2809. https://doi.org/10.1016/j.pragma.2011.04.007

Hu, G., & Wang, G. (2014). Disciplinary and ethnolinguistic influences on citation in research articles. *Journal of English for Academic Purposes,* 14, 14–28. https://doi.org/10.1016/j.jeap.2013.11.001

Huang, J. C. (2018). Marine engineering and sub-disciplinary variations: A rhetorical analysis of research article abstracts. *Text & Talk, 38*(3), 341-363. https://doi.org/10.1515/text-2018-0002

Hyland, K. (1999). Academic attribution: Citation and the construction of disciplinary knowledge. *Applied Linguistics, 20*, 341–367.

Hyland, K. (2001). Humble servants of the discipline? Self-mention in research articles. *English for Specific Purposes, 20*(3), 207-226. https://doi.org/10.1016/S0889-4906(00)00012-0

Hyland, K. (2002). Activity and evaluation: Reporting practices in academic writing. *Academic Discourse*, 115-130.

Jafarigohar, M., & Mohammadkhani, A. (2015). Reporting verbs in applied linguistics research articles by native and non-native writers. *Theory and Practice in Language Studies, 5*(12), 2490-2496. http://dx.doi.org/10.17507/tpls.0512.08

Jun, Z. (2020). Teaching reporting verbs to English as a second language undergraduate writers in the academic context. *TESOL International Journal, 15*(2), 28-45.

Kaplan, N. (1965). The norms of citation behavior: Prolegomena to the footnote. *Journal of the Association for Information Science and Technology, 16*(3), 179-184.

Koutsantoni, D. (2006). Rhetorical strategies in engineering research articles and research theses: Advanced academic literacy and relations of power. *Journal of English for Academic Purposes, 5*(1), 19-36. https://doi.org/10.1016/j.jeap.2005.11.002

Kuhn, T. S. (1962). *The structure of scientific revolutions*. University of Chicago Press.

Lee, J. J., Hitchcock, C., & Casal, E. (2018). Citation practices of L2 university students in first-year writing: Form, function, and stance. *Journal of English for Academic Purposes*, 33, 1-22. https://doi.org/10.1016/j.jeap.2018.01.001

Lin, L., & Evans, S. (2012). Structural patterns in empirical research articles: A cross-disciplinary study. *English for Specific Purposes, 31*(3), 150-160. https://doi.org/10.1016/j.esp.2011.10.002

Liu, G., Lin, V., Kou, X., & Wang, H. (2016). Best practices in L2 English source use pedagogy: A thematic review and synthesis of empirical studies. *Educational Research Review,* 19, 36–57. https://doi.org/10.1016/j.edurev.2016.06.002

Ma, R. (2015). *A study of citation competence and its individual impact factors in L2 academic writing*. [Doctoral Dissertation, Huazhong Normal University, China.]

Ma, R., & Qin, X. (2017). Individual factors influencing citation competence in L2 academic writing. *Journal of Quantitative Linguistics, 24*(2–3), 213–240. https://doi.org/10.1080/09296174.2016.1265793

Mansourizadeh, K., & Ahmad, U.K. (2011). Citation practices among non-native and novice scientific writers. *Journal of English for Academic Purposes,* 10, 152-161. https://doi.org/10.1016/j.jeap.2011.03.004

Martín, P., & Pérez, I. K. L. (2014). Convincing peers of the value of one's research: A genre analysis of rhetorical promotion in academic texts. *English for Specific Purposes,* 34, 1-13. https://doi.org/10.1016/j.esp.2013.09.002

Neumann, R. (2001). Disciplinary differences and university teaching, *Studies in Higher Education, 26*, 135–146.

North, S. (2005). Different values, different skills? A comparison of essay writing by students from arts and science backgrounds. *Studies in Higher Education, 30*(5), 517-533. https://doi.org/10.1080/03075070500249153

Peng, J. E. (2019). Authorial voice constructed in citation in literature reviews of doctoral theses: Variations across training contexts. *Journal of English for Academic Purposes*, 37, 11-21. https://doi.org/10.1016/j.jeap.2018.11.001

Schoonbaert, D., & Roelants, G. (1996). Citation analysis for measuring the value of scientific publications: quality assessment tool or comedy of errors? *Tropical Medicine & International Health, 1*(6), 739-752.

Staples, S., & Reppen, R. (2016). Understanding first-year L2 writing: A lexico-grammatical analysis across L1s, genres, and language ratings. *Journal of Second Language Writing*, 32, 17-35. https://doi.org/10.1016/j.jslw.2016.02.002

Suntara, W., & Usaha, S. (2013). Research article abstracts in two related disciplines: Rhetorical variation between linguistics and applied linguistics. *English Language Teaching, 6*(2), 84-99. http://dx.doi.org/10.5539/elt.v6n2p84

Taylor, H., & Goodall, J. (2019). A preliminary investigation into the rhetorical function of 'I' in different genres of successful business student academic writing. *Journal of English for Academic Purposes, 38*, 135-145. https://doi.org/10.1016/j.jeap.2019.01.009

Thompson, G., & Ye, Y. (1991). Evaluation in the reporting verbs used in academic papers. *Applied Linguistics, 12*(4), 365-382. https://doi.org/10.1093/applin/12.4.365

Uba, S. Y. (2020). Semantic categories of reporting verbs across four disciplines in research articles. *English Language Teaching, 13*(1), 89-98. https://doi.org/10.5539/elt.v13n1p89

Un-udom, S., & Un-udom, N. (2020). A corpus-based study on the use of reporting verbs in applied linguistics articles. *English Language Teaching, 13*(4), 162-169. https://doi.org/10.5539/elt.v13n4p162

Yang, M., & Lin, S. (2009, September). *The perception of referencing and plagiarism amongst students coming from Confucian heritage cultures* [Paper presentation]. 4th Asia Pacific Conference on Educational Integrity (4APCEI), University of Wollongong NSW, Australia. https://ro.uow.edu.au/cgi/viewcontent.cgi?article=1011&context=apcei

Yilmaz, M., & Özdem Erturk, Z. (2017). A contrastive corpus-based analysis of the use of reporting verbs by native and non-native ELT researchers. *Novitas-ROYAL (Research on Youth and Language), 11*(2), 112-127. https://eric.ed.gov/?id=EJ1171136

Zhang, C. (2013). Effect of instruction on ESL students' synthesis writing. *Journal of Second Language Writing, 22*, 51-67. http://dx.doi.org/10.1016/j.jslw.2012.12.001