

# Technology and strategy use in academic writing: Native, native-like versus non-native speakers of English

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## Abstract

This study investigates the practices of native, native-like and non-native English-speaking researchers in academic writing. The researchers developed a survey with Likert-type items, which were created using the researchers' personal experience, the bibliography of the field, and an initial open-ended questionnaire administered to 31 researchers. The resulting survey was validated through cognitive interviewing and piloting with 30 respondents. The validated version was administered to 249 respondents to gain comparative insights into how the three groups differ in their use of technology, strategies and dictionaries along with challenges they face in academic writing. The results globally indicated that non-native English-speaking researchers used strategies more frequently than native-like English-speaking or native English-speaking researchers. Similarly, non-native English-speaking researchers mostly preferred the integration of technology into academic writing process and dictionary use. However, all three groups of researchers experienced similar challenges in academic writing, which globally suggests that language per se is not enough for success in scholarly writing and publishing.

**Keywords:** Academic writing, native English-speaking researchers, non-native English-speaking researchers, strategy use.

## Resumen

*Uso de la tecnología y estrategias en la redacción académica: hablantes nativos de inglés frente a hablantes no nativos*

Este estudio investiga las prácticas de los investigadores de habla inglesa nativos, casi nativos y no nativos en la escritura académica. Los investigadores

desarrollaron y validaron una encuesta Likert. Las preguntas de la encuesta se crearon utilizando la experiencia personal de los investigadores, la bibliografía y una encuesta inicial abierta administrada a 31 investigadores. La encuesta resultante se validó mediante entrevistas cognitivas y pruebas piloto con 30 encuestados. La versión validada se administró a 249 encuestados para obtener una visión comparativa de cómo los tres grupos difieren en el uso de tecnología, estrategias y diccionarios junto con los desafíos que enfrentan en la escritura académica. Los resultados indicaron globalmente que los investigadores de habla inglesa no nativa utilizaron estrategias con más frecuencia que los investigadores de habla inglesa nativa o similar. Del mismo modo, los investigadores de habla no inglesa preferían en su mayoría la integración de la tecnología en el proceso de escritura académica y el uso del diccionario. Sin embargo, los tres grupos de investigadores experimentaron desafíos similares en la escritura académica, lo que sugiere a nivel global que el lenguaje por sí solo no es suficiente para el éxito en la escritura y publicación académica.

**Palabras clave:** escritura académica, investigadores hablantes nativos de inglés, investigadores hablantes no-nativos de inglés, uso de estrategias.

## 1. Introduction

In recent years, technology has become a central part of human life in almost every domain, and emerging technologies have greatly shaped the field of scholarly writing. As technology is an essential part of the academic writing process, what becomes imperative is to explore what technology integration into academic writing offers researchers to facilitate their practices in the demanding process of writing, “starting from deciding research topic or research conception, research design, data collection, data analysis, interpretation results, and research publication” (Wajdi et al., 2018, p. 94). This process is dynamic in that it “involves the strategies for effective reading and research” and “requires using a number of techniques and strategies specific to writing and moves through several stages of development” (Johnson, 2010, p. 23). Additionally, it is vital to understand the extent to which researchers use available technological tools and strategies in their academic writing practices, as well as the challenges they face and how they cope with these challenges.

For the purposes of the present study, a researcher is defined as someone who does scholarly research and is involved in writing up research results, regardless of their having a PhD or not. Researchers are divided into three

groups, based on their linguistic relationship with English: (a) native English-speaking researchers (NERS), who speak English as their L1, (b) non-native English-speaking researchers (NNERS), who speak it as a second or foreign language and (c) native-like English speaking researchers (NLERS). The members of the third group stand somewhere in the middle of the nativeness and non-nativeness continuum. This group is usually defined as highly competent non-native speakers of English, most of whom are known to have spent some of their lives in an English-speaking country, although this is not a prerequisite.

Most researchers who publish and assume roles as reviewers and editors today are non-native English researchers (NNERS) (Hyland, 2016a; Hynninen & Kuteeva, 2017). The use of technological tools and strategies in writing instruction and teaching has been extensively studied with undergraduate and graduate students of both native and non-native English backgrounds (Cuff, 2014). Research has also examined the issues of nativeness and non-nativeness in academic writing, such as differences in their language use, reporting practices (e.g., Marti et al., 2019), authorial presence (e.g., Candarli et al., 2015) and writing patterns (Güngör, 2019; Salazar, 2014). However, the issues of nativeness and non-nativeness have centred around teaching practices, with little or no attention given to research-publishing practices (Karakaş et al., 2016; Walkinshaw & Oanh, 2014). In the field of English for academic purposes (EAP), there is little well-documented research that has explored NERS' and NNERS' academic writing practices in terms of technology and strategy use. Gaining insights into these three groups' research practices, strategies and technology use might reveal whether one group, particularly the group of NERS, is advantaged over the others and what role different nativeness status might play in dealing with challenges of academic writing and how this affects the level and variety of technology use. This may also help counter the myth that NERS are advantaged in academic writing and publishing, as reflected in the frequent request that NNERS should get their paper edited by native English speakers. Such practices create the impression that NNERS are the only group facing challenges in academic writing while NERS are portrayed as experts by nature of their nativeness (e.g., Ferguson, 2007; McKinley & Rose, 2018). Against this backdrop, this research aims to investigate NERS' and NNERS' engagement with technological tools and strategies in their academic writing practices and to explore the perceived challenges they face.

## 2. Academic writing, technological tools and strategy use

A widely held misperception is that academic writing is only *writing* performed for academic purposes, such as publishing scholarly research (Murray & Moore, 2006). However, academic writing does not entail the write-up process only, as it is a multi-stage process in which the write-up is just one of several stages. By its nature, it consists of a non-linear, recursive and “continuous process involving reflection, improvement, development, progress and fulfilment of various types and in varying measures” (Murray & Moore, 2006, p. 5). Highlighting the importance of this point, Johnson (2010) notes that academic “writing is not just putting words on paper to turn in, but a dynamic process that involves effective reading and research strategies” (p. 10). That is, the academic writing process denotes a superordinate notion with inter-reliant components; that is, research, reading and writing.

In this, the research component necessitates researchers “to seek out information about a subject, take stand on it, and back it up with opinions, ideas and views of others” (Winkler & Metherell, 2011, pp. 3-4). This is interconnected with the reading component, which allows researchers to develop effective reading strategies (e.g., previewing, summarising, critical reading) while reading others’ work. However, research has shown that not only undergraduate and graduate students but also researchers feel challenged by particular issues emanating from incorrect referencing, inappropriate citation format, careless note-taking, plagiarism, and disorganised and unsaved quotations (Helgesson & Eriksson, 2015; Jomaa & Bidin, 2017; Wajdi et al., 2018). Despite previous research portraying plagiarism as a problem largely experienced by undergraduate and graduate students in academic writing, it is also a common problem among both NERS and NNERS, especially among those with less experience in academic writing (Shah et al., 2009).

To respond to such challenges, researchers can benefit from certain strategies and technological tools to manage the tasks of appraising sources critically, finding and using online resources carefully, using and documenting sources reliably, especially to avoid plagiarism, and taking clear and comprehensive notes (Guraya & Guraya, 2017; Johnson, 2010). For instance, assistive tools are available for doing research, managing citation styles and literature reviews, as well as storing and organising notes. These include

research databases, (e.g., Google Scholar and Springer) (Rucker, 2015), plagiarism software (Guraya & Guraya, 2017; Johnson, 2010; Wajdi et al., 2018), citation generators (Katz, 2018; Rucker, 2015), reference managers (e.g., Mendeley and EndNote) (Kali, 2016), and tools to create textual, visual and audio notes (e.g., Evernote and OneNote) (Rucker, 2015).

As for the writing component, it denotes the process of transferring the information obtained from the reading and research processes into drafts. These tasks are also considered a part of the effective writing strategies, such as process writing, text structure application and summarising (Wischgoll, 2017). Although publishers' expectations might not be the same for all researchers across any discipline, research on journal guidelines (Oermann et al., 2018; Schriger et al., 2006) indicates that researchers are expected to meet certain general sets of standards in their writing, including accurate sentence structure, wider vocabulary range, standard grammar, mechanics, a convincing academic voice, appropriate citations and reference style. As Jenkins (2011) notes, "the vast majority of academic journals with international distribution remain deeply grounded in the norms of British and/or North American academic English, despite their (linguistically paradoxical) claims to internationalism" (p. 927). Likewise, reviewers and journal editors are often negative about non-native features in papers (Flowerdew, 2001). Therefore, several lines of evidence suggest that researchers, especially less experienced researchers using English as an additional language, are facing various challenges in meeting the criteria (Chireshe et al., 2014; Goh & Lepage, 2019; Hyland, 2016b; Kotamjani et al., 2018).

In response to these expectations and challenges, researchers take some steps to facilitate the publication process and decrease the likelihood of rejection due to content, organisation, style and language-related issues. The most widely taken actions to improve text quality include but are not limited to using spell-check and grammar check tools (Cavaleri & Dianati, 2016; Johnson, 2010), employing editing and proofreading strategies, getting feedback, taking regular breaks from writing, using writing models (Hyland, 2016b; Johnson, 2010; Murray & Moore, 2006) and using dictionaries or thesauri and corpus tools (Chitez et al., 2015; Goh & Lepage, 2019; Wischgoll, 2017).

However, the vast majority of the above-mentioned studies were conducted in relation to the challenges faced by undergraduate and graduate

researchers. This suggests a need for research on more experienced researchers' academic writing practices by exploring the technological tools and strategies they employ to grapple with the challenges they face. Since “[w]riting for international publication presents challenges for both Anglophone and non-Anglophone researchers” (Hynninen & Kuteeva, 2017, p. 53), it is particularly important to address the challenges faced by these groups of researchers in their writing practices and look into their technology and strategy use.

### **3. The native and non-native dichotomy in academic writing**

Previous studies have hotly discussed whether the native and non-native status of researchers affects their academic writing practices and whether NERS enjoy a linguistic advantage over NNERS in the academic writing context. The overall discussion can be placed at the two opposite ends of the native and non-native continuum. Linguistically considered, NNERS are depicted as suffering from several issues and difficulties, mostly language-related, in their academic writing practices (e.g., Flowerdew, 2008; Huang, 2010). NNERS' failure to be accepted for publication in high-profile journals is predominantly attributed to language issues, even though the complex writing process can be influenced by other variables, such as researchers' writing experiences (Bardi, 2015; Candarli et al., 2015; Martín et al., 2014), academic literacy and genre-specific knowledge (Casanave, 2008; Ferguson et al., 2011), access to international research networks (Hyland, 2016a) and language-related issues (Flowerdew 2007; Langum & Sullivan, 2017). However, as mentioned earlier, there might be several other issues, such as disciplinary knowledge and differences, previous experiences and varied expectations of publishers as to academic writing conventions.

However, as for the other end of the continuum, scholars from different disciplinary backgrounds, such as English as an academic lingua franca (ELFA) (e.g., Mauranen, 2006, 2012), academic literacies (e.g., Lillis & Scott, 2007), and genre approaches (e.g., Hyland, 2009), argue against the linguistic injustice allegation claiming that the native and non-native status has nothing to do with effective academic writing, especially in terms of using academic English. This is mainly because, as Ferguson (2007) notes, “the native speaker and the non-native speaker start as novices in the acquisition of

academic writing skills” (p. 28). Highlighting the unique characteristics of academic English in the writing process, Mauranen (2006) also contends that “[t]he genres and rhetoric of the discourse communities that we participate in need to be acquired by all novices” (p. 149) in academic writing regardless of their being NERS or NNERS. Based on this perspective, she further advances two arguments: (1) “there are no native speakers of academic English,” and (2) “the English of academic genres is new use to all its practitioners at the beginning”.

It is, therefore, argued that what affects the success of one’s academic literacy goes beyond the issue of having a native or non-native background because it “depends on multiple factors of genre, style, disciplinary knowledge, writing experience and language, and language is only one of the factors” (Zhao, 2017, p. 49). Additionally, research on publication through English concludes that in comparison with genre-specific knowledge and the level of academic writing expertise, the case of nativeness is of less importance for successful academic writing (Bocanegra-Valle, 2014; Ferguson et al., 2011; Hyland, 2016a). Moreover, Casanave (2008) suggests that NERS share most of the challenges experienced by NNERS in their writing, and these difficulties predominantly originate from unfamiliarity with academic conventions, lack of academic register and lack of writing experience in scholarly quarters. Thus, what influences researchers’ academic writing practices is whether they have received training in academic writing and its conventions and have gained expertise in academic literacy. This is because academic writing cannot be considered “part of the native speaker’s inheritance” as “it is acquired rather through lengthy formal education and is far from a universal skill” (Ferguson et al., 2011, p. 42). Therefore, what would differentiate NERS from NNERS may be the resources they use to acquire academic literacy. Technological tools and various strategies available for effective reading, research and writing processes are among the possible ways both NERS and NNERS can exploit to deal with the complicated demands of the academic writing process.

In line with the importance of gaining insights into NERS and NNERS’ academic writing practices in terms of technology and strategy use and the research gap in this field, this study addresses the following research questions:

- 1) What are the patterns of technology use in academic writing among native, native-like and non-native English-speaking researchers?

- 2) How do native, native-like and non-native English-speaking researchers differ in terms of research software and dictionary use?
- 3) What are the challenges faced by native, native-like and non-native English-speaking researchers in academic writing?

## 4. Method

This study aimed to explore the academic writing practices of the NERS, NLERS and NNERS, with a specific reference to strategy, technology and dictionary use. The researchers constructed a survey with Likert-type items to collect data, since we aimed to research how often they used certain practices and experienced difficulties.

### 4.1. Participants

30 researchers participated in the piloting phase of the study, and 249 participants, recruited through convenience sampling, responded to the validated survey. The survey was administered online through an URL link on social media sites. The key point was to make sure that all the respondents were researchers. Therefore, a particular item in the survey asked the participants if they write academic texts in English; 13 out of 249 reported that they did not, and 46 people failed to complete at least half of the items in the survey, while 4 did not specify if they were a native, non-native or native-like English speaker, so they were all excluded from the study. Finally, 186 participants (59 males and 127 females) completed the survey; 24 out of 186 preferred not to respond to the last section in the survey (challenges experienced in academic writing). However, they were not excluded from the study as they successfully completed all the other parts. Most of the respondents were non-natives ( $N= 118, 63.44\%$ ) (Figure 1).



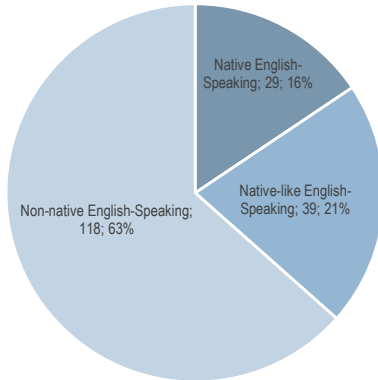


Figure 1. Native, non-native versus native-like distribution.

The NLEs and NNEs (N=157, 84.40%) came from various L1 backgrounds. Turkish, Arabic and Spanish speakers formed the largest group. There were several respondents with other languages as their L1 (Table 1).

Mother Tongue	Frequency
Arabic	33
Chinese	4
French	2
German	7
Hindi	2
Japanese	1
Portuguese	3
Russian	2
Spanish	19
Turkish	43
Urdu	4
Vietnamese	1
Other	37
Missing	2

Table 1. The Mother Tongues of the Non-Native Respondents.

Regarding employment, 103 (55.38%) of the respondents were working at a university at the time of the study. Most of them belonged to language-related areas, such as English language education, English language and literature, and translation. Concerning field of study, the ‘other’ category of the respondents belonged to diverse fields ranging from health sciences to political sciences, and from film studies to history (Table 2).

Response		NERS		NLEERS		NNERS		Total	
		F	%	F	%	F	%	F	%
Employed at a university?	Yes	18	9.70	21	11.30	62	33.30	101	54.30
	No	11	5.90	18	9.70	56	30.10	85	45.70
	Total	29	15.60	39	21.00	118	63.40	186	100
Educational background	BA	6	3.20	4	2.20	11	5.90	21	11.40
	MA	11	5.90	10	5.40	50	27.00	71	38.30
	PhD	12	6.50	25	13.50	56	30.30	93	50.30
	Total	29	15.70	39	21.10	117	63.20	185	100
Area of Study	Language Education	3	1.70	11	6.30	48	27.40	62	35.40
	Linguistics	6	3.40	7	4.00	26	14.90	39	22.30
	Literature	2	1.10	4	2.30	4	2.30	10	5.70
	Other	15	8.60	16	9.10	33	18.90	64	36.60
	Total	26	14.90	38	21.70	111	63.40	175	100

Table 2. The crosstabulation of some key personal characteristics based on linguistic background.

## 4.2. Data collection tools

Two data collection tools were used to gather data in the present study. The first was an initial online survey with three open-ended questions (Appendix 1). The second was the main survey with Likert-type items (Appendix 2). The initial survey was constructed and administered to help the researchers enrich the item pool they prepared for the survey. Two other sources of data were used to construct the main survey: (a) the researchers' own research and teaching experience and (b) the bibliography.

## 4.3. The initial open-ended survey

The researchers began to collect data through an initial online survey with three open-ended questions (Appendix 1). Although the researchers created a rich item pool (see section on "Construction and Validation"), they attempted to boost the content validity of the survey by constructing and administering a survey with three open-ended questions. Seeking a group of respondents' perspectives about an under-researched area can help explore different ideas and include all significant aspects of the topic under investigation, thereby increasing content validity, which, in Creswell and Plano Clarke's (2011) words, refers to "whether the items or questions are representative of possible items" (p. 210). This initial survey was administered to a cohort of researchers, including both native and non-native speakers of English, the largest group of respondents being English-L1 researchers

( $N=12$ ) followed by Turkish-L1 researchers ( $N=10$ ). The rest of the respondents came from various mother tongue backgrounds (Figure 2).

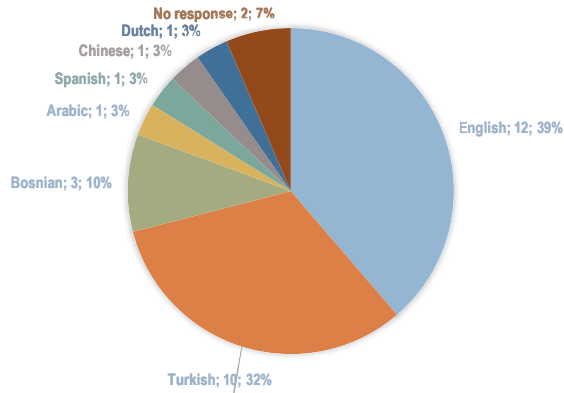


Figure 2. L1 of the researchers who responded to the initial survey.

The open-ended survey items (Appendix 1) were intended to elicit information for the item construction process for the survey, which was the main data collection tool (Appendix 2). The participants in the initial short survey usually provided shorter open responses. As suggested by Given (2016), these qualitative responses were analysed using content analysis in line with the quantitative nature of the study, based on the frequency of certain words or phrases. The frequencies of the recurrent ideas were calculated, yet this was not the only factor for a theme to be turned into a survey item.

Name	# of Respondents	# of References
THEME_AFFECTIVE PROBLEMS LEAD TO POOR WRITING	0	0
Lack of confidence	5	5
Perfectionism or procrastination	4	8
Writer's block	1	1
THM_INABILITY TO WRITE WITH A STYLE IS A MAJOR CHALLENGE	0	0
Achieving clarity in writing	3	3
Conciseness	7	8
Difficulty in finding the right expressions	9	11
Repetitiveness	3	4
THEME_PREFERRED STRATEGIES VARY A LOT	0	0
Formulaic expressions	1	2
Leaving time between writing and editing	3	3
Peer review as a useful but difficult-to-seek tool	19	23
Inadequate opportunities for peer-reviewing	5	7
Reading aloud	13	13
Recursiveness in writing and editing	0	0
Recursive revising	6	6
Multiple drafting	5	6
Using dictionaries or translators	4	4
Working on hardcopy	3	3
THEME_TECHNOLOGY FUNCTIONS AS A FACILITATOR	0	0
Accessing relevant literature	5	5
Bibliography management software	12	12
Grammar-spelling checkers	19	28
Plagiarism software	9	9
Using corpora	1	3
Using online dictionaries and thesauri	9	13
Using the Internet for cross-checking	4	5
THEME_THE NATURE OF ACADEMIC WRITING ITSELF CAUSES PROBLEMS	0	0
Academic genres	4	5
Time consuming	3	3

Table 3. Data from Initial Survey with Three Open-Ended Questions (Used for Item Construction).

#### 4.4. The Survey

The data from the initial survey mostly verified the items written using personal experience and the literature, yet they also helped to generate some new items. For example, the respondents mentioned problems regarding writing concisely, understanding the properties of different genres of academic writing, achieving clarity of expression, and finding the right words (Table 3). Using these sources of data, the authors checked the whole survey for its content, comprehensibility/readability and coherence. The online version of the survey was created using Limesurvey v2.05. The final version of the survey is provided in Appendix 2.

#### 4.5. Validation of the Survey

A two-step method was followed to validate the survey. First, it was examined by three native speakers of English with a PhD in Applied Linguistics/TESOL who were based at a UK university as lecturers. The scope of their expertise and research interests includes the issues and ideologies pertinent to (non-)nativeness. For this reason, they were not only asked to check the language of the items in the survey, but they were also asked to comment on the content of the survey. However, they suggested some revisions, mostly in the content of a few items, but saw no major problems in the wording. Two Likert-type items in the section reserved for academic writing practices were rephrased and moved to the next section: “My writing seems monotonous to me” and “I experience writer’s block (the state of being unable to write for some time)”. Then, a cognitive interview was carried out with two Turkish-L1 researchers. Both respondents had a PhD (the first in linguistics and the second in English language and literature), but they were not experts in survey development. These people were asked to read the survey items and explain what they understood from each item. In some items, they were asked to explain what certain terms or phrases meant for them. Based on their suggestions, some revisions were made in the wording.

The resulting survey was piloted with 30 researchers, most of whom were Turkish. The data from the piloting phase were not used only to carry out a reliability analysis of the items on academic writing activities (14 items), difficulties experienced in academic writing (8 items) and personal problems in academic writing (5 items). An acceptable Cronbach’s alpha coefficient for the first section ( $\alpha = 0.78$ ) and a higher one for the second ( $\alpha = 0.86$ ) were obtained, yet the Cronbach’s alpha coefficient for the last section was at a questionable level ( $\alpha = 0.58$ ), so all five items in this section were removed from the survey.

#### 4.6. Data Analysis

The text data from the initial survey with open-ended questions were analysed using NVivo v12. The researchers first read the responses thoroughly, and to identify potential survey items, they carried out quantitative content analysis, which is predominantly based on the calculation of frequency of the ideas expressed in the participants’ words when forming codes and categories. This analysis provided survey items

reflecting those written based on the researchers' personal experience in academic writing.

The data from the pilot version of the survey were directly imported into SPSS. The Cronbach alpha coefficients were calculated for the sections about the frequency of practices and strategy use, and about how often they experienced various challenges, where five-point Likert-type items were used (1: never, 2: rarely, 3: sometimes, 4: often and 5: always). They were also calculated for the section where participants responded about the problems they experienced through a five-point Likert-type items (1: strongly disagree, 2: disagree, 3: undecided, 4: agree and 5: strongly agree).

## 5. Results

*RQ1) What are the patterns of technology use in academic writing among native, native-like and non-native English-speaking researchers?*

In the present study, 5-point Likert-type items were used to seek information about the researchers' strategy use and the challenges they experienced. Globally considered, the NNERS used strategies more frequently than both the NLERS and NERS, who were the least frequent users of strategies. For instance, the NERS used writing templates or formulaic expressions less often. They also used professional editing services less frequently and were less interested in attending courses/webinars or watching tutorials to improve their writing. The order of frequency of use was the same for the item about using a proofreading checklist and leaving a reasonable time between writing and revision. For all these items, NLERS followed NERS, and the NNERS were the most frequent user group (Table 4).

Items about practices and strategies	NERS			NLERS			NNERS		
	N	M	SD	N	M	SD	N	M	SD
I use a list of commonly used phrases to write in English.	29	1.41	0.78	39	2.54	1.35	118	2.93	1.22
I get help from professional editing services.	29	1.38	0.94	39	1.74	1.19	118	1.93	1.11
I use a proofreading checklist while checking my writing.	29	1.62	0.90	39	2.15	1.41	118	2.32	1.27
I leave a reasonable time between writing and proofreading.	29	3.00	1.22	39	3.28	1.30	118	3.38	1.12
I attend courses/webinars or watch tutorials to improve my writing.	29	1.93	1.28	39	2.56	1.31	118	2.63	1.20

Table 4. The Practices/Strategies which were less frequently preferred by the NERS.

On the other hand, the NERS attached more importance to some practices/strategies. For instance, they considered pre-writing activities important, and they used them more frequently than the remaining two groups. The least frequent use belonged to the NNERS. Likewise, using intuition to judge grammaticality was more important for the NERS than the NLERS and NNERS. Table 5 shows that the NERS also used spell-check software more often than the NNERS and NLERS ( $M = 4.24, 3.68$  and  $3.36$ , respectively). The mean scores of the NERS and the NNERS were similar ( $M = 2.41$  vs.  $2.38$ , respectively). The NERS also used reading aloud (while writing or proofreading) more frequently than the other groups. The least frequent user of reading aloud was the NNERS. The NLERS and NNERS had similar mean scores for this item ( $M = 3.54$  and  $3.48$ , respectively).

Items about practices and strategies	NERS			NLERS			NNERS		
	N	M	SD	N	M	SD	N	M	SD
I do some pre-writing activities, such as freewriting, outlining, or listing etc.	29	4.21	0.90	39	3.74	1.14	118	3.60	1.26
I use my intuition to judge grammaticality of my writing.	29	4.45	0.69	39	3.36	1.16	118	3.57	1.09
I read my writing out loud while I am writing or proofreading.	29	3.69	1.23	39	3.05	1.43	118	2.81	1.41
Mean		4.12	0.94		3.38	1.24		3.33	1.25

Table 5. The Practices/Strategies for which Native English-speaking researchers were the most Frequent Users.

For the last group of items, the groups had similar mean scores, and for some items there were variations with respect to the order of frequency of use among the three groups. For example, drafting multiple times was considered highly important by all the three groups as the mean score for this item was above 4. Similarly, all the respondents used their computers to edit their work very frequently ( $M=434, 4.28$  and  $4.37$  for the NERS, NLERS and NNERS, respectively). At the same time, all three groups used printed versions of their writing with almost equal frequency, and they all worked with peers during proofreading (Table 6).

Items about practices and strategies	NERS			NLERS			NNERS		
	N	M	SD	N	M	SD	N	M	SD
I draft my research paper several times before submitting it.	29	4.17	1.04	39	4.15	1.09	118	4.14	1.09
I request my colleagues to proofread my writing.	29	3.00	1.22	39	2.51	1.14	118	3.14	1.26
I help my colleagues to proofread their writing.	29	3.41	1.12	39	3.15	1.14	118	3.42	1.10
I edit my writing on the computer screen.	29	4.34	0.67	39	4.28	1.00	118	4.37	0.75
I use a printed version of my writing for proofreading.	29	3.10	1.35	39	2.87	1.38	118	3.08	1.36
I read books on how to improve my writing.	29	2.62	1.21	39	2.77	1.42	118	2.85	1.17
Mean		3.44	1.10		3.29	1.20		3.50	1.12

Table 6. A Comparison of Native, Non-Native and Native-Like English-speaking researchers in Terms of Strategy Use.

*RQ2) How do native and non-native English-speaking researchers differ in terms of research software and dictionary use?*

The data indicated that significant numbers of researchers used various software and dictionaries in academic writing. Bibliographic data management tools, plagiarism software and various dictionaries were used by most of the participants. However, very few people used assistive software (e.g., NVivo) while conducting literature reviews, particularly among the NERS or the NLERS. Similarly, corpus tools, collocation dictionaries and specific reference dictionaries were used by fewer respondents, while thesauri were preferred by nearly half. An easily discernible pattern of use was that more respondents among the NNERS utilised software and dictionaries in academic writing. The NERS underutilized the software and dictionary types mentioned in the survey, except for grammar and spell-check software. The NLERS had higher percentages than the NERS in seven of the ten items; slightly more NERS than NLERS used corpus tools and general-purpose dictionaries, but almost all the NERS (96.60%) used spell-check software. The percentage of spell-check software use was 79.50 and 88.10 for the NLERS and NNERS, respectively. Globally considered, except for these three items, the percentage of use went up from the NERS to NNERS. Spell-check software was often preferred by all the groups, but more NERS used them. In most cases, the percentages of use for these tools among the NLERS approximated those of the NERS, rather than those of the NNERS (Figure 3). Furthermore, some respondents provided information about the tools they used other than those listed in the survey (i.e., Grammarly, Google Translate and Google as a corpus).



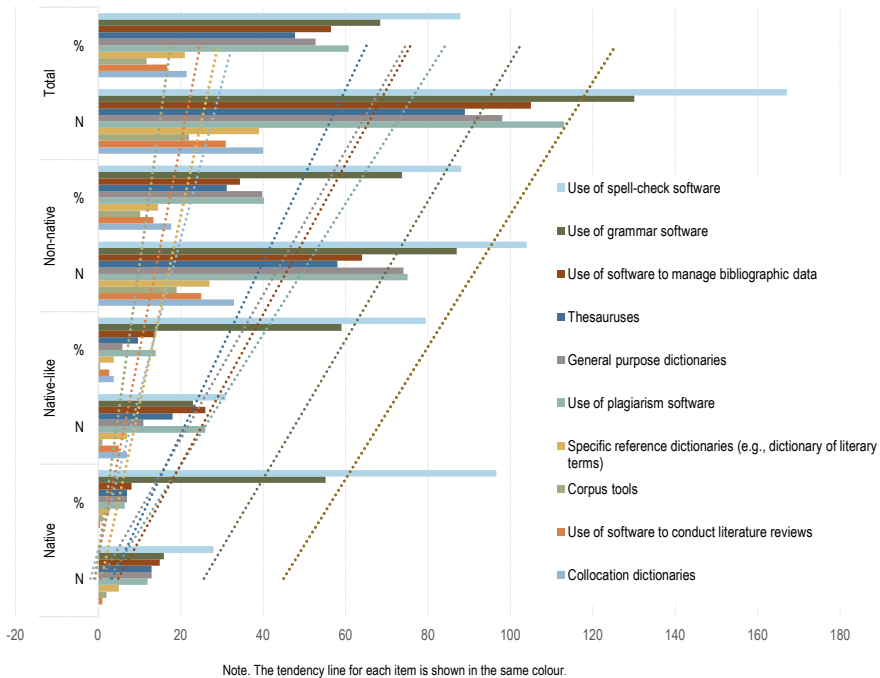


Figure 3. A Comparison of Software and Dictionary Use.

*RQ3) What are the challenges faced by NERS, NLERS and NNERS in academic writing?*

One of the items in the section devoted to difficulties experienced in academic writing asked whether the respondents had difficulties in writing. Interestingly, all three groups reported that they experienced difficulties, the mean scores being quite similar (Table 7). All three groups had trouble finding the right words to express themselves and writing concisely. The mean scores for these items for the three groups were similar (the difference was 0.38 or less). However, there were also some unexpected data. For example, the NERS ( $M=3.52$ ) reported experiencing writer's block more frequently than the NLERS ( $M=3.07$ ) or the NNERS ( $M=3.17$ ). Similarly, the NERS ( $M=3.00$ ) felt slightly more challenged at deciding on the structure of their paper compared to NLERS ( $M=2.90$ ) and NNERS ( $M=2.87$ ).

Items	NERS			NLERS			NNERS		
	N	M	SD	N	M	SD	N	M	SD
Paraphrasing others' ideas	25	2.00	0.82	30	2.73	0.91	107	2.97	0.99
Finding the right words to express myself	25	3.20	0.65	30	3.23	0.86	107	3.36	0.98
Achieving clarity of expression	25	2.92	0.95	30	3.20	0.85	107	3.32	0.89
Writing concisely (being succinct and avoiding redundancy in my writing)	25	3.00	1.26	30	3.27	0.87	107	3.25	0.95
Deciding on the structure of my paper	25	3.00	1.00	30	2.90	0.84	107	2.87	0.91
Understanding the properties of different genres of academic writing	25	2.00	0.87	30	2.47	1.11	107	2.59	1.04
Finding a colleague who could provide feedback on my writing	25	2.24	1.27	30	2.50	1.36	107	2.65	1.10
Experiencing writer's block (the state of being unable to write for some time)	25	3.52	0.87	30	3.07	1.11	107	3.17	0.97
Mean		2.74	0.96		2.92	0.99		3.02	0.98

Table 7. A Comparison of Native, Native-Like and Non-Native English-Speaking Researchers in Terms of Difficulties Experienced.

For the remaining items (i.e., paraphrasing, understanding different genres, finding a colleague for peer review, achieving clarity of expression and writing concisely), the native speaker group experienced the least difficulty. However, the difference among the groups was not large. In other words, the data from this section indicated that academic writing posed challenges not only for the NNERS but also for the NLERS and the NERS, yet in varying degrees.

## 6. Discussion

In relation to the first research question, one notable result was that there were discernible patterns of technology and strategy use among the NERS, NLERS and NNERS. The results indicate that nativeness led to less frequent use of all writing strategies, software and dictionaries (except for spell-check software). For example, for five of the strategies, the NNERS were the most frequent users and the NLERS and the NERS followed them (Table 4). This finding also accords with earlier observations (e.g., Politzer-Ahles et al., 2016), which showed that working in L1 somewhat privileges NERS in academic writing because they spend less effort in the areas of vocabulary and language use (e.g., sophisticated range, accurate word/phrase choice and usage), mechanics (e.g., standard English usage) and style (e.g., appropriate tone, distinctive voice) in academic writing compared to non-native researchers.

Another major result was that some practices/strategies, such as pre-writing strategies, using intuition to judge grammaticality and reading aloud while writing or proofreading, were favoured and used more frequently by NERS than the NLEs and NNERS. This result may be explained by the fact that NERS attach importance to process writing along with content and meaning making, as well as the accuracy of their written discourse. Moreover, according to Elbow (2010), reading aloud enables them to take an “outside perspective”; that is, to read their writing from the perspectives of potential readers. However, similar results were observed across groups with respect to some practices and strategies adopted (e.g., multiple drafting, getting and providing collegial help for proofreading, editing on the computer screen, using the printed version of written texts, and reading books on academic writing). This indicates that procedural aspects of academic writing (focus, content and organization), unlike its linguistic aspects (e.g., written conventions and style), can challenge writers equally, irrespective of their language proficiency background.

As for the second research question, a higher percentage of NNERS reported using dictionaries and academic writing software (i.e., for bibliographic data management, grammar checking). The results of the present study indicated that NNERS use dictionaries to compensate for possible deficiencies in their writing, which lends support to earlier research findings (e.g., Chitez et al., 2015; Goh & Lepage, 2019; Wischgoll, 2017). As noted earlier, researchers have difficulty in meeting the publication criteria of major journals (Chireshe et al., 2014; Goh & Lepage, 2019; Hyland, 2016b; Kotamjani et al., 2018). Therefore, higher dictionary use among NNERS was observed because dictionaries and corpus tools could help them boost the quality of their writing and take a step towards meeting the expected publication criteria. An unexpected finding in this respect was that the NERS were the most frequent users of spell-check software. A possible explanation for this may be that spelling proficiency of NERS is guided by their intuitive knowledge resulting from their L1 acquisition process rather than conscious knowledge (Krashen, 1989; Schmidt, 1990). Therefore, they prefer to be on the safe side by consulting spell-check software to be accurate in their spelling. Another potential explanation may be related to the effort to use the right kind of English spelling required by publishers as “[e]ditors of academic journals insist on either British or American spelling” (Cook, 1997, p. 474). With the help of spell-check software, it becomes easier for writers to learn the differences in spelling between British and American English, thereby fulfilling the journal submission criteria.

On the other hand, while one could naturally expect that NERS and more proficient users of English would probably have less difficulty in writing up research, the results of the present study have shown that challenges in academic writing are common to all groups of academic researchers, regardless of their linguistic background. Unlike what is claimed by some researchers (e.g., Flowerdew, 2008; Huang, 2010), not only NNERS but also NERS experience difficulties. These difficulties include various issues related to language use (e.g., paraphrasing, finding the right words, writing concisely), or the properties of academic texts, collaboration with fellow researchers (e.g., seeking peer feedback), or experiencing writer's block. Such challenges obviously make it difficult for researchers to transfer what they obtained from reading and research into drafts. The data from the present study suggest that, although nativeness apparently offers a linguistic advantage in academic writing, much more experience in academic writing (Huang, 2010) and academic literacy (Braine, 2002) is needed for successful academic writing. Academic writing is a multi-faceted skill, and it has complex conventions that affect all academic writers alike (Ferguson, 2007; Zhao, 2017). Compared to the two other groups, the NERS more frequently experienced writers' block, which is an unexpected finding. There may be several causes for this, such as striving for perfection in their writing and/or feeling forced to publish (e.g., Johnstone, 1983; Kaufman, 1992; Rahmat, 2020).

There was also variability among the three groups with respect to the use of assistive technologies, such as bibliographic data management software or tools for literature reviews (e.g., NVivo or other qualitative data analysis software). Using bibliographic management software is related with saving time while dealing with the mechanical aspects of writing. However, the data indicated that a lower percentage of the NERS used such software. It could be possible that their confidence in their linguistic skills lead them to underutilize some assistive software that could be considered as tools outside the core area (grammar and spell-check tools). Although they might not need dictionaries as often as NNERS do, they would benefit from assistive software to save time when formatting referencing styles to meet journal requirements (Kali, 2016). Using qualitative data analysis software enhances literature reviews and makes them more rigorous when dealing with an immensely large amount of research available online (O'Neill et al., 2018).

A major conclusion to be drawn is that some strategies which were more frequently used by the NERS could be associated with being confident in

one's linguistic competence and performance. For example, it appears effortless for NERS to read their written work aloud, while NNERS might experience some trouble doing so. Similarly, NNERS might not be comfortable enough to be able to use their intuition to judge grammaticality, owing to their lower levels of noticing (Schmidt, 1990). On the other hand, having confidence in linguistic skills also leads to less frequent use of software (e.g., dictionaries, thesauri or corpora). However, confidence in linguistic skills could hardly explain the lower use of assistive technologies. Furthermore, the use of some software (e.g., spell-check) could be attributed to their availability in most word processing tools and to user-friendliness of such tools, while corpus tools, bibliography tools or data analysis software imply steeper learning curves. Moreover, more complex tools are usually paid software with time-limited trial versions. These two factors could account for their lower use.

## 7. Conclusion

The strategies and the software that different groups of researchers (NERS, NLERS and NERS) use in academic writing differ markedly. This finding globally lends support to Mauranen (2012), who observed that the technological tools and strategies to be employed by NNERS and NERS in academic writing might vary owing to their different language backgrounds, writing cultures and needs. However, there may be some similarities regarding generic tools and strategies used. For instance, although the NERS in the present study were less willing to use strategies and software in academic writing, they experienced nearly the same difficulties as NLERS and NNERS. The NNERS apparently put in considerable effort to compensate for the linguistic disadvantage they experienced by using various strategies and software. However, although NNERS' failure to publish in high-profile journals is predominantly attributed to language issues, there might be other equally important factors at play. For example, it is probable that higher-quality academic writing instruction in Western universities that emphasises critical thinking might offer an advantage to NERS (Shaheen, 2012). Similarly, NERS, most of whom are of Anglo-American origin, usually send their publications to journals which are published by academics with similar educational and cultural backgrounds, which makes their task less challenging. Their advantage in this regard can partly be due to their intimate familiarity with Anglo-American and/or British academic expectations,

which can be more effortlessly fulfilled by NERS compared to NNERS (Cortazzi & Jin, 1997). However, it should be noted that the NERS in this study also reported experiencing challenges, which corroborates the argument that “there are no native speakers of academic English” (Mauranen, 2006, p. 149), and thus the “crude Native vs non-Native polarization” (Hyland, 2016a, p. 59) needs to be alleviated in order not to “further undermine the capabilities of L2 writers” who can achieve success in academic writing through coping strategies/practices (Langum & Sullivan, 2017, p. 20). Lastly, one can conclude, based on the preceding discussions, that irrespective of researchers’ backgrounds, it is necessary for them to be informed about academic writing expectations and cultures of the target publishing houses, and trained for strategy and technology use to ensure eventual success in academic writing and scholarly publishing.

### 7.1. Limitations and further research

This study suffers from a few limitations. As our conclusions were based on survey responses, the concept of social desirability could have influenced the results. Moreover, the category “I am a non-native speaker, but I have a native-like command of English” was based on the respondents’ self-perception; they might have overrated their English proficiency. Furthermore, the number of respondents was moderate, and convenience sampling was used to recruit the respondents for the survey by sharing the survey link on social media sites. Future studies could be carried out with carefully selected larger samples and fully validated tools (scales) with items examined through factor analysis. Prospective researchers could qualitatively investigate researchers’ experience of using assistive software and writing strategies and compare NERS and NNERS. Future researchers could carry out mixed-methods research to ensure a deeper understanding of strategy and software use for academic writing. Although we attributed less frequent use of dictionaries and corpus tools to the NERS’ confidence, other factors might also be at play. Therefore, future researchers should investigate why they use such tools less frequently than their non-native counterparts.

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## Appendix 1

### The Open-ended Questions in the Initial Survey

1. What is your native language?
  - Arabic
  - Bengali
  - Chinese
  - English
  - French
  - German
  - Hindi
  - Japanese
  - Javanese
  - Korean
  - Portuguese
  - Russian
  - Spanish
  - Tamil
  - Telugu
  - Turkish
  - Urdu
  - Vietnamese
  - Other
2. What strategies do you use when you are revising and editing your academic writing in English? (e.g., reading aloud, using dictionaries/reference materials, asking someone for peer review, using professional editing services, etc.)?
3. How does technology help you in academic writing (e.g., use of referencing/plagiarism software, spell-check software etc.)?
4. What are the challenges that you encounter when you're writing for scholarly purposes in English and revising/editing your work? Please elaborate on them.

## Appendix 2

### Practices in Academic Writing

This questionnaire has been designed to investigate the practices researchers in academic writing. Please read each question carefully and respond to them. The data will be used for research purposes and will not be disclosed unless required by legal authorities. Thank you for your participation.

#### A. Personal Information

1. What is your name and surname? (Optional) \_\_\_\_\_.
2. What is your gender?
  - Male
  - Female
3. How old are you?
  - 20-24
  - 25-34
  - 35-44
  - 45-54
  - 55-64
  - 65+
4. What is your area of study?
  - Language Education
  - Linguistics
  - Literature
  - Other
5. What is your educational background?
  - BA
  - MA
  - PhD
6. Are you employed at a university?
  - Yes
  - No
7. What is your title in your current position? (Respond to this question if your answer is "Yes" to the previous question.)
  - Lecturer
  - Research Assistant
  - Assistant Professor
  - Associate Professor
  - Full Professor
  - Other
8. Which of the following describes you best?
  - I am a native speaker of English (i.e., born and brought up in an English-speaking country)

- I am a non-native speaker, but I have lived in an English-speaking country for years and possess native-like command of English.
  - I am a non-native speaker of English.
9. What is your native language?
- Arabic
  - Bengali
  - Chinese
  - English
  - French
  - German
  - Hindi
  - Japanese
  - Korean
  - Portuguese
  - Russian
  - Spanish
  - Turkish
  - Urdu
  - Vietnamese
  - Other

**B. Writing, Editing and Proofreading Your Work**

1. Do you write academic texts (e.g., articles, books, reports etc.) in English?
  - Yes
  - No
2. Have you ever used any software to manage your bibliographic data?
  - Yes
  - No
3. Have you ever used any software to conduct literature reviews?
  - Yes
  - No
4. Have you ever used any software to check your writing against plagiarism?
  - Yes
  - No
5. Do you use a dictionary while you are writing or editing in English?
  - Yes
  - No
6. Which of the following tools do you use while writing or revising?
  - General purpose dictionaries
  - Collocation dictionaries

- Thesauruses
- Corpus tools
- Specific reference dictionaries (e.g., dictionary of literary terms):
- Other

7. Please specify how often you do the following activities while writing for academic purposes.

Please choose the appropriate response for each item.

	ALWAYS (5)	FREQUENTLY (4)	SOMETIMES (3)	RARELY (2)	NEVER (1)
I do some pre-writing activities, such as freewriting, outlining, or listing etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I draft my research paper several times before submitting it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use a list of commonly used phrases to write in English.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I get help from professional editing services.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I request my colleagues to proofread my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I help my colleagues to proofread their writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use a proofreading checklist while checking my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I leave a reasonable time between writing and proofreading.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use my intuition to judge grammaticality of my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I read my writing out loud while I am writing or proofreading.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I edit my writing on the computer screen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use a printed version of my writing for proofreading.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use grammar software to help me proofread my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use spell check software to help me proofread my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use plagiarism software to check the originality of my work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I use bibliography management software (e.g., Endnote, Zotero, Mendeley, etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I find myself procrastinating while I am writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I read books on how to improve my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I attend courses/webinars or watch tutorials to improve my writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I experience some difficulties in writing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Which of the following difficulties do you experience in academic writing? Please choose the appropriate response for each item.

(Respond to this question if your answer to "I experience some difficulties in academic writing." Is "Always, frequently, sometimes or rarely".)

	ALWAYS (1)	FREQUENTLY (2)	SOMETIMES (3)	RARELY (4)	NEVER (5)
Paraphrasing others' ideas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finding the right words to express myself	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Achieving clarity of expression	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Writing concisely (being succinct and avoiding redundancy in my writing)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Deciding on the structure of my paper	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Understanding the properties of different genres of academic writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finding a colleague who could provide feedback on my writing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Experiencing writer's block (the state of being unable to write for some time)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>