

The Perceived English Writing Needs of Non-Primary English International Doctoral Students at
R1 Universities Across the United States

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DEDICATION

To my grandparents, Thomas & Jean Berry and Margaret & Hayes Wilson, along with my parents, John & Margaret Berry, who equipped me well to set out on this education journey years ago. This one is for you all – thank you for your unending love and support.

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Lastly, I place trust that my future children will view this document as a symbol that your dreams and goals can be achieved, no matter how daunting they may appear. The path to the future you envision may not always be an easy one, but dedication, determination, and deliberate faith that you are answering your God-given call will allow you to rise up to the challenge and confidently endure the difficult moments you encounter.

Ad majorem Dei glóriam

ABSTRACT

Despite United States higher education institutions experiencing a 7.4% increase and a 3.1% increase in enrollment of international doctoral students (IDSs) during the 2018-19 and 2019-20 school years, there are aspects of graduate education that are lacking for IDSs, including training specifically on writing (Sidman-Taveau & Karathanos-Aguilar, 2015). Without adequate writing assistance provided to IDSs, there is a potential that they may be less likely to persist and succeed in their doctoral programs (Sowell et al., 2009), which may dampen international graduate students' contribution to the intellectual life (Smith & Khawaja, 2011) and diversity on campus (Williams & Johnson, 2011). Therefore, this needs assessment sought to assess non-primary English IDSs' perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications. The results from this study indicated that IDSs on average stated that they perceived they *were not currently adequately prepared* to successfully obtain employment for their desired careers post-PhD in 23 of the 25 areas of English writing measured in this study. Specific areas of English writing that IDSs perceived themselves to have a lower skill ability on included writing without surface-level errors, writing with clarity, and providing a strong argument in their writing. These findings are troubling, as most IDSs stated that these were also specific areas of writing they perceived as needing to possess strong skillsets on in order to successfully obtain employment in their desired careers post-PhD. The implementation of this study's findings will allow for U.S. R1 institutions to provide targeted academic assistance towards students' specific areas of need and be affirmed

that they are adequately preparing non-primary English IDSs with the powerful English writing skills they need for a successful graduate school experience and career post-PhD.

TABLE OF CONTENTS

Chapter 1 INTRODUCTION AND GENERAL INFORMATION.....	1
Statement of the Problem.....	2
Purpose of the Study	6
Purpose of Doctoral Graduate Education	7
Theoretical Framework	8
Significance of the Study	12
Research Questions	14
Assumptions, Delimitations, and Limitations.....	15
Assumptions.....	15
Delimitations.....	16
Limitations	17
Terms and Definition of Terms.....	18
Overview of the Study	20
Summary	21
Chapter 2 LITERATURE REVIEW	22
Description of the Problem	23
Rise of International Doctoral Students at U.S. Institutions	24
Importance of IDSs Studying at U.S. Institutions.....	25
Social.....	26
Cross-Cultural Competency	26
Academic	27
Economic/Financial	28
English Writing Difficulties Experienced by IDSs.....	28
IDSs in STEM Fields	31
IDSs with Prior Degree Earned at English-Speaking Institution.....	33
Institutional Support Services for IDSs' Writing.....	34
Writing Skills Required for IDSs in Post-PhD Jobs	35
Characteristics of IDSs' Post-PhD Jobs.....	36
Academic Versus Non-Academic Jobs.....	36
STEM Versus Non-STEM Jobs.....	39
Importance of Assessing Non-Primary English IDSs' Perceived Writing Skills	41
Academic Success.....	41
Career Preparation	42
Research Productivity	44
Graduate Study at R1 Doctoral Universities.....	45
Gaps in the Literature.....	47
Study Purpose and Research Questions	49
Summary	52
Chapter 3 RESEARCH DESIGN AND METHODOLOGY	54
Study Design.....	56
Sampling Methods and Participant Eligibility	58
Eligibility Questions	61

Recruitment of Participants.....	62
Pilot Study.....	62
Main Study.....	63
Measures	67
Participant Demographics.....	73
Procedures and Materials	76
Pilot Study.....	76
Main Study.....	77
Data Analyses	78
Pilot Study.....	78
Main Study.....	83
Research Question 1: What are R1 non-primary English IDSs' perceptions of their own English writing skills?.....	84
Research Question 2: What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?.....	84
Research Question 3: What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?.....	85
Research Question 4: What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?	86
Summary	87
Chapter 4 PRESENTATION OF STUDY FINDINGS	91
Overview of Data Cleaning and Analyses	93
Quantitative Data	93
Qualitative Data	95
IDSs' Perceptions of Their Own English Writing Skills (RQ1).....	97
IDSs' Perceptions of Their Own English Writing Skills Needed to Succeed in Their PhD Programs (RQ2).....	103
English Writing Needs of IDSs Who Earned a Previous Degree from an English-speaking Institution Versus IDSs Who Did Not (RQ2a)	109
Assumptions.....	109
English Writing Needs of STEM Versus non-STEM Major IDSs (RQ2b).....	111
IDSs' Perceptions of Their Own English Writing Skills Required to Successfully Obtain Employment in Their Desired Career post-PhD (RQ3).....	119
Perceptions of English Writing Skills Required to Obtain Employment of IDSs with Academic Career Goals Versus IDSs with Non-academic Career Goals (RQ3a).....	125
Perceptions of English Writing Skills Required to Obtain Employment of STEM Versus non-STEM Major IDSs (RQ3b).....	133
Perceptions of English Writing Skills Required to Obtain Employment of IDSs Who Earned a Previous Degree from an English-Speaking Institution Versus IDSs that Have Not (RQ3c)	138
Perceived Gaps Between IDSs' English Writing Skills and the English Writing Skills Required to Obtain Employment in Their Desired Career post-PhD (RQ4).....	141

Additional Survey Results	143
Summary	146
Chapter 5 DISCUSSION.....	149
Research Question 1: What are R1 non-primary English IDSs' perceptions of their own English writing skills?.....	149
Research Question 2: What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?.....	153
Research Question 3: What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?.....	157
Research Question 4: What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?	165
Limitations of Study	167
Practical Implications.....	169
Recommendations for Future Research	176
Conclusions.....	179
REFERENCES.....	182
APPENDICES.....	197
VITA.....	228

LIST OF TABLES

Table 1: Comparison of Commitment to Various U.S. Employment Sectors Post-PhD by International and Non-International Students that Earned a Doctorate in 2018	37
Table 2: U.S. R1 Institutions with Greatest Number of Doctorates Earned by International Students in 2018.....	46
Table 3: Recruitment Methods and Sampling Procedures for the Main Study	66
Table 4: Alignment of Survey Questions to Research Questions	71
Table 5: Various Demographics of Participants	74
Table 6: Closed-Ended Pilot Study Data and Subsequent Changes Made to Main Study's Survey	80
Table 7: Open-Ended Pilot Study Data and Subsequent Changes Made to Main Study's Survey	81
Table 8: Analysis Plan	88
Table 9: IDSs' Perceptions of Their Own Current English Writing Skills.....	98
Table 10: IDSs' Perceptions of Their Own Current English Writing Skills on Various Writing Tasks	99
Table 11: Most Commonly Reported Themes of IDSs' Own Perceived Current English Writing Skills	101
Table 12: IDSs' Perceptions the English Writing Skills Needed to Succeed in Their PhD Programs	104
Table 13: IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs	106
Table 14: Most Commonly Reported Themes of IDSs' Own Perceived English Writing Skills Needed to Succeed in Their PhD Programs.....	107
Table 15: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills Needed to Succeed in Their PhD Programs.....	112
Table 16: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs	113
Table 17: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills Needed to Succeed in Their PhD Programs	115
Table 18: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs	115
Table 19: IDSs' Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in their Desired Career Post-PhD	120
Table 20: IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in their Desired Career Post-PhD.....	122
Table 21: Most Commonly Reported Themes of IDSs' Own Perceived English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD	123

Table 22: Differences Between IDSs with Academic and non-Academic Career Goals on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD	128
Table 23: Differences Between IDSs with Academic and non-Academic Career Goals on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD.....	131
Table 24: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD	134
Table 25: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD.....	136
Table 26: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD	140
Table 27: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD	142
Table 28: Perceived Skill Gaps Between IDSs' English Writing Skills and the English Writing Skills Required to Obtain Employment in Their Desired Career Post-PhD.....	144
Table 29: Perceived Skill Gaps on Various Writing Tasks Between IDSs' English Writing Skills and the English Writing Skills Required to Obtain Employment in Their Desired Career Post-PhD	144
Table 30: Most Commonly Reported Themes on How IDSs' Perceptions of their Own Writing Skills Were Formed	147

LIST OF FIGURES

Figure 1: Heat Map of United States Indicating Location of Participants' Institutions	74
Figure 2: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of Their Own Current English Writing Skills	98
Figure 3: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of Their Own Current English Writing Skills on Various Writing Tasks.....	101
Figure 4: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Program.....	107
Figure 5: Top Five Largest Differences in the Means Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs	117
Figure 6: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD.....	123
Figure 7: Top Five Largest Differences in the Means Between IDSs with Academic and non-Academic Career Goals on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD.....	129

CHAPTER 1

INTRODUCTION AND GENERAL INFORMATION

In this chapter, the problem that was investigated in this current study is discussed, along with the purpose of the study, the theoretical background used to guide the study, and the overall significance of the study. Additionally, the research questions and definition of terms for this current study is discussed, along with the study's assumptions, delimitations, and limitations. This chapter will conclude by providing a brief overview of how the other chapters in this document are organized.

During the 2018-19 and 2019-20 school years, United States higher education institutions experienced a 7.4% and a 3.1% increase in enrollment of international doctoral students, resulting in the largest increase of international students in a degree field for both years (Institute of International Education [IIE], 2020c). Additionally, 26% of all doctoral students studying at U.S. institutions were international students during the 2017 school year (Organisation for Economic Cooperation and Development [OECD], 2019). Furthermore, around 62% international students originated from a country with a native/official language(s) other than English during the 2019-20 school year (IIE, 2020a). These statistics signify the demand to better understand the experiences of non-primary English¹ international doctoral students studying at U.S. institutions.

One area of international doctoral students' (IDSs) experiences that has raised some concern from researchers is the perceptions of IDSs' writing skills. Perceived difficulties

¹ In this study, "non-primary English" students are defined as individuals who do not consider English their strongest language.

experienced by IDSs in their writing during their doctoral program is often a compounded problem of writing complex pieces in an additional language (Casanave, 2019) without IDSs having a strong understanding of the expectations (Laufer & Gorup, 2019), writing structure (Hsu, 2011), or norms and rules (Laufer & Gorup, 2019) that comprise academic writing. However, training specifically on writing is often not targeted upon in graduate instruction (Badenhorst et al., 2015; Sanger & Baer, 2019; Starke-Meyerring, 2011), especially for international graduate students (Sidman-Taveau & Karathanos-Aguilar, 2015). This problem may be intensified for non-primary English IDSs studying at institutions with R1 Doctoral University Carnegie Classifications across the United States. This group of students must possess strong research skills, which include a high proficiency in writing abilities, to successfully meet the demands of attending a research-intensive institution (Okahana & Zhou, 2018). This highlights the importance of better understanding the unmet perceived writing needs of non-primary English IDSs studying at R1 doctoral universities in the United States during their graduate program.

Statement of the Problem

Through examination of the literature, it is apparent that bolstering IDSs' English writing skills can lead to a multitude of benefits for IDSs, including increased academic success (Li et al., 2010; Stephen et al., 2004), heightened career preparation (Badenhorst et al., 2015; Robles, 2012; Starke-Meyerring, 2011), and heightened research productivity (Kuehne et al., 2014; Messinger & Schuette, 2009; Smith & Khawaja, 2011). Furthering IDSs' English writing skills can also help students adequately prepare for the jobs that IDSs commit to post-PhD. Each career path requires IDSs to possess specific writing skills to be successful in their careers (Robles,

2012), including writing executive summaries, memos (Woodson et al., 2018), grant proposals, and business proposals (Ramsey & Baethe, 2013), although there is limited information on the exact English writing skills that employers require in post-PhD positions.

There are several writing support systems in place at the institutional level that are available for IDSs to utilize throughout their academic careers, including writing centers (Moon et al., 2020; Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015; Summers, 2018), instructors and advisors (Le & Gardner, 2010; Ravichandran et al., 2017; Simpson, 2018; Turner, 2018), and peer support (Ravichandran et al., 2017; Simpson et al., 2016). However, the quality and availability of these support systems vary across institutions. This is concerning, as English writing for IDSs in their doctoral programs is often challenging. Obstacles frequently experienced by IDSs in their writing include avoiding plagiarism (Hsu, 2011; Ravichandran et al., 2017; Simpson, 2018) and experiencing conflicting cultural backgrounds with faculty members when writing feedback is provided (Cardona et al., 2013; Laufer & Gorup, 2019; Ravichandran et al., 2017; Wang & Li, 2011). In addition to these challenging aspects, there are also added layers of writing challenges that some IDSs from specific demographics experience in their doctoral programs, such as IDSs studying in science, technology, engineering, and math fields (STEM; Le & Gardner, 2010; Simpson, 2018) and potentially IDSs who have not earned a prior degree at an English-speaking institution (Bastien et al., 2018), although little information exists on these potential English writing challenges.

Overall, the literature indicated that there are several aspects regarding non-primary English IDSs' perceptions of their own writing skills that are not sufficiently known. These areas include non-primary English IDSs' perceptions of their own English writing needs while

studying specifically at institutions that have R1 Doctoral University Carnegie Classifications across the United States, the specific career goals post-PhD of IDSs studying at R1 institutions, and the English writing skills non-primary English IDSs perceive they must possess to successfully obtain employment in their career goals upon graduation from their doctoral programs. Additionally, there is insufficient awareness on how non-primary English IDSs' perceptions of their own writing difficulties may vary between students who have earned a prior master's or bachelor's degree at an English-speaking institution and non-primary English IDSs who have not previously earned a degree at an English-speaking institution. There is also limited knowledge on how non-primary English IDSs' perceptions of their own writing difficulties may differ between students who are in STEM fields and those who are in non-STEM fields, or how non-primary English IDSs' perceptions of their own writing difficulties may vary between those who wish to pursue academic careers versus non-primary English IDSs who wish to pursue non-academic careers upon graduation.

In order to gather more information on IDSs and fill the literature gap to ensure an adequate alignment between the writing support services available to non-primary English IDSs at R1 U.S. institutions, the perceptions of their own writing skills, and their own perceived writing skills needed to be successful in their desired career post-PhD, the current needs assessment study was conducted. The study's results will be useful for R1 U.S. institutions to implement into improving the services provided for building the skills of non-primary English IDSs' English writing abilities and thus assist IDSs specifically in being more successful in their doctoral programs and obtaining employment post-PhD.

Providing IDSs with adequate support to minimize their English writing needs while enrolled in their PhD programs is crucial in today's increasingly demanding doctoral education experience. With some estimates stating that competitive PhD graduates in job markets need a Curriculum Vitae equal to the expectations of a professor that successfully received tenure 15-20 years ago (McAlpine, 2017), how can non-primary English IDSs be expected to meet these expectations without potentially receiving adequate training in English writing? Gathering more detailed information on non-primary English IDSs' specific perceptions of their own English writing needs from various demographics and backgrounds is vital to ensuring the success of IDSs in their doctoral programs.

It is also extremely important to fully understand non-primary English IDSs' perceptions of their own English writing needs who are studying at R1 U.S institutions, as writing is a highly important skill to possess to successfully obtain employment (Robles, 2012). Despite the demand for mastery of writing skills by employers, many doctoral programs do not offer formal training in writing (Badenhorst et al., 2015; Sanger & Baer, 2019; Starke-Meyerring, 2011). Thus, doctoral programs may not be providing the adequate career development opportunities for students to prepare them for employment post-PhD (McAlpine, 2017). This highlights the importance of fully understanding the English writing needs of IDSs to promote change in their doctoral education experience and thus adequately prepare students for their jobs upon earning their doctorate.

Additional information on this topic is especially important to uncover due to the recent rapid increase in IDS enrollment at U.S. institutions (IIE, 2020c) and the large percentage of international students who originate from a country with a native/official language(s) other than

English (IIE, 2020a). The information discovered in this needs assessment may illuminate areas of increased writing support that can specifically meet the perceived writing needs that non-primary English IDSs hold from distinct demographics. Providing additional targeted writing support may be crucial for non-primary English IDSs who wish to pursue non-academic and STEM related careers post-PhD, as both career paths carry unique writing challenges (Penson, 2010; Purcell et al., 2005; Rayner & Papakonstantinou, 2015; Woodson et al., 2018). This may increase non-primary English IDSs' competitiveness for non-academic and STEM related careers, given that around 64% of IDSs committed to a non-academic job post-PhD in 2018 that was located in the U.S., and 86% of all IDSs who earned their doctorate in 2018 were in STEM fields (National Science Foundation [NSF] & National Center for Science and Engineering Statistics [NCSES], 2019). Thus, additional targeted training in writing may better prepare IDSs for their specific career pursuits, which will lead to a significant addition to the U.S. work force (Smith & Khawaja, 2011) and further contribute to the near 40 billion dollars that international students annually supply to the U.S. economy (NAFSA: Association of International Educators [NAFSA], 2020).

Purpose of the Study

Non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD were measured in this needs assessment. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications. By further understanding

non-primary English IDSs' perceived writing skill gaps, targeted academic assistance towards students' specific areas of perceived need could be provided by U.S. R1 institutions.

Purpose of Doctoral Graduate Education

One of the main purposes of doctoral education is for students to produce valuable knowledge through innovative and original research, often performed individually by a student in a thesis or a dissertation (McAlpine, 2017). Additionally, when students are immersed into a doctoral program, it allows for them to gather content knowledge of their future profession while being socialized as members of their academic field (Cruess et al., 2015). Moreover, a key learning outcome of doctoral programs is for students to gain employability skills, such as possessing awareness for cultural sensitivity, working well in teams, and having strong communication skills, including strong writing skills (McAlpine, 2017).

Despite the demand for mastery of these “soft” skills by employers, many doctoral programs do not offer formal training in these areas, and those that do provide them as “add-on” workshops that are in addition to the demands of completing a doctoral degree (McAlpine, 2017). Thus, preparing students for employment post-PhD may be emphasized as a key learning outcome of a student's doctoral education experience without doctoral programs providing adequate career development opportunities for students, such as working in inter-disciplinary research teams, opportunities for co-authorship, and writing for a non-academic audience (McAlpine, 2017). This places students in a position to potentially seek out sources other than their doctoral program (e.g., internships) to gain this valuable knowledge, which adds to the demands of an already increasingly pressurized doctoral education experience. This once more highlights the importance of fully understanding the needs of doctoral students to promote

change in their doctoral education experience and thus adequately prepare students for their jobs after graduation.

Theoretical Framework

The intention of this study was to identify specific areas of English writing that non-primary English IDSs studying at U.S. R1 institutions perceived they needed assistance with. Therefore, a needs assessment was used as a guiding lens for the data collected in this study, which measured IDSs' perceptions of their own current English writing skills and the perceptions of their own English writing skills they must possess to successfully obtain employment in their desired career post-PhD. A needs assessment is a way of developing informed decisions which is often based on the gap between present and desired results (Watkins et al., 2012). Using a needs assessment for this study's methodology allowed for a gap analysis to be performed on the comparison of non-primary English IDSs' perceptions of their own writing skills and the perceptions of their own English writing skills they must possess to successfully obtain employment. This indicated areas of increased targeted instruction that non-primary English IDSs need; knowing this information fulfilled the purpose of this study, indicating that a needs assessment strongly fit with this study.

Additionally, when examining a student's graduate education experience, it is a multifaceted structure that shares connections among their advisor, faculty members, their graduate program, their graduate department, the graduate school, and the institution, along with various student resources, such as career, health and wellness, and international student resources. Therefore, areas of concern in graduate education should be viewed in a holistic manner, as there are many inter-relationships between different contexts. The systems thinking

approach is a framework that considers multiple paths of influence on the organization under investigation, such as personal, social, and societal influences (Arthur & McMahon, 2005). These influences can then be used to indicate areas to change and/or maintain the organization (Mette & Bengtson, 2015). In this manner, the systems thinking approach provides a framework for evaluating a system, or the different elements that compose an organization (Arnold & Wade, 2015), based on its inter-functions and ever-changing aspects that are open to influence (Mette & Bengtson, 2015; Patton & McMahon, 2006). Due to the focus on the inter-workings of a system, the systems thinking approach emphasizes that there is not one “correct” answer to solving a detected problem; rather, there are multiple methods to accomplish the desired results (Watkins et al., 2012). Therefore, the systems thinking approach framework was used in this needs assessment study, as it assisted in interpreting the study’s data to identify multiple areas in the graduate school system that can be altered to support the enhancement of non-primary English IDss’ perceived writing skills.

The systems thinking approach has been applied to previous studies, such as research in the fields of educational leadership (Mette & Bengtson, 2015) and career counseling (Arthur & McMahon, 2005; Patton & McMahon, 2006). In these studies, along with this current study, the systems thinking approach allowed for the influences of students’ individual characteristics, the students’ social structure, and the larger societal system to shine through on the topic under investigation (Patton & McMahon, 2006). This approach also highlighted students’ cultural influences on the topic under investigation (Arthur & McMahon, 2005), making the systems thinking approach ideal for a study that includes a multicultural group of students, such as the current study.

The systems thinking approach has also been used alongside needs assessments as a way to frame ways of thinking about problems at hand. For example, in undergraduate chemistry education, instructors have been encouraged to have their students conduct needs assessments to identify chemistry-related issues in their college community while using a systems thinking approach to consider the interwoven macro-level concerns, such as public health and business concerns. By utilizing a systems thinking approach, students can conduct a chemistry project that is more “real-world” oriented which can allow the focus of their project to critically examine a solution to the need in a multifaceted way (Lasker, 2019). Similarly, Grohs and colleagues (2018) have utilized a needs assessment project using a systems thinking approach for both undergraduate and graduate students from various disciplines. This structure of the project allows students to better identify and understand the stakeholders, their short-term and long-term goals, and to better align the project’s results and the identified need. Public health sectors have also used a needs assessment framework using a systems thinking approach to inform the development of programs for reducing tobacco use. In this project, various networks, or systems, were analyzed and evaluated to determine their effects in the problem at hand. The data were integrated into solutions to the problem and also used to advocate for future systems thinking processes to occur (Leischow et al., 2008).

Just as these studies promoted critical thinking with problem-solving skills using a needs assessment with a systems thinking approach, this study also utilized a combination of these two frameworks in order to critically examine and analyze the problem under investigation, which was non-primary English IDSs’ perceptions of their own individual writing skills and needs. Furthermore, the systems thinking approach strongly aligned with the current study, as there

were several inter-working elements involved. The needs assessment took into account non-primary English IDSs' perceptions of their own English writing skills (individual students' perceived current abilities), students' own perceived English writing skills needed to succeed in their PhD programs (perceived desired abilities determined by the social structure), and students' perceptions of the English writing expectations of their employers post-PhD (perceived desired abilities determined by the societal system; Watkins et al., 2012). Therefore, the systems thinking approach allowed for the interwoven macro-levels (e.g., higher education institutions) and micro-levels (e.g., individual student characteristics) that contribute to non-primary English IDSs' perceptions of their own English writing skills to be "untangled" in this needs assessment study in order to investigate potential areas of change that can bolster non-primary English IDSs' writing abilities (Arthur & McMahon, 2005).

Additionally, the systems thinking approach utilized alongside a needs assessment equipped the researcher to interpret the data in this study through a lens that allowed for multiple suggested solutions to be offered in a multifaceted way that met the need (Lasker, 2019). This study's framework also encouraged a focus on fully understanding the area of need from the primary stakeholders' perspectives (e.g., non-primary English IDSs), which involved examining students' perceptions of their English writing skills based on their short-term (skills needed in PhD program) and long-term needs (skills needed in post-PhD job). The framework allowed for a more robust capture of the problem at hand, which ultimately encouraged this study's results to better align with identified needs (Grohs et al., 2018). Furthermore, the study's framework allowed for the results of this study to be interpreted in an evaluative manner, which welcomed

multiple areas of potential growth for leaders primarily involved with IDSs at R1 institutions to meet the needs expressed by non-primary English IDSs (Leischow et al., 2008).

Significance of the Study

By specifically shedding light onto non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills while enrolled at R1 U.S. institutions, this gap that previously existed in the literature was filled. Additionally, this needs assessment sought to provide increased information on areas of additional writing support that specific groups of non-primary English IDSs required, such as STEM and non-STEM major IDSs, and IDSs who have not earned a prior degree at an English-speaking institution. Although researchers and practitioners were previously aware of common challenges frequently experienced by IDSs in their writing, such as avoiding plagiarism (Hsu, 2011; Ravichandran et al., 2017; Simpson, 2018) and navigating conflicting cultural backgrounds with faculty members regarding their feedback on IDSs' writing (Cardona et al., 2013; Laufer & Gorup, 2019; Ravichandran et al., 2017; Wang & Li, 2011), this study expanded upon the perceptions of IDSs' English writing difficulties experienced in their doctoral programs, especially for IDSs from specific demographics (e.g., IDSs in STEM majors). Therefore, faculty, doctoral programs, writing centers, and graduate schools at R1 U.S. institutions can utilize this study's information to bolster non-primary English IDSs' perceptions of their own specific areas of need in English writing. This information also added insight into the additional trainings, workshops, and coursework that would be beneficial for U.S. R1 institutions to offer in order to provide targeted services to strengthen the English writing needs of specific groups of non-primary English IDSs (e.g., IDSs in STEM majors). This study's information can also inform policy changes to fund additional academic services at these

institutions to support non-primary English international students' English writing abilities, specifically for IDSs.

Ultimately, by providing increased English writing assistance to non-primary English IDSs, they potentially may be more likely to persist and succeed in their doctoral programs (Sowell et al., 2009). By doing so, this may potentially benefit *all* students enrolled at U.S. institutions through international graduate students' contribution to the intellectual life (Smith & Khawaja, 2011) and diversity on campus (Williams & Johnson, 2011), while also stimulating the U.S. economy (NAFSA, 2020). Furthermore, additional English writing support for non-primary English IDSs may increase their academic success, as English writing skills were previously found to be a significant predictor of international students' academic success in graduate school (Li et al., 2010). Additional English writing support for non-primary English IDSs may also increase their research productivity in graduate school (Kuehne et al., 2014; Messinger & Schuette, 2009; Smith & Khawaja, 2011), which may ultimately increase non-primary English IDSs' English writing skills that are required to successfully obtain employment in English-speaking countries after graduation (Jang, 2016; Robles, 2012; Woodson et al., 2018).

Overall, this study's results can be utilized to further IDSs' English writing skills to help students adequately prepare for the jobs that IDSs commit to post-PhD. While the literature indicates that IDSs need to possess specific English writing skills to be successful in their careers (Robles, 2012), such as writing executive summaries, memos (Woodson et al., 2018), grant proposals, and business proposals (Ramsey & Baethe, 2013), limited information previously existed on the exact English writing skills that IDSs perceive employers require of them in post-PhD positions. Therefore, the results from this study expanded the information on IDSs'

perceptions of their own English writing skills required to obtain employment post-PhD. This information can be used to provide targeted assistance to non-primary English IDSs in order to increase their preparation for successful employment upon graduation.

Research Questions

This needs assessment study addressed the following research questions:

- 1) What are R1 non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills?
- 2) What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?
 - a. How do IDSs' perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
 - b. How do IDSs' perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?
- 3) What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?
 - a. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals versus IDSs with non-academic career goals?
 - b. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?

- c. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
- 4) What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?

Assumptions, Delimitations, and Limitations

In this needs assessment, there were several assumptions, delimitations, and limitations that were important for the researcher to keep cognizant in order to maximize the amount of accuracy that is present in the study's results. These points are addressed in detail below.

Assumptions

The current study employed a needs assessment that examined the measurement of participants' current skills compared to their desired skills (Watkins et al., 2012). In other words, this study intended to measure non-primary English IDSs' perceptions of their own current English writing skills and the perceptions of their own English writing skills they must possess to successfully obtain employment in their desired career. Therefore, this study assumed that there is a gap, or need, between non-primary English IDSs' perceived current English writing skills and their desired English writing skills to obtain employment post-PhD. This study also assumed that the writing skills asked on the survey given to participants were important skills for non-primary English IDSs to possess in order to be more successful in their doctoral programs and beyond, along with the assumption that the survey questions were important to furthering the

literature on IDSs' perceived English writing skills. Additionally, an assumption was also made that students accurately reported their current writing skill levels and the level of writing skills they believed were needed to successfully obtain employment in their desired career post-PhD. The assumption that the results from this study were valuable to doctoral faculty, doctoral programs, and institutions' graduate schools to implement procedures to address the English writing needs of non-primary English IDSs was also made in this study.

Delimitations

There were specific delimitations placed on this study in order to narrow the study's scope. Competency in a language is often viewed on a continuum to represent different levels of proficiency (Otwinowska, 2016); however, this continuum was narrowed down to a binary of, "students who self-identified English as not their strongest language" (individuals included in this study and defined as "non-primary English") and "students who self-identified English as their strongest language" (individuals excluded in this study) for the sake of determining the eligibility of students for this study. Additionally, there are many academic challenges that non-primary English IDSs face in their doctoral programs beyond their English writing skills, including their English oral communication skills (Andrade, 2006; Rodríguez et al., 2019; Young & Gutierrez Moncaleano, 2019), English reading comprehension skills (Andrade, 2006; Young & Gutierrez Moncaleano, 2019), and pedagogical differences experienced in U.S. classrooms (Cardona et al., 2013; Rodríguez et al., 2019). In order to limit the size of the current needs assessment study, the academic challenges that non-primary English IDSs face were narrowed down to examine just their English writing skills, since this is typically not an area of instruction

formally provided to international graduate students (Sidman-Taveau & Karathanos-Aguilar, 2015).

Furthermore, this study's population of interest was limited to non-primary English international doctoral students studying at R1 institutions in the U.S. to narrow the scope of the study, despite the fact that international students from other academic degree programs (e.g., Associate's, Bachelor's, Master's) studying at non-R1 institutions in countries other than the U.S. experience academic difficulties during their higher education program as well (Bastien et al., 2018; Li et al., 2010; Perry, 2016; Tsevi, 2018). Finally, there are many different ways to classify IDSs (e.g., beyond STEM versus non-STEM major) and the jobs they pursue post-PhD (e.g., beyond academic versus non-academic) than what was selected for this needs assessment. For example, students could be categorized by year in their PhD program to examine the unique English writing challenges experienced throughout their program, but for the sake of narrowing down the scope of this study, students from various years in their PhD program were combined together for all analyses. However, the student characteristics selected to examine in this needs assessment were based on gaps present in the literature to highlight the unique areas of English writing needs of IDSs from specific demographics where information was not sufficiently known.

Limitations

There were also several limitations present in this needs assessment. Students were recruited to participate in the study using self-selection, convenience, and snowball sampling, which are all non-probability sampling techniques (Johnson & Christensen, 2017). Therefore, the results of this study cannot be generalized to the entire population of non-primary English IDSs

studying at R1 institutions across the U.S. Additionally, the data collection for this needs assessment only occurred for a few months during the Fall 2020 semester, so the results may only be reflective of the English writing challenges that non-primary English IDss experienced during this timeframe in the school year. The data collection for this needs assessment also occurred during the COVID-19 pandemic, which may have affected the response rate and impacted the study's findings.

Furthermore, a self-reported survey was utilized in this study. Participants may not have possessed a strong awareness of their own behavior to accurately report information about their English writing skills and needs during their doctoral program. The employment of a quantitative study also limited the data collected to predefined categories of information (e.g., survey questions) that may not have reflected participants' own meaning and personal experiences with the data (Johnson & Christensen, 2017). Additionally, participants may not have been honest or felt uncomfortable sharing their perceptions of their English writing challenges they experienced on the survey, despite this research not being a "sensitive" topic. This may have also impacted participants' responses and thus affected the needs assessment's findings.

Terms and Definition of Terms

The following is a list of key terms and their definitions used throughout this study:

- 1) U.S. International Students – individuals who are currently enrolled and making progress towards completing their degree at a United States institution and neither consider the United States their country of origin nor are citizens, nationals, or permanent residents of the United States (Laufer & Gorup, 2019; Zhou et al., 2020)

- 2) International Doctoral Students (IDSs) – individuals who are currently enrolled in a PhD program, which excludes individuals enrolled in a professional doctorate, or a terminal degree focused on professional training or practice (e.g., J.D., Ed.D., Pharm.D.; Lynch et al., 2007)
- 3) Non-primary English Student – individuals who do not consider English to be their strongest language, or in other words, the language they are most proficient in
- 4) R1 Doctoral University Carnegie Classification – a United States higher education institution that awarded at least 20 doctorates during the 2016-17 school year and reported a very high research activity, defined as more than \$5 million in total research expenses, and having a “very high” index of aggregate and per-capita research activity based on 2016-17 school year data (The Carnegie Classification of Institutions of Higher Education [CCIHE], 2018a)
- 5) Perceived Writing Skills – a student’s recognition of the extent that they are able to adequately perform various English writing skills and tasks based on previous work they have completed in their PhD program (modified from Watkins et al., 2012)
- 6) Perceived Writing Needs – a student’s recognition of the extent that they are expected to adequately perform various English writing skills and tasks in order to succeed in their PhD program (modified from Watkins et al., 2012)
- 7) Previous Degree Earned from an English-Speaking Institution – students who have earned a bachelor’s or master’s degree at a primarily English-speaking institution (e.g., United Kingdom, United States, Australian institutions)

- 8) STEM Major – students currently enrolled in science, technology, engineering, and mathematics majors, as classified by the Department of Education’s Classification of Instructional Programs taxonomy (U.S. Department Of Veterans Affairs [VA], 2020)
- 9) Academic Career Goal – PhD students who desire to pursue a traditional tenure or non-tenure track faculty position at a higher education institution post-PhD (including after their post-doc, if applicable; NSF & NCSES, 2019)
- 10) Non-academic Career Goal – PhD students who desire to pursue a business, self-employment, government or public administration, nonprofit, elementary/secondary education career, or other higher education non-faculty position post-PhD (including after their post-doc, if applicable; NSF & NCSES, 2019)

Overview of the Study

This document is divided into five separate chapters. The current chapter, Chapter One, provided an overview of the current study and presented the research questions and definition of terms that are used in this study. Chapter Two includes an overview of the related literature to this study, along with the gaps in the literature. The purpose of this needs assessment and how this study intended to fill the literature gaps is also covered. Chapter Three discusses the study design, including how participants were recruited for the study, the data collection measures that were used, how the study was conducted, and an overview of the data analyses employed. Chapter Four describes the results of the study, and Chapter Five includes the discussion of the results, along with the implications of the study’s results.

Summary

The previous chapter briefly described the purpose of the current needs assessment study, which was to better understand non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills and needs while enrolled in R1 institutions across the U.S. The benefits of the information gathered from this study, including its contribution to the literature and the potential improvements for IDSs and non-IDSs, were also discussed. Additionally, details on how a needs assessment and the systems-based thinking approach framed this study were discussed. The study's research questions and definition of terms used were also presented, along with the study's assumptions, delimitations, and limitations. Chapter 2 will describe key findings from the literature on international doctoral students' (IDSs) writing skills and describe how this needs assessment study intended to fill specific gaps within this body of literature.

CHAPTER 2

LITERATURE REVIEW

The focus of this needs assessment was to measure non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications. The following literature review was performed to inform the current needs assessment by using the University of Tennessee Hodges Library electronic journal collection, Google Scholar search engine, and several electronic databases (e.g., ERIC, PsycINFO, Web of Science). Keywords used for initial literature searches included “international doctoral student writing needs” and “international doctoral student writing challenges.” Subsequent searches used keywords from the initial searches and keywords relating to more specific topics about international students. Additionally, several websites that house data on international students in higher education were browsed as part of the literature review, which included the Institute of International Education (IIE), NAFSA: Association of International Educators, and the National Science Foundation (NSF) and the National Center for Science and Engineering Statistics (NCSES)'s Survey of Earned Doctorates. The most recent data collected on international students from these websites were incorporated into the following literature review.

The literature review will first focus on the timeliness and importance of this research topic. Next, the English writing difficulties commonly experienced by IDSs will be discussed, specifically for IDSs in science, technology, engineering and math (STEM) fields and IDSs who

do not have a prior degree at an English-speaking institution. The lack of institutional support services widely available specifically for IDSs' English writing will also be explored.

Additionally, the English writing skills required for employment in post-PhD jobs will be discussed, specifically for academic versus non-academic jobs and STEM versus non-STEM careers. Finally, this chapter will end by addressing the gap in the literature on non-primary English IDSs' perceptions of their own English writing skills in graduate school and their own perceptions of English writing skills required to successfully obtain employment post-PhD – a gap that this current needs assessment sought to fill.

Description of the Problem

A critical experience of international doctoral students that is important to fully understand is their perceived English writing skills. By specifically shedding light onto non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills while enrolled at U.S. R1 institutions, areas of additional increased support that institutions could provide students to bolster areas of need in English writing may be highlighted. Increased assistance provided to non-primary English IDSs may indicate they are potentially more likely to persist and succeed in their doctoral programs (Sowell et al., 2009). By doing so, this may potentially benefit *all* students enrolled at U.S. institutions through international graduate students' addition to the intellectual life (Smith & Khawaja, 2011) and diversity on campus (Williams & Johnson, 2011), while also stimulating the U.S. economy (NAFSA, 2020). Furthermore, additional writing support for non-primary English IDSs may increase their academic success (Li et al., 2010; Stephen et al., 2004) and research productivity in graduate school (Kuehne et al., 2014; Messinger & Schuette, 2009; Smith & Khawaja, 2011), ultimately

increasing non-primary English IDSs' writing skills required to obtain employment in English-speaking countries after graduation (Jang, 2016; Robles, 2012; Woodson et al., 2018).

However, training specifically on writing is often not targeted upon in graduate instruction (Badenhorst et al., 2015; Sanger & Baer, 2019; Starke-Meyerring, 2011), especially for international graduate students (Sidman-Taveau & Karathanos-Aguilar, 2015). This indicates that IDSs may not be fully prepared for a career that highly relies on excellent English writing skills, which also leads to less of a contribution to the U.S. work force (Smith & Khawaja, 2011). Details of this multifaceted problem that emerges once IDSs' perceptions of their own English writing needs are not fully met, in which this current needs assessment sought to shed light on, are discussed below.

Rise of International Doctoral Students at U.S. Institutions

Despite the fact that United States higher education institutions experienced a 0.6% decrease in the total number of first-time enrolled international students during the 2019-20 school year (IIE, 2020a), the number international doctoral students enrolled in U.S. institutions has increased (Sanger & Baer, 2019). U.S. higher education institutions had a 7.4% increase and a 3.1% increase in enrollment of international doctoral students during the 2018-19 and 2019-20 school years, respectfully. Both of these climbs in enrollment represented the largest increase in international student enrollment of an academic degree compared to the previous school year out of any other academic degree measured (e.g., Associate's, Bachelor's, Master's, and Professional Graduate degrees; IIE, 2020b). Overall, this indicates a need to focus on the experiences of international doctoral students studying at U.S. institutions due to their rapid increase in enrollment.

Accounting for all international students at U.S. institutions during the 2019-20 school year, around 62% of students originated from a country with a native/official language(s) other than English, with most international students residing from the continent of Asia (IIE, 2020a). Around 45% of all degree-seeking postsecondary international students were specifically graduate students (e.g., Master's, Doctoral, or Professional; IIE, 2020c). Moreover, 26% of all doctoral students studying at U.S. institutions were international students during the 2017 school year (OECD, 2019). All academic disciplines have also experienced an increase in the percentage of doctorate degrees earned by international students at U.S. institutions from 1999 to 2018, with the exception of the Life Sciences. More specifically, around 57% of all Engineering doctorates earned at U.S. institutions in 2018 were awarded to international students, along with 55% of all Mathematics and Computer Science doctorates earned by international students (NSF & NCSES, 2019). Therefore, the large proportion of doctoral students who are also international students (OECD, 2019), combined with over half of international students originating from a country with a native/official language(s) other than English (IIE, 2020a), signifies the demand to better understand the experiences of non-primary English international doctoral students studying at U.S. institutions.

Importance of IDSs Studying at U.S. Institutions

By examining non-primary English IDSs' perceptions of their own English writing skills and providing additional targeted support to specific areas of need, it potentially may encourage non-primary English IDSs to persist in their doctoral programs (Sowell et al., 2009). This may potentially allow for the many benefits for both IDSs and non-IDSs to occur when IDSs successfully persist and succeed in a doctoral program at a U.S. institution. These benefits

include social (Laufer & Gorup, 2019; Li et al., 2010; Zhang & Goodson, 2011), academic (Bastien et al., 2018; Smith & Khawaja, 2011; Zhang & Brunton, 2007), and economic/financial benefits (Gray, 2003; NAFSA, 2020; Robles, 2012; Smith & Khawaja, 2011; Sowell et al., 2009), along with the promotion of cross-cultural competence (Andrade, 2006; Williams & Johnson, 2011), which will be discussed in further detail below.

Social. A previous study indicated that international graduate students who have regular social interactions with English-speaking students positively correlated with their psychological well-being (Zhang & Goodson, 2011). This may help relieve some of the academic and social isolation that IDSs experience throughout their doctoral programs (Laufer & Gorup, 2019). Furthermore, international students who have strong friendships can utilize these relationships to help facilitate the cross-cultural adjustment that occurs when students study at a foreign country. This finding indicates that institutions should promote aspects such as social events that host both international and non-international students and peer-to-peer tutoring to facilitate in the formation of these positive friendships for international students (Li et al., 2010).

Cross-Cultural Competency. Additionally, both IDSs and non-IDSs benefit from an intercultural learning experience that prepares both groups of students for today's globalized workplace (Andrade, 2006). A study by Williams and Johnson (2011) found that non-international students who had friendships with international students had higher levels of open-mindedness along with lower levels of intercultural communication apprehension, which is a measurement of apprehension experienced within a cross-cultural environment (Williams & Johnson, 2011). Another study previously indicated that some international students may alter their values and perspectives to match what they are exposed to in the U.S. (Hsu, 2011). It can be

inferred that non-international students may also alter their norms and values based on the new cultural encounters they experience through relationships with international students. These findings indicate that the diversity that IDSs bring to campuses benefits all students by increasing the cultural awareness of both IDSs and non-IDSs.

Academic. During IDSs' academic careers on campus, they often provide a wealth of acquired abilities and innovative knowledge, often rooted in their home country's culture, that are unique compared to non-international students. This adds to the intellect shared within the institution's student body (Smith & Khawaja, 2011). Furthermore, previous studies have indicated that international graduate students' English proficiency are significantly correlated with the amount of time they have spent in the U.S. (Bastien et al., 2018). Higher levels of English proficiency are also correlated with a higher academic achievement in international students (Zhang & Brunton, 2007). Therefore, it can be inferred that the time international students spend studying in the U.S. is tremendously valuable to them, as it helps bolster their academic performance. Additionally, the time international students have previously spent in the U.S. is predictive of students' overall academic adjustment, which includes additional factors other than academic achievement, such as commitment to the institution and satisfaction with their academics (Bastien et al., 2018). An increase in these factors may potentially indicate IDSs' willingness to persist in their doctoral programs. Overall, these findings highlight that by studying at U.S. institutions, IDSs may bolster their own academic achievement (Zhang & Brunton, 2007) and academic adjustment (Bastien et al., 2018), as well as the overall body of knowledge shared within the institution (Smith & Khawaja, 2011).

Economic/Financial. Additionally, international graduate students have a tremendous economic impact on institutions and on the U.S as a whole. During the 2019-20 school year, it is estimated that international graduate students contributed \$39 billion dollars to the U.S. economy. Also during this school year, it is estimated that international graduate students funded 416,000 jobs in the U.S., primarily in the job sectors of Higher Education (55%), Accommodations (18%), and Dining (11%; NAFSA, 2020). After graduation, IDSs may opt to stay in the U.S. to obtain employment (Robles, 2012), filling jobs as highly skilled workers that few Americans are qualified to fill (Gray, 2003; Smith & Khawaja, 2011). Therefore, not only does the U.S. economy benefit from IDSs studying at U.S. institutions (NAFSA, 2020), but the overall intellectual and cultural richness confined to college campuses are greatly increased (Andrade, 2006; Smith & Khawaja, 2011). However, these benefits can only occur if IDSs can successfully persist in their doctoral programs, which may potentially include ensuring their English writing needs are met (Sowell et al., 2009).

English Writing Difficulties Experienced by IDSs

When specifically examining non-primary English IDSs' perceptions of their English writing skills, there are several difficulties that are commonly shared amongst most IDSs. These areas include completing writing tasks in a second or additional language while writing in a new genre (Casanave, 2019; Hsu, 2011; Li, 2006; Turner, 2018; Xu & Hu, 2019). Academic writing is often regarded as a separate writing genre (Dressen-Hammouda, 2008), as the writing structure follows unique rules that often include unspoken expectations (Laufer & Gorup, 2019; Starke-Meyerring, 2011). International students are often placed at a disadvantage when performing

academic writing, as this genre is rarely overtly taught to international students before beginning their higher education careers (Hsu, 2011).

This challenge is heightened for IDSs, as they are often considered Academic Others, defined by Laufer and Gorup (2019) as having a disadvantage in academics, including writing, due to IDSs' novice status and perceived lack of understanding of the unique academic norms and rules. Furthermore, international graduate students are often met with unrealistic expectations by others to write in English with a greater proficiency in multilingualism than they actually possess (Kang, 2010; Rhee, 2010), which falls into the category of linguistic discrimination (Liu, 2010; Rhee, 2010). This is especially troublesome for IDSs who are often required to complete a dissertation, who may be expected to work in a linguistic discriminatory environment while learning how to follow the linguistic conventions of their academic discipline (Casanave, 2019). Therefore, English writing for IDSs in their doctoral program is often a compounded problem of writing complex pieces in an additional language (Casanave, 2019) in an environment comprised of biases towards IDSs (Kang, 2010; Liu, 2010; Rhee, 2010) without a strong understanding of the expectations (Laufer & Gorup, 2019), writing structure (Hsu, 2011), or norms and rules (Laufer & Gorup, 2019) that comprise academic English writing.

A general theme found in non-primary English IDSs' difficulties experienced in their English writing relates to negotiating between different expectations and approaches to academic writing in the U.S. compared to in their home country. Each English writing task in graduate school (e.g., comprehensive exams, analyzing data) requires students to master a unique and specialized technique of communicating (Madden & Stinnett, 2016). This highly-specialized skill of writing in graduate school is only further expanded, as academic English writing styles

and structures often vary by source type and by academic discipline (Moon et al., 2020; Xu & Hu, 2019). This can lead to international graduate students feeling like they “ha[ve] no idea how to develop each of these different [writing] formats: qualitative, quantitative, essay, proposal” (Moon et al., 2020, p. 37). This can often lead to students not linguistically experimenting in their academic English writing and thus producing writing that is overly formulaic (Cox, 2010). This may especially hold true when specific disciplinary conventions are not overtly instructed to IDSs by graduate faculty (Starke-Meyerring, 2011). This leaves IDSs at a disadvantage to their non-IDS peers who may have mastered academic English writing over years of exposure and practice.

Moreover, international graduate students often experience additional challenges in their English writing, such as properly citing academic work in their writing using their field’s bibliography format (Ravichandran et al., 2017) and using correct grammatical structures (Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015). Many students also find it challenging to organize information in their writing to make logical sense, both at the paragraph and global levels (Sidman-Taveau & Karathanos-Aguilar, 2015). Additionally, some international graduate students struggle with selecting the proper word choices and academic vocabulary to use in their writing. Furthermore, students often find the general process of academic writing in English to be difficult (Sidman-Taveau & Karathanos-Aguilar, 2015), specifically for non-primary English IDSs who may find it challenging to translate expressions and ideas from their primary language into English (Moon et al., 2020). This may be reflected in Ravichandran and colleagues’ (2017) findings that international graduate students take a longer period of time to complete English writing assignments than non-international graduate students.

This time consumption exceeding upwards to “14 hours a day to raise [international graduate students’] ability to write” (Ravichandran et al., 2017, p. 774) is bound to take a mental toll on IDSs who are often expected to develop complex writing pieces during their graduate studies (Casanave, 2019).

Additional challenges frequently experienced by IDSs in their writing include avoiding plagiarism (Hsu, 2011; Ravichandran et al., 2017; Simpson, 2018) and experiencing conflicting cultural backgrounds with faculty members when writing feedback is provided (Cardona et al., 2013; Laufer & Gorup, 2019; Ravichandran et al., 2017; Wang & Li, 2011). In addition to these challenging aspects, there are also added layers of writing challenges that some IDSs from specific demographics experience, such as IDSs studying in science, technology, engineering, and math fields (STEM; Le & Gardner, 2010; Simpson, 2018) and potentially IDSs who have not earned a prior degree at an English-speaking institution (Bastien et al., 2018). A detailed examination of these writing difficulties will be explored further.

IDSs in STEM Fields

Due to the highly technical and narrow scope of most STEM fields (Le & Gardner, 2010), the writing difficulties experienced by IDSs studying in STEM fields warrants further attention. Around 86% of all international students who earned their doctorate in 2018 were in STEM fields (NSF & NCSES, 2019), indicating a large prevalence of STEM IDSs. The writing difficulties experienced by STEM IDSs often involve an increased prevalence of the same writing challenges that most IDSs experience. STEM IDSs often experience difficulties in avoiding plagiarism in their writing at a heightened amount compared to non-STEM IDSs (Simpson, 2018). Although research on this topic is limited, it can be hypothesized that this

increased difficulty for STEM IDSs may be due to their native culture encouraging repeating experts' words into their own work more so than non-STEM IDSs' culture (Chien, 2014).

Additionally, STEM IDSs' previous institutions may have not emphasized plagiarism as much as non-STEM IDSs' institutions. Some universities worldwide do not place a wrongdoing on plagiarism (Ravichandran et al., 2017; Simpson, 2018) or only focus on students avoiding plagiarism on large writing assignments (Ravichandran et al., 2017). These different cultural values between U.S. institutions and institutions worldwide may lead to IDSs, specifically STEM IDSs, having a more difficult challenge avoiding plagiarism than non-IDSs.

Additionally, a larger percentage of STEM IDSs often work on research projects that are funded by a faculty member or funded by their advisor's grant compared to non-STEM IDSs. This indicates that STEM IDSs typically have increased interactions with their supervisor than non-STEM IDSs (Le & Gardner, 2010). However, this may be an added challenge, as the cultural differences of interpersonal relationships often differ between IDSs' culture and U.S. culture, as IDSs may view the relationship with their supervisor as master versus apprentice, instead of more equal. This may lead to IDSs not taking ownership of their writing (Wang & Li, 2011) or being uncomfortable with the one-on-one attention and feedback their supervisor provides on their writing (Cardona et al., 2013). Due to STEM IDSs' potential increase in supervision from their advisor or other faculty member providing feedback on their writing, STEM IDSs may experience a heightened hurdle of negotiating cultural differences (Cardona et al., 2013; Wang & Li, 2011) when receiving feedback on their writing more so than non-STEM IDSs.

IDSs with Prior Degree Earned at English-Speaking Institution

When examining IDSs' writing difficulties experienced by students who specifically do not have a prior degree at an English-speaking institution (e.g., U.K., U.S., Australian institutions), there is a gap in the literature. A previous study indicated that international graduate students' English proficiency is significantly correlated with the amount of time they spend in the U.S. (Bastien et al., 2018), so one can hypothesize that IDSs without a prior degree at an English-speaking institution may have a lower English proficiency and thus experience increased writing difficulties. Data collected from an exit survey indicated that out of all doctorates earned by international students in 2018, 75% of students had previously earned a master's degree, and 61% of students had earned a master's degree related to their doctorate field (NSF, 2019). However, it is unknown exactly how many IDSs who earned a master's degree attended an English-speaking institution, or how many IDSs earned their bachelor's degree at an English-speaking institution, as data is not readily available on this specific area. Due to this lack of information, researchers are unable to easily make comparisons between the different writing difficulties experienced by IDSs who have earned a prior master's or bachelor's degree at an English-speaking institution versus IDSs who have not. In sum, there appears to be specific English writing difficulties experienced by all IDSs, and specifically students from particular demographics (Bastien et al., 2018; Le & Gardner, 2010; Simpson, 2018), which call into action the demand for tailored support provided by institutions for IDSs' perceptions of their own writing needs.

Institutional Support Services for IDSs' Writing

There are several writing support systems at the institutional level available for IDSs throughout their academic careers, including writing centers (Moon et al., 2020; Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015; Summers, 2018), instructors and advisors (Le & Gardner, 2010; Ravichandran et al., 2017; Simpson, 2018; Turner, 2018), and peer support (Ravichandran et al., 2017; Simpson et al., 2016). Writing centers housed at institutions provide individualized feedback to IDSs with their writing assignments and often provide educational workshops specifically on international student writing (Sidman-Taveau & Karathanos-Aguilar, 2015). However, international graduate students often provide mixed reviews on the helpfulness of the writing center, as some students have stated this service has bolstered their writing abilities (Sidman-Taveau & Karathanos-Aguilar, 2015), while other students have commented that the services are typically not tailored towards graduate writing (Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015).

There has been a recent movement to have separate graduate writing centers to specifically fit the needs of graduate students, but unfortunately, their prevalence across U.S. institutions is still limited (Summers, 2018). Additionally, some researchers such as Moon and colleagues (2020) have advocated for writing centers to employ writing tutors for international graduate students who specialize in academic writing across various disciplines. This would help negate a problem that international graduate students often express, which is that tutors at writing centers tend to focus on grammatical errors in their writing, and often do not provide assistance with structuring their writing to fit the specific guidelines followed in a particular academic field.

This finding is troublesome, as international graduate students often find structuring their writing for a particular academic discipline challenging (Moon et al., 2020).

Additionally, IDSs often report that their faculty advisor is their main support for improving their writing (Le & Gardner, 2010), specifically in larger institutions where the writing center cannot be the main support system for all international students (Simpson, 2018). However, not all experiences with faculty support may be positive for IDSs, as previous research has indicated that faculty members provide writing feedback that often focuses more on minute grammatical errors (Turner, 2018) and less on the holistic quality of the writing, such as the synthesis of information (Ravichandran et al., 2017). There has also been a recent push to encourage peer-to-peer writing support at institutions, which has been met with positive feedback from IDSs (Simpson et al., 2016) along with requests from IDSs without peer writing services to start one at their institution with peer graduate student mentors (Ravichandran et al., 2017). In sum, there are several writing support services available to IDSs, but their quality and availability of services varies across institutions.

Writing Skills Required for IDSs in Post-PhD Jobs

Through the positives and negatives of writing support services for IDSs, the ultimate goal should be to better prepare IDSs for the writing skills required in their future careers. Jobs that IDSs commit to post-PhD range from academic to non-academic jobs, along with STEM versus non-STEM related careers (NSF & NCSES, 2019). Each career path requires IDSs to possess specific writing skills to be successful in their careers (Robles, 2012), including executive summaries, memos (Woodson et al., 2018), grant proposals, and business proposals (Ramsey & Baethe, 2013). In the discussion below, these different job sectors will be broken

down to provide a snapshot into how many IDSs stay in the U.S. after graduation and how many students select each of the different U.S. employment sectors. Additionally, the various English writing skills that are required for IDSs to be successful in each of the various career paths post-PhD will be explored.

Characteristics of IDSs' Post-PhD Jobs

An exit survey conducted regarding IDSs' post-PhD career plans indicated that out of all doctorates earned by international students in 2018, around 64% of all survey respondents stated that they had committed to either a job post-PhD or to a postdoctoral position. Out of the survey respondents that had committed to a position, 58% of students committed to an employment position, while 42% of students committed to a postdoctoral position. Around 77% of the employment and postdoctoral positions IDSs committed to were located in the U.S. (NSF & NCSES, 2019). Table 1 breaks down the U.S. employment commitments of international students who earned a doctorate in 2018 by employment sectors and compares these percentages to the U.S. employment commitments of non-IDSs who earned a doctorate in 2018. Overall, non-IDSs committed to all categories of U.S. employment sectors with a higher percentage than IDSs, with the exception of industry/business/self-employment (27.8% of non-IDSs and 63.8% of IDSs; NSF & NCSES, 2019). This indicates that IDSs may have different career goals than non-IDSs that include more of a focus on non-academic jobs located in the U.S.

Academic Versus Non-Academic Jobs

An academic career for PhDs is typically defined as the traditional tenure or non-tenure track faculty position, whereas a non-academic career is typically defined as a business, self-employment, government or public administration, nonprofit, or elementary/secondary education

Table 1: Comparison of Commitment to Various U.S. Employment Sectors Post-PhD by International and Non-International Students that Earned a Doctorate in 2018

U.S. Employment Sector	% of International Doctoral Students Committing to Sector	% of Non-international Doctoral Students Committing to Sector
Academy	30.3%	47.5%
Government	1.2%	8.7%
Industry/Business/Self-Employment	63.8%	27.8%
Nonprofit Organization	3.0%	7.4%
Elementary/Secondary Schools/Other Sector	1.6%	8.6%

career, or other non-higher education faculty position (NSF & NCSES, 2019). For many academic fields, there are more PhD graduates each year than faculty positions currently available, but doctoral programs often do not adequately train their students to be successful in non-academic careers (Woodson et al., 2018). To compile this issue, little information is known about the specific writing skills required in non-academic careers post-PhD (McAlpine, 2017), although few studies exist, but those that do are dated. In one study of recent social scientist PhD graduates, most reported that their PhD training prepared them well for their job in academia (89%), and slightly less recent graduates responded that their PhD training prepared them well for their non-academic job (around 66%; Purcell et al., 2005). This difference in preparation may be due to recent PhD's lack of writing skills, as 90% of recent graduates mentioned that their job specifically required strong writing skills, but they received little to no targeted training on writing in their doctoral program (Purcell et al., 2005).

Additionally, succinct, technical writing such as developing executive summaries, non-academic documents, social media posts, newspaper articles, and memos for a broad audience are more common writing tasks performed in non-academic jobs, but rarely focused on in doctoral program curriculums (McAlpine, 2017). In a panelist of PhDs employed in non-academic jobs, the panelists stated that PhDs often need to re-learn how to write for the non-academic workforce since there is often a mismatch between the writing performed in doctoral programs compared to the non-academic writing tasks required in a job (Woodson et al., 2018). This may be one explanation for PhD's lack of job preparation in non-academic careers. This can be contrasted with the specific writing skills that are more prevalent in academic careers. In a survey of social scientist PhDs who had been in their jobs for 5 -10 years, those in academic

careers rated writing and publishing (66%) and grant writing (40%) to be very important skills to possess to be successful in their careers more frequently than PhDs in non-academic careers (51% and 30%, respectfully; Morrison et al., 2011).

Although some information is known about the writing tasks that are commonly found in academic and non-academic jobs post-PhD, there is a gap in the literature on IDSs' perceptions of the English writing skills required for successful employment in academic versus non-academic careers. Previous research has indicated that IDSs often have difficulties performing academic writing tasks due to the work being in their second or additional language while writing in a new genre (Casanave, 2019; Hsu, 2011; Li, 2006; Turner, 2018). One can hypothesize that the writing difficulty experienced by PhDs in non-academic jobs may be greater for IDSs, as non-academic writing is often perceived as a different writing genre (Woodson et al., 2018). This inference raises a concern for IDSs employed in non-academic jobs in predominantly English-speaking countries post-PhD. The added barrier of producing quality writing in English without a strong knowledgebase on non-academic writing genres may mean that IDSs are less prepared for this sector of the workforce, despite the fact that over half of IDSs pursue a non-academic career in the U.S (NSF & NCSES, 2019).

STEM Versus Non-STEM Jobs

IDSs studying in STEM fields who desire to pursue STEM related careers post-PhD in the U.S. may experience more difficulty in securing a job, as a recent analysis of job advertisements indicated that English writing skills to effectively communicate for the needs of a targeted audience and demonstration of critical thinking skills were rated with more importance for successful job candidates to possess in STEM related careers than in non-STEM related

careers (Jang, 2016). Additionally, Jang (2016) found that a strong comprehension of the English language was rated as the most important type of knowledge for successful job candidates to possess in STEM related careers. However, in addition to writing difficulties, IDSs also often struggle with having strong critical thinking skills (Ravichandran et al., 2017), meaning that they may be at a disadvantage for securing a STEM related job compared to non-IDSs.

Additional research on the specific writing skills needed to be successful in STEM and non-STEM careers is limited to studies on undergraduates' employability in these fields. These studies have indicated that possessing strong written communication skills is highly valued by STEM employers (Penson, 2010; Rayner & Papakonstantinou, 2015), even significantly more so than graduates' numeracy skills (Rayner & Papakonstantinou, 2015). Additionally, an analysis of STEM undergraduates' laboratory reports by Ramsey and Baethe (2013) indicated that students' written work did not follow a strong structure, even though writing is an essential skill to possess in STEM related careers. The lack of structure observed in students' work indicated that they may not be able to successfully perform crucial writing tasks required in STEM related careers, such as writing a grant proposal or a business proposal (Ramsey & Baethe, 2013). If non-international STEM students are struggling with writing laboratory reports, then it can be inferred that international STEM students may find the strong writing skills required to be successful in STEM related careers to be even more challenging.

Overall, the literature reviewed calls into action additional research to further investigate IDSs' specific writing challenges and needs of those who wish to pursue various career paths. This may illuminate areas of increased English writing support needed for IDSs, especially for those who wish to pursue non-academic and STEM related careers, which carry unique writing

challenges (Penson, 2010; Purcell et al., 2005; Rayner & Papakonstantinou, 2015; Woodson et al., 2018). This may increase their competitiveness for non-academic and STEM related careers, especially since a large percentage of IDSs commit to both of these sectors post-PhD (NSF & NCSES, 2019).

Importance of Assessing Non-Primary English IDSs' Perceived Writing Skills

By fully understanding non-primary English IDSs' perceptions of their own English writing skills, targeted academic assistance towards students' specific areas of need can be provided by institutions. Bolstering IDSs' English writing skills can lead to a multitude of benefits for IDSs, including increased academic success (Li et al., 2010; Stephen et al., 2004), heightened career preparation (Badenhorst et al., 2015; Robles, 2012; Starke-Meyerring, 2011), and heightened research productivity (Kuehne et al., 2014; Messinger & Schuette, 2009; Smith & Khawaja, 2011), which will be explored in detail below.

Academic Success

Fully addressing IDSs' perceptions of their own English writing skills and providing targeted support to strengthen these perceived needs can also increase IDSs' academic achievements. English writing competencies have been linked to academic success, specifically for international graduate students (Li et al., 2010; Stephen et al., 2004). A previous study conducted by Li and colleagues (2010) surveyed international students studying in the United Kingdom and asked participants to rate their English abilities in several different areas. A regression analysis on the measured factors to predict students' GPAs revealed that English writing skills were a significant predictor of students' academic success in graduate school. This

indicates a need for IDSs to possess strong English writing skills in order to academically achieve in their doctoral programs.

Despite this importance in IDSs' writing skills, previous studies have indicated that strong writing abilities are often not a targeted learning outcome of graduate school programs (Sanger & Baer, 2019; Starke-Meyerring, 2011). This may be reflected in Sowell and colleagues' (2009) finding that students' decision to drop out of their doctoral program included a lack of mentoring and advising, which may comprise a lack of writing support. According to Starke-Meyerring (2011), graduate advisors often do not overtly instruct their graduate students on how to write well. For advisors who have been in their fields for quite some time, writing becomes so habitualized that they may perceive it as "a universal skill – transparent, invisible, hidden in plain sight" (Starke-Meyerring, 2011, p. 78). Therefore, graduate advisors may make the assumption that students do not require additional training in writing, which may be detrimental to IDSs (Casanave, 2019). Furthermore, around 45% of U.S. institutions do not provide any targeted academic assistance to international students at the beginning of their programs (Sanger & Baer, 2019). This lack of writing support may be crippling for IDSs whose primary language is not English, as they take on the demand to write in an additional language (Casanave, 2019) in a new academic culture (Laufer & Gorup, 2019) without potentially possessing strong English writing skills needed to academically succeed in their programs.

Career Preparation

For all students who begin enrollment at a U.S. institution in pursuit of earning a PhD, only around 57% of students will complete their degree within 10 years (OECD, 2019; Sowell et al., 2009). Factors that may influence students' decision to drop out of their doctoral program

include a lack of professional or career preparation (Sowell et al., 2009), which often includes a lack of writing preparation (Badenhorst et al., 2015; Starke-Meyerring, 2011). However, researchers can only infer that there may be a connection between IDSs' persistence to graduate and their English writing skills, as there is a gap in the literature that investigates a direct connection between these two aspects. Furthermore, data that specifically examines IDSs' persistence to their PhD versus non-IDSs' persistence to their PhD is not available. Therefore, researchers are limited to the somewhat outdated Sowell and colleagues data (2009) which examined the graduation rates of all doctoral students (IDSs and non-IDSs combined) to assume that non-IDSs may have a similar persistence to degree rate of 57%. If this assumption holds true, this is an unacceptably low graduation rate for IDSs.

A high English writing proficiency may just not be key for earning a PhD, but for obtaining employment after graduation as well. As part of developing career skills, doctoral students must possess strong writing abilities in order to obtain employment after graduation. In a survey of 57 business executives about the importance of employees displaying various soft skills in order for them to be successful in the workplace, around 91% of respondents rated "communication" skills, which included writing skills, as required for obtaining and retaining employment (Robles, 2012). These findings highlight the non-negotiable importance for IDSs to polish their English writing abilities while in graduate school in order to secure a job in an English-speaking country, and potentially to ensure they successfully complete their doctoral program.

Research Productivity

There has been a recent push in various academic disciplines to strengthen experts' abilities to be effective communicators in their field in order to clearly disseminate research findings to both academic and to non-academic fields (Kuehne et al., 2014; Woodson et al., 2018). To strengthen the writing communication skills of experts in the field, some researchers such as Kuehne and colleagues (2014) have stated that increased focus should be placed on strengthening the writing abilities of graduate students, since they will be the future leaders in their fields. Kuehne and colleagues (2014) argue that by engaging in more written communication skills, graduate students may also expand their social network, which may promote interdisciplinary research. This may provide an added benefit to international students, as language and cultural barriers can make it difficult for students to connect with others (Smith & Khawaja, 2011), which may potentially hinder their research productivity.

Furthermore, graduate students who have opportunities to speak about their research to a general audience improve their abilities to relate a topic to the general population. This increases their awareness of how their research impacts others. This may help graduate students better formulate the ways their grant proposals benefit the general population, and thus increase their competitiveness to win grants (Messinger & Schuette, 2009). In sum, IDSs who receive targeted writing assistance towards their specific areas of need may strengthen their academic and non-academic written communication skills (Kuehne et al., 2014), and thus benefit from a multitude of advantages to utilize both throughout their doctoral programs and throughout their future careers (Messinger & Schuette, 2009; Smith & Khawaja, 2011).

Graduate Study at R1 Doctoral Universities

When examining all international students in graduate school, the majority of students attend R1 doctoral universities (67% of all international students in 2017; Okahana & Zhou, 2018). An R1 doctoral university is defined by The Carnegie Classification of Institutions of Higher Education (CCIHE) as an institution that awarded at least 20 doctorates during the 2016-17 school year and reported a very high research activity, defined as more than \$5 million in total research expenses, and having a “very high” index of aggregate and per-capita research activity based on 2016-17 school year data (CCIHE, 2018a). This current study specifically focused on assessing the perceived English writing skills of doctoral students studying at R1 institutions across the U.S. because most doctoral degrees are awarded to students attending R1 institutions (75% of all doctorate degrees earned in 2018; NSF & NCSES, 2019). Therefore, R1 institutions were targeted in this study due to their large enrollment of international graduate students and high number of doctoral degrees awarded annually. Table 2 displays the top 20 U.S. R1 institutions with the greatest number of doctorates earned by international students in 2018 (NSF & NCSES, 2019).²

Additionally, R1 institutions were the most selective schools for doctoral applications compared to the selectiveness of the other Carnegie Classification institutions in 2017 (20% acceptance rate of all doctoral applications; Okahana & Zhou, 2018). Furthermore, the defining factors of an R1 doctoral university indicate that many faculty members at the institution have large grants and research projects that are currently funded (CCIHE, 2018a). It can be inferred that the expectations for doctoral students at U.S. R1 institutions include possessing strong

² An exhaustive list of the number of doctorate recipients from all U.S. R1 institutions is not freely available.

Table 2: U.S. R1 Institutions with Greatest Number of Doctorates Earned by International Students in 2018

Rank	Institution	Total International Doctorate Recipients
1	Purdue University - West Lafayette	386
2	Texas A&M University - College Station and Health Science Center	340
3	University of Illinois - Urbana-Champaign	336
4	University of Florida	331
5	Pennsylvania State University - University Park and Hershey Medical Center	293
6	University of Michigan - Ann Arbor	284
7	Ohio State University - Columbus	282
8	Massachusetts Institute of Technology	262
9	Georgia Institute of Technology	245
10	University of Minnesota - Twin Cities	243
11	University of Wisconsin - Madison	240
12	Columbia University in the City of New York	226
13	Cornell University	225
13	University of California - Berkeley	225
15	Harvard University	224
16	University of Texas - Austin	213
17	University of Maryland - College Park	208
18	University of Southern California	201
19	North Carolina State University	200
20	University of California, Los Angeles	199

research skills, which include having a high proficiency in their English writing abilities. This may be reflected in the higher selectivity that R1 institutions place on their admissions of incoming doctoral students. Thus, it is important to specifically focus on the writing skills of doctoral students at R1 universities to ensure that they have the adequate skills needed to successfully meet the English writing demands of attending a research-intensive institution.

Gaps in the Literature

Through examination of the literature, there appeared to be several gaps in knowledge on this current study's topic. Less research has been conducted that focused specifically on non-primary English IDSs' own perceived English writing skills compared to the body of literature that exists on international undergraduate or master's students' perceptions on this topic.

Additionally, there is an insufficient awareness of non-primary English IDSs enrolled at U.S. R1 institutions' specific career goals post-PhD and the English writing skills they perceive are required to successfully obtain employment in these career goals. Additionally, the different perceived English writing needs experienced by non-primary English IDSs who have earned a prior master's or bachelor's degree at an English-speaking institution who may differ from non-primary English IDSs who have not previously earned a degree at an English-speaking institution are not sufficiently known. There is also an insufficient awareness on how the perceived English writing needs of non-primary English IDSs who are in STEM fields may differ from the perceived English writing needs of non-primary English IDSs in non-STEM fields, or how the perceived English writing needs of non-primary English IDSs who wish to pursue academic careers may differ from non-primary English IDSs who wish to pursue non-academic careers upon graduation. Without full understanding of the specific English writing

skills and needs perceived by non-primary English IDSs studying at U.S. R1 institutions and without a clear understanding of these students' career goals, how do R1 institutions and the doctoral programs, faculty, and writing centers at these institutions know that they are adequately preparing non-primary English IDSs with the English writing skills they need for a successful career post-PhD? This current needs assessment sought to provide additional information for R1 institutions to be able to answer this question with more confidence.

Self-identified non-primary English IDSs currently enrolled at an institution that had an R1 Doctoral University (very high research activity) Carnegie Classification across the United States were asked about the perceptions of their own English writing skills and writing needs. Additionally, non-primary English IDSs were also asked about their own perceptions of the English writing skills they believe are required to successfully obtain employment in their future career goals post-PhD. Comparisons between non-primary English IDSs' perceptions of their own English writing skills and their own perceptions of the anticipated employer expectations of their English writing skills were examined for potential gaps. These perceived English writing skill gaps by IDSs indicated the need for additional English writing training and instruction for non-primary English IDSs to meet the perceived English writing competencies to obtain employment post-PhD. Comparisons were also made between groups of non-primary English IDSs (academic career goal vs. non-academic; STEM major vs. non-STEM major; previous degree earned from English-speaking institution vs. no previous degree earned from English-speaking institution) on their own perceived English writing needs. Additionally, comparisons were made between these groups on their perceptions of their own English writing skills required for their desired career. These group comparisons indicated specific demographics that were an

influence on non-primary English IDSs' perceived level of competency in various English writing skills and tasks in order to adequately prepare for their future job post-PhD.

Study Purpose and Research Questions

The purpose of this needs assessment was to measure non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications.

This needs assessment study addressed the following research questions:

- 1) What are R1 non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills?
- 2) What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?
 - a. How do IDSs' perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
 - b. How do IDSs' perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?
- 3) What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?

- a. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals versus IDSs with non-academic career goals?
 - b. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?
 - c. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
- 4) What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?

These research questions were primarily developed based on gaps that existed in the literature. Research question 1 was developed to better understand non-primary English IDSs' own perceived English writing skills who were enrolled at R1 institutions, as there is an insufficient awareness on this topic. Fully understanding these students' own perceived English skills can allow for increased targeted instruction in areas where their perceived skill levels were lower. There are many potential benefits to unlocking this information, as bolstering IDSs' English writing skills can lead to a multitude of benefits for IDSs, including increased academic success (Li et al., 2010; Stephen et al., 2004), heightened career preparation (Badenhorst et al.,

2015; Robles, 2012; Starke-Meyerring, 2011), and heightened research productivity (Kuehne et al., 2014; Messinger & Schuette, 2009; Smith & Khawaja, 2011).

Research question 2 was developed to better understand non-primary English IDSs' own perceived English writing needs, as this information is not sufficiently known. Additionally, there is insufficient awareness on how different demographic groups of non-primary English IDSs' perceptions of their own writing difficulties may vary (e.g., IDSs' who have earned a prior master's or bachelor's degree at an English-speaking institution versus those that have not; IDSs who are in STEM fields versus IDSs in non-STEM fields). What little information that exists in these potential differences in IDSs' English writing difficulties indicate that STEM IDSs often experience difficulties in avoiding plagiarism in their writing while enrolled in their PhD program at a heightened amount compared to non-STEM IDSs (Simpson, 2018). Additionally, English proficiency is significantly correlated with the amount of time IDSs spend in the U.S. (Bastien et al., 2018), so one can hypothesize that IDSs without a prior degree at an English-speaking institution may have a lower English proficiency and thus experience increased writing difficulties. However, more robust information needed gathered to explore these potential differences in English writing needs to provide targeted instruction to IDSs.

Research question 3 was developed since little information is known about the specific English writing skills required of IDSs in their careers post-PhD (McAlpine, 2017). What little information on this topic that exists indicted that succinct, technical writing such as developing executive summaries, non-academic documents, social media posts, newspaper articles, and memos for a broad audience are more common writing tasks performed in non-academic jobs, but rarely focused on in doctoral program curriculums (McAlpine, 2017). Also, English writing

skills to effectively communicate for the needs of a targeted audience were rated with more importance for successful job candidates to possess in STEM related careers than in non-STEM related careers (Jang, 2016). This indicated the need to investigate further into these potential differences that may occur in IDSs' own perceptions of the English writing skills needed for employment post-PhD for IDSs wishing to pursue academic versus non-academic jobs, STEM versus non-STEM major IDSs, and IDSs who have not earned a previous degree from an English-speaking institution in order to ensure adequate preparation of IDSs in their English writing skills, regardless of their desired career path or educational background.

Finally, research question 4 was developed to perform an analysis gap on the study's data to more fully understand areas of English writing that IDSs perceive they needed assistance on in order to successfully obtain employment in their desired career post-PhD. This research question added information to a body of knowledge that was previously not well researched. This research question also added insight into the additional trainings, workshops, and coursework that would be beneficial for U.S. R1 institutions to offer in order to provide targeted services to strengthen the English writing needs of non-primary English IDSs, especially since the quality and availability of support services for IDSs' English writing varies across institutions (Moon et al., 2020; Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015).

Summary

In this chapter, the importance of international doctoral students (IDSs) studying at U.S. institutions along with the importance of assessing non-primary English IDSs' perceptions of their own English writing skills were discussed. Additionally, previous literature examining the English writing difficulties commonly experienced by IDSs and the English writing skills

required for employment in post-PhD jobs, both for academic and non-academic careers and for STEM and non-STEM careers, were discussed. The lack of institutional support services that is widely provided for IDSs' English writing was also examined. The gaps in the literature along with how this current needs assessment study sought to address these gaps were also presented in this chapter, along with this study's research questions. Chapter 3 will merge key findings from the extant literature with a methodological approach to describe the process that was taken to assess non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, English writing needs in their PhD programs, and English writing skills required to successfully obtain employment post-PhD.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

Despite English writing competencies being linked to students' academic success, specifically for international graduate students (Li et al., 2010; Stephen et al., 2004), there is a lack of targeted training provided in graduate school instruction for international graduate students (Sidman-Taveau & Karathanos-Aguilar, 2015). To compound this problem, the perceptions that non-primary English international doctoral students (IDSs) studying at institutions who have an R1 Doctoral University Carnegie Classification across the United States hold regarding their own English writing skills are not sufficiently known.

Therefore, the purpose of this needs assessment was to measure non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications. By further understanding non-primary English IDSs' perceived writing skill gaps, targeted academic assistance towards students' specific areas of perceived need could be provided by U.S. R1 institutions.

This needs assessment study addressed the following research questions:

- 1) What are R1 non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills?
- 2) What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?

- a. How do IDSs' perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
 - b. How do IDSs' perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?
- 3) What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?
 - a. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals versus IDSs with non-academic career goals?
 - b. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?
 - c. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
- 4) What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?

The research design and methodology that was used to uncover information about these research questions will be presented in this chapter. First, the research design and the rationale

for selecting the design for this needs assessment study will be presented, along with the population and sample for this study and how participants were recruited for the study. The measurements that were used to collect data in this needs assessment will also be introduced. Additionally, a detailed description of the procedures that participants followed in this study will be described. This chapter will conclude by describing how the collected data were cleaned, the data analysis plan of how each research question was investigated, and the proposed data visualizations that were used to depict the main findings of the study's data.

Study Design

In this study, the researcher intended to identify specific areas of English writing that non-primary English IDSs studying at U.S. R1 institutions perceived they needed assistance with. Therefore, this study employed a national needs assessment, which measured participants' current skills compared to their desired skills (Watkins et al., 2012). More specifically, this study intended to measure non-primary English IDSs' perceptions of their own current English writing skills and the perceptions of their own English writing skills they believe they must possess to successfully obtain employment in their desired career post-PhD. A needs assessment allowed for the comparison of non-primary English IDSs' perceptions of these two constructs. Therefore, any gaps between students' own perceived current English writing skills and their own perceived English writing skills needed to obtain employment post-PhD were identified and analyzed. This indicated areas of increased targeted instruction that non-primary English IDSs need; knowing this information ultimately fulfilled the purpose of this needs assessment.

Specifically, this study utilized nonexperimental quantitative survey research to conduct the national needs assessment. A survey was specifically chosen for this study because it allowed

for a wide range of information from a large number of students to be collected (Johnson & Christensen, 2017), making it ideal for a national needs assessment and examining the problem under investigation. Additionally, several of the study's research questions examined comparisons in non-primary English IDSs' perceptions of their own English writing needs based on specific demographics (e.g., STEM versus non-STEM major IDSs). A quantitative method allowed for these comparisons to be easily made between groups (Johnson & Christensen, 2017). Furthermore, a large amount of the existing research on this topic involved qualitative studies (e.g., Cardona et al., 2013; Le & Gardner, 2010; Ravichandran et al., 2017; Rhee, 2010; Starke-Meyerring, 2011; Wang & Li, 2011; Xu & Hu, 2019); those quantitative studies that exist are often of smaller scale, and some do not include scales that are valid or reliable (e.g., Bastien et al., 2018; Sidman-Taveau & Karathanos-Aguilar, 2015; Zhang & Brunton, 2007). This indicated that there was a need to conduct a quantitative study that employed a national survey which contained valid and reliable closed-ended survey questions with supplemental open-ended questions.

The survey employed in this needs assessment first underwent a pilot study with content experts in international graduate student writing education and with individuals from the target population (non-primary English IDSs at R1 Universities). This allowed for the examination of the content and face validity of the survey that was designed by the researcher, along with the clarity of the wording of the survey questions to be measured before the survey was distributed to participants in the main study. The survey primarily included quantitative questions (e.g., Likert scale questions) that comprised the core of the survey, with a few supplemental qualitative questions (e.g., open-ended questions). However, the qualitative questions were analyzed

quantitatively (e.g., frequencies of most commonly reported answers), indicating that this is a quantitative study. The open-ended questions were added to the survey to allow non-primary English IDSs to contribute their own understanding of the different categories of English writing that they perceived they need assistance with or perceived they need to possess to successfully obtain employment post-PhD. Thus, the open-ended qualitative questions on the survey bolstered a limitation of the quantitative questions, which is that the researcher decides which categories of information respondents answer without providing the respondents their voice to alter these categories to reflect their own experiences (Johnson & Christensen, 2017).

Sampling Methods and Participant Eligibility

The population for the main study was self-identified non-primary English international doctoral students (IDSs) who were currently enrolled at an institution with an R1 Doctoral University (very high research activity) Carnegie Classification in the United States. Since a freely available list of all non-primary English IDSs currently enrolled at R1 U.S. institutions was not available at the time this study took place, the total size of the population was unknown.

IDSs who were currently enrolled at all 131 institutions with an R1 Doctoral University (very high research activity) Carnegie Classification in the United States were contacted to participate in the main study. The complete list of U.S. R1 institutions was downloaded from the Carnegie Classification website, which reflected the most recent classification of institutions that was conducted in 2018. These institutions were comprised of 94 public institutions and 37 private, non-profit institutions (CCIHE, 2018b). Participants for the pilot study were recruited using convenience sampling, and the main study utilized a combination of convenience, self-selection, and snowball sampling. Due to these sampling techniques used, the sample size for

this study was unknown. The recruitment methods for this study utilized convenience sampling techniques, as the easiest to reach individuals (e.g., potential participants active on social media and Listservs) were contacted to participate in the main study's survey (Johnson & Christensen, 2017). Self-selection sampling methods were also used, as the directors of the institutional groups who were contacted ultimately decided if an invitation to participate in the study was passed along to IDSs at their institution (Lavrakas, 2008). Throughout the entire recruitment process, snowball sampling was also utilized, as participants were asked at the end of the survey to send the survey link to any students who they thought may be eligible and interested in participating in the study (Johnson & Christensen, 2017).

To further understand exactly how many participants needed to complete the survey in the main study to detect a significant difference, if one exists, a power analysis was completed using G*Power version 3.1.9.6 for Mac. Because there were no known studies measuring the constructs proposed in this needs assessment with non-primary English IDSs, similar, yet different, studies were used to calculate the effect size for two separate power analyses. Since these studies measured only a rough estimate of the effect size that may have occurred in this study, a more conservative power level of .95 was used in the power analyses. The power analyses were conducted using a two-tailed independent samples *t*-test with $\alpha = .002$ (Bonferroni-corrected critical value, see "Data Analysis" section for details on how this value was determined), since this test represented the majority of the inferential statistics used in this study.

The two closest known studies to this current study were used to calculate the effect size for two separate power analyses. The first study was previously conducted by the researcher and

her advisor (publication forthcoming) on fifteen IDSs' perceptions of their own English scholarly writing skills via a survey before and after completing online modules designed to increase their English scholarly writing abilities. Although the current study did not involve an educational intervention, one could hypothesize that the "pre-module" group may have represented the English writing abilities of students who have no previous degree from an English-speaking institution, and the "post-module" group may have represented the English writing abilities of students who have a previous degree from an English-speaking institution (roughly research question 2a of this study). Since the writing abilities of students who did and did not have a previous degree from an English-speaking institution were not measured in this study, the use of the "pre-module" and "post-module" groups from this study allowed the researcher to measure what was expected to occur in the current study's specific methodology. Therefore, the effect size for this pre- and post-module study (Cohen's $d = .77$) was used to calculate the first power analysis for the current study. This power analysis indicated that a total sample size of 154 was needed to detect a significant difference, if one existed, in the current study.

The second study used to calculate the effect size for the second power analysis was from Xu (1991), who randomly sampled 450 international graduate students on the perceptions of their own English writing skills through a survey. Because this study only measured one group of participants once, the change in the mean and standard deviation observed between the two groups from the IDS module study (highlighted above) was used to calculate a "theoretical" second group's projected mean and standard deviation for the participants' score on the writing skills construct from the Xu (1991) study. Thus, the actual and projected mean and standard deviations from the Xu (1991) study were used to represent an estimate of what the groups'

differences observed in the current study were expected to be based on the current study's methodology. The effect size was calculated from these groups (Cohen's $d = .69$) and used to calculate a second power analysis. This power analysis revealed that a total sample of 192 was needed in this current study to detect a significant difference, if one exists. Therefore, it was estimated that a total sample size between 154 to 192 participants should have been recruited at the minimum for this current study. However, since there was no previous research to accurately estimate the effect sizes for the power analyses, the sample size estimates should be treated as vague estimates. Because of this, more participants than this estimated range were recruited to participate in this needs assessment due to the potential inaccuracy of the power analyses that were based on estimated measures.

Eligibility Questions. To self-select into the study, students were asked at the beginning of the survey, "Do you consider English your strongest language (e.g., language you are the most proficient in)?" This question was asked to categorize students as either "primary English" (students who responded their strongest language was English) or "non-primary English" (students who responded their strongest language was not English). Although the terms "native" and "non-native" speakers are used the most frequently in the field of linguistics (Otwinowska, 2016), these terms have been deconstructed by scholars such as Cook (2007), who stated that language acquisition is a multi-dimensional process that is more accurately defined through a broader definition beyond one's origin of language. Therefore, the terms "primary" and "non-primary" languages were developed for this needs assessment to more accurately define the multifaceted dimensions of participants' language acquisition.

In addition to the “strongest language” question, students answered two more questions at the beginning of the survey that determined their eligibility for participating in the study.

Through these questions, students self-identified if they were in the population under investigation. The first eligibility question asked, “Are you currently enrolled in a PhD program in the United States?”. The second eligibility question asked, “Are you an international student who is not a citizen, national, or permanent resident of the United States, or does not consider the United States your country of origin?”. The third eligibility question was the “strongest language” question that was stated previously. All three of the questions had answer options of “yes” and “no”. If students responded “yes” to the first two questions and “no” to the third question, they were eligible to complete the survey. If students answered these questions with other responses, they were not eligible to complete the survey and were directed to a screen on the survey that stated this.

Recruitment of Participants

First, content experts and individuals from the target population were recruited for the pilot study, which gathered information on the face and content validity of the survey along with any potential areas of confusion that may have occurred on the survey. After the results from the pilot study were incorporated into revising the survey, recruitment for the main study occurred. The specific details of recruiting these participants are described below.

Pilot Study. After approval was received from the University of Tennessee Institutional Review Board (IRB), the recruitment of participants for the pilot study occurred. Overall, three content experts in international graduate student writing education and two individuals from the target population (non-primary English IDSs who were currently enrolled at R1 Universities)

participated in the pilot study. Participants were recruited via email (see Appendix A for the pilot study recruitment email) through individuals already known to the researchers. Participants were reminded one week after initial contact of their invitation to participate in the pilot study if no response was received.

To ensure that the two participants for the pilot study were representative of the target population, potential participants who were not content experts were asked the same three eligibility questions that appeared at the beginning of the main survey. These eligibility questions were asked to participants in the recruitment email (see, “Sampling Methods and Participant Eligibility” for the eligibility questions). Potential participants were asked to respond to the eligibility questions by highlighting the answer in the email that best described them. If potential participants were not part of the target population, they were thanked for their time and informed that they were not eligible to participate in the pilot study. Additionally, potential participants were also emailed a copy of the pilot study informed consent to review and sign (see Appendix B). Potential participants were reminded that the information they shared was to be kept confidential and would not be shared outside of the research team. Once participants interested in participating in the pilot study emailed the researcher back their signed informed consent, they were emailed the pilot study materials, which included the Pilot Study Feedback Survey (see Appendix C) and an Excel sheet to document any suggested changes to the survey questions. Pilot study participants were each provided a \$10 Amazon gift card for appreciation of their time and expertise.

Main Study. After approval was received from the University of Tennessee Institutional Review Board (IRB), the recruitment of participants for the main study occurred through multiple direct

and indirect contact recruitment methods. Self-selection sampling with the use of gatekeepers was the first employed recruitment method in this main study. Various directors at R1 institutions were contacted, such as the directors of international houses, graduate student senates, writing centers, centers for global engagement, and student success centers. These gatekeepers were contacted by the researcher via email to see if they were willing to send out the email invitation (see Appendix D) to IDSs whom they had contact with at their institution on behalf of the researcher. The recruitment flyer for the main study (see Appendix F) was also sent to the directors and they were asked if they were willing to post the flyer in a visible area, such as including the flyer in their organization's email list or e-newsletter or including the flyer on their organization's website. Additionally, leaders of international graduate student groups, clubs, and organizations at R1 institutions were also contacted via email to see if they were willing to distribute the email invitation and recruitment flyer to their group members. The directors and leaders were reminded one week after initial contact of the invitation to send recruitment information to potential participants if no response was received.

A few weeks after the first method of recruitment efforts began, convenience sampling techniques were then employed in the main study, as the easiest to reach non-primary English IDSs, such as those active on social media and Listservs, were contacted to participate in the main study's survey (Johnson & Christensen, 2017). Specific Listservs targeted towards international students (e.g., Listservs sponsored by universities for international students) were used to send the recruitment statement (see Appendix D) to potential participants. Additionally, social media platforms, including Facebook, Twitter, Instagram, and LinkedIn were utilized to distribute both the social media recruitment statement (See Appendix E) and the recruitment

flyer (see Appendix F) to recruit potential participants. A Facebook page, along with a Twitter account and Instagram account, were specifically created by the researcher for recruitment purposes for this research study. Specific hashtags along with Facebook and LinkedIn groups targeted towards international graduate students were used when recruiting potential participants on these social media platforms. Participants were reminded one week after initial contact on the Listservs and the social media platforms of their invitation to participate in the main study.

Throughout the entire recruitment process, snowball sampling was used, which is ideal for contacting individuals that are hard to reach (Johnson & Christensen, 2017). Potential participants were asked to send the survey link to any students who they thought were eligible and interested in participating in the study in multiple ways, such as in the recruitment statement, in the closing statement if individuals were ineligible to participate in the study, and in the closing statement if students did not agree to participate in the study. Additionally, participants who chose to complete the survey were provided the survey link upon completion and asked to share the survey link with any students who they thought were eligible and interested in participating in the study. Table 3 indicates each recruitment method that was utilized in this main study, the corresponding recruitment information that was distributed to potential participants, and the sampling procedure that each recruitment method utilized.

In the informed consent for the main study (see Appendix G), participants were informed that the information they shared in the survey was kept confidential and was not shared outside of the research team. Participants were also reminded that if they felt uncomfortable answering any of the questions on the online survey (see Appendix H), they were encouraged to skip the question, or they were able to exit out of the survey entirely. The emails of participants were not

Table 3: Recruitment Methods and Sampling Procedures for the Main Study

Recruitment Method	Recruitment Information Distributed	Sampling Procedure Utilized
Institutional Directors - International Houses, Graduate Student Senates, Writing Centers, and Leaders of Student Clubs/Organizations	Recruitment Statement (Appendix D) and Recruitment Flyer (Appendix F)	self-selection sampling
Social Media – Facebook, Twitter, Instagram, LinkedIn	Social Media Recruitment Statement (Appendix E) and Recruitment Flyer (Appendix F)	convenience sampling
Listserve Targeted Towards IDSs	Recruitment Statement (Appendix D)	convenience sampling
Participants Asked to Forward Survey Link to Other Potential Participants	N/A	snowball sampling

obtained by the researcher; therefore, reminder emails contacting participants who did not yet complete the survey were not sent.

As a thank you for participants who completed the survey, a free scholarly writing guide that included videos and a handout previously developed by the researchers designed to increase international graduate students' scholarly writing skills were provided to participants.

Additionally, as an incentive to participate, students were able to enter a raffle to receive either one of 20 academic books on scholarly writing or one of 10 \$15 Amazon gift cards. Students were informed that they could enter the gift card/book raffle and/or receive the free scholarly writing guide without participating in the study, if they chose to do so.

Measures

To develop the survey for the main study, a literature review was conducted on published surveys that measured the constructs of interest in this study, including international students' perceptions of their own English writing skills, needs, and English writing skills needed for employment upon graduation. Since one single instrument did not exist that was designed to measure the three constructs of interest for this study, the researcher developed the survey through modifying questions located on existing surveys to fit this needs assessment's purpose. Additionally, the survey was modified using the feedback provided by participants in the pilot study, which will be described in detail later in this section.

The existing measurements that were used to develop the survey for this study (e.g., Butler et al., in press; Butler & Morrow, 2020; Song, 2014; Xu, 1991) were chosen because they all were designed to measure international graduate students' perceptions of their own English writing skills and needs. Many of these modifications involved changes to the question stem,

changes to make the survey question clearer, or alterations to the writing task asked in the survey question to make it more generalized to a wider audience of students from various disciplines. See Appendix I for the original source of each survey item, the original wording of each survey item, and the modified version of the survey item that appeared on this study's survey.

The remaining eleven questions on this main study's survey that did not originate from existing surveys were developed by the researcher to specifically match the unique research questions asked in this study. Since a portion of the main objective of this study was to assess the differences between IDSs' perceptions of their own English writing skills required post-PhD from different demographics, such as IDSs with academic career goals and IDSs with non-academic career goals, along with STEM major IDSs versus non-STEM major IDSs, five writing tasks supported by literature that are typically found in non-academic settings and in STEM related careers were incorporated into the survey as five unique questions.

Specifically for STEM related careers, Ramsey and Baethe (2013) suggested that business proposals are often commonly performed, which indicated a need to develop a survey question regarding this writing task. Furthermore, technical writing tasks such as developing executive summaries, social media posts, newspaper articles, and memos are common writing tasks performed in non-academic jobs, but rarely are focused on in doctoral programs (McAlpine, 2017; Woodson et al., 2018). This called into action the need for these four writing tasks to be developed into separate survey questions for the study. Additionally, from the researcher's own experience as a student in a PhD program, academic blog posts and infographics have been a portion of the tasks required of the researcher to perform in her

doctoral studies. Due to this lived experience, two separate survey questions relating to these two writing tasks were also developed for this study's survey.

Additionally, three open-ended questions were developed by the researcher and added to the end of each set of survey questions. Each question asked participants what additional information they would like to share about each construct that the survey intended to measure. The purpose of these questions was to provide the opportunity for participants to share information about each of the indented constructs measured in the survey that may have not been captured in the survey's closed-ended questions. These open-ended questions allowed for the limitations of the closed-ended questions to be minimized, since closed-ended questions limit the data collected to predefined categories of information that may not reflect participants' own meaning and personal experiences with the data (Johnson & Christensen, 2017). There was also one general question on the survey developed by the researcher that asked respondents, "What/whom has influenced your perceptions regarding your writing needs/skills?" to investigate further into how IDSs' perceptions were potentially formulated when responding to the survey questions.

Overall, the survey consisted of 25 closed-ended questions (part of two question matrices) and one open-ended question that intended to measure IDSs' perceptions of their own English writing skills. A sample question from this section is, "I can perform the following English writing skill well: drawing conclusions in my writing". There were also 25 closed-ended questions (part of two question matrices) and one open-ended question that intended to measure IDSs' perceptions of their own English writing needs. A sample question from this section is, "In order to succeed in my PhD program, I believe I must be able to develop the

following writing tasks in English well: grant writing”. Additionally, there are 27 closed-ended questions (part of two question matrices) and one open-ended question that intended to measure IDSs’ perceptions of their English writing skills needed to successfully obtain employment in their desired career. A sample question from this section is, “In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing tasks in English well: literature reviews”. The survey concluded with eleven demographic questions. All closed-ended questions in the question matrices were Likert-style questions with answer choices that ranged from “Strongly Disagree” to “Strongly Agree”. See Table 4 for the alignment of these survey questions to each of the main research questions that they corresponded to.

Since the questions on this study’s survey were developed by modifying subsets of questions from multiple existing surveys and by the researcher developing some of the survey questions, the reliability of the survey questions was originally unknown. However, an estimate of the reliability of the survey questions was made based on the original sets of survey items that the questions were mainly modified from (e.g., Butler et al., in press; Butler & Morrow, 2020). The scale of international graduate students’ perceptions of their own English writing skills from the Butler and Morrow (2020) study had an internal consistency measure of $\alpha = .87$. Additionally, from the Butler et al. study, the scale of international graduate students’ perceptions of their own English writing needs had an internal consistency measure of $\alpha = .91$, and the scale of students’ perceptions of their own English writing and communication needs required for successful employment had an internal consistency measure of $\alpha = .87$. Although these measures all indicated strong internal consistency for the survey items, these reliability

Table 4: Alignment of Survey Questions to Research Questions

Research Question	Corresponding Survey Questions
1. What are R1 non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills?	question matrices 1 and 2; question 3
2. What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?	question matrices 4 and 5; question 6
3. What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?	questions 7 and 8; question matrices 9 and 10; question 11
4. What perceived gaps are there between non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?	question matrices 1, 2, 9, and 10

measurements were only an estimate for this study's survey, as there were items deleted from the original scales and the wording of the original items was changed. These alterations to the original items may have affected the reliability of the data collected in this study (Tabachnick & Fidell, 2019). To test this, the reliability for the survey data measuring each of the intended constructs was calculated after the main study's data was collected and cleaned. The scale intended to measure IDSs' perceptions of their own English writing skills had an internal consistency measure of $\alpha = .93$, the scale intended to measure IDSs' perceptions of their own English writing needs had an internal consistency measure of $\alpha = .90$, and the scale intended to measure IDSs' perceptions of their own English writing skills needed to successfully obtain employment post-PhD had an internal consistency measure of $\alpha = .92$. Therefore, these high reliability ratings of the survey data aligned with the estimated high reliability ratings, indicating strong internal consistency for the survey items used in this main study.

Before administering the survey instrument to participants in the main study, the pilot study on this survey was conducted. A group of content experts and individuals from the target audience for the main study were recruited as participants in the pilot study. All pilot study participants received the Pilot Study Feedback Survey (see Appendix C), which was designed to assess the content validity of the survey questions from the content experts, along with the face validity of the items from the target audience. The Pilot Study Feedback Survey was also designed to gather information regarding any design issues with the survey, such as the ordering of the survey questions. Pilot study participants had nine closed-ended Likert-style questions and four open-ended questions on the feedback survey to provide their input. Pilot study participants were also provided an Excel document to suggest any changes to the wording

of the survey questions. Main themes that emerged from the feedback provided by the pilot study participants were incorporated into revising the survey.

Participant Demographics. The overall sample size³ for the main study included 356 participants from 65 various institutions across 34 states. See Figure 1 for a heat map representing the states where participants' institutions they were currently enrolled in were located. The level of intensity of the shade of green for each state on the heat map represents the number of participants who were currently enrolled in an institution located in that state. The darker green shades on the heat map represent the most common states where participants' institutions were located in, which were Michigan (n = 49, 13.8%), Virginia (n = 36, 10.1%), Florida (n = 33, 9.3%), New York (n = 32, 9%), and Indiana (n = 29, 8.1%). The sample also included 52 various languages that participants considered to be their strongest language who originated from 57 different countries around the world. The most common strongest languages reported by respondents were Chinese (n = 61, 17.5%), Spanish (n = 57, 16.3%), and Korean (n = 21, 6%).⁴ Additionally, participants' country of origin was most commonly reported as China (n = 63, 18.2%), India (n = 34, 9.8%), Colombia (n = 24, 6.9%), and South Korea (n = 21, 6.1%).

Furthermore, Table 5 presents additional demographics of participants in the sample. Overall, the majority of participants were female (62.6%), in their 2nd or 3rd year of their PhD program (22.8% of participants in both years), and in a STEM PhD program (59.6%). The mean age of respondents was 31 years old (SD = 4.84), with the age of the respondents ranging from

³ See the "Overview of Data Cleaning and Analyses" section in Chapter 4 for the data cleaning procedures that were conducted to achieve the final sample used in the main study.

⁴ Participants that identified their strongest languages as being both English and an additional language were included in the study's sample. Participants that only identified their strongest language as English were excluded from the study's sample.

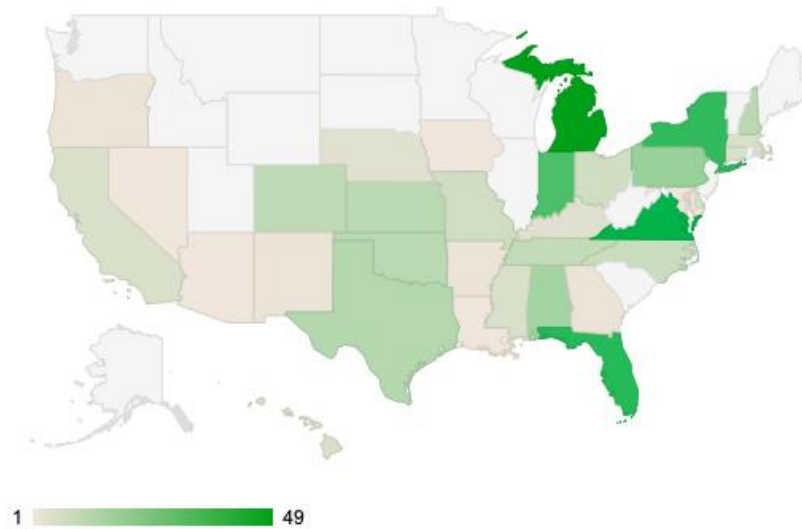


Figure 1: Heat Map of United States Indicating Location of Participants' Institutions

Table 5: Various Demographics of Participants

Student Characteristic	n	%
Biological Sex		
Male	130	36.5%
Female	223	62.6%
Current Year in PhD Program		
1 st	57	16%
2 nd	81	22.8%
3 rd	81	22.8%
4 th	62	17.4%
5 th	52	14.6%
6 th	18	5.1%
7 th	3	0.8%
8 th	1	0.3%
PhD Program in STEM		
Yes	212	59.6%
No	144	40.4%
Highest Degree Earned at Either an English-Speaking or non-English-Speaking Institution		
Bachelor's degree	45	12.6%
Master's degree	301	84.6%
Other	10	2.8%

Table 5 Continued: Various Demographics of Participants

Student Characteristic	n	%
Bachelor's or Master's Degree Earned at an English-Speaking Institution		
<i>Yes</i>	142	39.9%
<i>No</i>	214	60.1%
Plans of Obtaining Employment in a Primarily English-Speaking Country		
<i>Yes</i>	182	51.1%
<i>No</i>	35	9.8%
<i>I am undecided at this time</i>	134	37.6%
Career Plans Post-PhD		
<i>Academic</i>	199	55.9%
<i>Non-academic</i>	76	21.3%
<i>I am undecided at this time</i>	76	21.3%

*Note: The percentage total for each variable may not add up to 100% due to missing data.

22 to 48 years old. Most participants had previously earned a master's degree (84.6%) but did not previously receive their bachelor's or master's degree at a primarily English-speaking institution (60.1%). In terms of career plans, a large portion of participants planned on obtaining employment in a primarily English-speaking country upon graduation from their PhD program (51.1%). Furthermore, a little over half of participants in the sample planned on pursuing an academic career post-PhD (55.9%), while an equal number of participants planned on pursuing a non-academic career or were undecided (21.3% of participants in both categories).

Procedures and Materials

The following section describes in detail the procedures that occurred and the materials that were used in both the pilot study and the main study.

Pilot Study. After potential participants for the pilot study reviewed and signed the informed consent (see Appendix B), they were emailed three different documents: 1) a copy of the survey draft for the main study on a Word document, 2) an Excel sheet with all of the main study's survey questions and the research question they corresponded to, along with a section for participants to provide suggested modifications to the question (if applicable), and 3) the Pilot Study Feedback Survey, which was a questionnaire on a Word document with both open and closed ended questions (e.g., Likert-scale questions ranging from "Strongly Disagree" to "Strongly Agree") for participants to assess the content of the main study's survey questions and the layout/format of the survey (see Appendix C). Specifically, the questionnaire was also used to measure the content validity of the main study's survey questions that was assessed by the content experts. The questionnaire also measured the face validity of the main study's survey

questions that was assessed by the members of the target audience for the main study (e.g., non-primary English IDSs at R1 Universities).

Once participants completed the questionnaire and added any suggested changes to the survey questions on the Excel sheet, they were asked to email the researcher their two completed documents. If participants decided to not email the researcher their completed documents, then their data were destroyed and not used in the pilot study. Data collection for the pilot study occurred in September 2020.

Main Study. After potential participants for the main study clicked on the survey link on their computer, tablet, or smartphone, they were directed to the online survey, which was housed on Qualtrics. Potential participants were first directed to the three eligibility survey questions to determine if they qualified to participate in the study (see, “Sampling Methods and Participant Eligibility” for the eligibility questions). If students were not eligible to participate in the study, they were directed to a screen in the survey that stated, “Thank you for your time. Unfortunately, you are not eligible to participate in this research study. You may now exit out of your web browser.” In this case, the student’s information was deleted from the database and they were not eligible to enter the gift card/book raffle or receive the free scholarly writing guide. If students were eligible to participate in the study, they were directed to the informed consent (see Appendix G). Students were informed that they may enter the gift card/book raffle and/or receive the free scholarly writing guide without participating in the study. If students reviewed the informed consent and agreed to participate in the study, they were directed to the online survey questions (see Appendix H).

Once participants completed the online survey, they were directed to a screen in the survey that stated, “Thank you for your time. Your responses have been recorded.” The names and contact information of the researchers were provided on the screen if participants had any additional questions about the survey. Participants were also provided a link on this screen that directed them to the free scholarly writing guide composed of videos and a handout. Participants were also provided a link to the survey and were encouraged to share the survey link with other students who they thought might have been interested in participating in the study.

If participants chose to exit out of the Qualtrics survey before completing it, their responses were collected after two weeks of inactivity. Participants’ data were temporarily stored on Qualtrics until the survey was closed for participation. The quantitative data was then moved to SPSS 27 and the qualitative data was moved to Microsoft Excel for analyses. At this time, the data housed on Qualtrics was deleted. Data collection for the main study began around the middle of October 2020 and ended at the beginning of December 2020.

Data Analyses

The following section describes in detail the data analysis procedures that occurred in both the pilot study and the main study, along with the main findings from the pilot study data.

Pilot Study

Since a small number of participants were invited to participate in the pilot study (e.g., three content experts and two individuals from the target population), quantitative data (e.g., Likert-style questions) were analyzed using descriptive statistics. The means and standard deviations (SD) for each of the questions presented to participants in the pilot study questionnaire were calculated. The main findings from the quantitative questions were reviewed

and recommended changes to the main study's survey were made, as depicted in Table 6. Overall, all of the closed-ended questions had high means (between "Agree" and "Strongly Agree") and low standard deviations, with the exception of the "primary language" question ($M = 3.4$, $SD = 1.52$). Therefore, this question was altered on the main study's survey to reflect the recommendations that the pilot study participants suggested in the follow-up open-ended question, which will be explored in detail later on.

Since all of the other closed-ended pilot study questions had relatively high means and low standard deviations, no other alterations to the main study's survey were made based on these results. Additionally, this set of pilot study results indicated that the survey questions for the main study had relatively high content validity ($M = 4.67$, $SD = 0.58$), or that the questions adequately "covered" all aspects of the constructs the questions intended to measure (Chiang et al., 2015). The pilot study results also indicated that the questions had high face validity ($M = 4.5$, $SD = 0.71$), or that the questions appeared to ask the appropriate content information in order to measure the intended constructs (Chiang et al., 2015). Overall, the results from the closed-ended questions on the pilot study indicated that administering the survey for the main study was appropriate.

For the qualitative data (e.g., open-ended questions and participants' suggested modifications to the survey questions), the data were read over by the researcher and general themes from the data were developed, as indicated in Table 7. The main themes from the qualitative questions were reviewed and recommended changes to the main study's survey were made that reflected the pilot study's main findings, as depicted in Table 7 and described in detail below.

Table 6: Closed-Ended Pilot Study Data and Subsequent Changes Made to Main Study's Survey

Closed-Ended Question Stem	Mean	SD	Change Made to Main Study's Survey
I thought that the survey questions measured all facets/aspects of the content areas (e.g., constructs) (also known as content validity). <i>*Note: This question was only presented to the content experts.</i>	4.67	0.58	None
I thought that the survey questions measured the content areas (e.g., constructs) they intended to measure (also known as face validity). <i>*Note: This question was only presented to participants in the target audience.</i>	4.5	0.71	None
I thought that the survey <u>directions</u> were worded clearly.	4.6	0.55	None
I thought that the survey <u>questions</u> were worded clearly.	4.2	0.84	None
I thought that the content of the survey questions are appropriate for the intended audience (non-primary English international doctoral students).	4.8	0.45	None
I thought that it is easy for IDSs to self-identify English as their primary language(s) or not at the beginning of the survey (eligibility question number 3).	3.4	1.52	Eligibility question number 3 reworded to ask participants if they consider "English their strongest language".
I thought that the survey would take respondents the estimated time of 15 minutes to complete.	4.25	1.5	None
I thought that the order of the questions asked on the survey made logical sense.	4.75	0.5	None
I thought that the amount of questions on the survey was appropriate.	4.5	1	None
I thought that the layout of the questions made the survey easy to read.	4.75	0.5	None

**Note:* Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5).

Table 7: Open-Ended Pilot Study Data and Subsequent Changes Made to Main Study's Survey

Closed-Ended Question Stem	Main Theme(s)	Change Made to Main Study's Survey
There are different ways to ask about the English proficiency of IDSs other than asking students if English is their primary language or not (eligibility question number 3 on the survey). One of these ways is to ask IDSs if English is their strongest language. Would you suggest for the question at the beginning of the survey to be asked this way, or some other way?	• “Non-primary English” confusing • “English as your strongest language” more meaningful than “order” of languages (e.g., “primary language”) • “English as your strongest language” a clearer phrase • Add in question that strongest language refers to proficiency	Eligibility question number 3 reworded to ask participants if they consider “English their strongest language (e.g., language they are the most proficient in”).
What additional comments regarding the content of the survey questions would you like to provide?	• “I don’t know” response needed in the “employment skills” question matrices	Question matrices 9 and 10 changed to include an “I don’t know” response option.
Do you think any of the questions should be re-ordered to make more logical sense? If so, please describe in detail the question(s) that should be re-ordered and how you would suggest re-ordering the question(s) to make more logical sense.	• “Writing skills” matrices need re-ordered based on similar skills • Order makes sense	Items in question matrices 1, 4, and 9 re-ordered to categorize similar skills together (e.g., “avoiding plagiarism” and “following my field’s bibliography formatting guidelines” placed together).
What additional comments regarding the layout and/or the format of the survey questions would you like to provide?	• Add “N/A” options to question matrices	Question matrix 1 changed to include an “I have not used this writing skill in my PhD program so far” response option. Question matrix 2 changed to include an “I have not developed this writing task in my PhD program so far” response option.

One main theme that was revealed in the open-ended pilot study data, which also paralleled the results from the closed-ended data, was that all of the pilot study participants agreed that asking IDSs to self-identify if English was their primary language in the eligibility questions was “confusing”. The majority of pilot study participants recommended changing this eligibility question to ask IDSs if English was their strongest language, as pilot study participants thought this was “a clearer phrase” and provided “more meaningful” information. One participant recommended clarifying that the “strongest language refers to proficiency”, so this information was also added to the eligibility question.

Pilot study participants also expressed that some of the survey’s response options on the question matrices needed expanded to include additional options to more accurately represent participants’ experiences. Therefore, the main study’s survey was modified to include an “I don’t know” response option for question matrices 9 and 10 (perceptions of English writing skills needed for employment post-PhD). The response options of “I have not used this writing skill in my PhD program so far” and “I have not developed this writing task in my PhD program so far” were also added to question matrices 1 and 2, respectfully (perceptions of English writing skills).

Another theme that emerged from the open-ended pilot study data was that the survey questions that represented English writing skills should have been regrouped into categories that represented skills that were similar in nature. One pilot study participant argued that this reorganization “might help the respondents generate more careful responses”. Therefore, the writing skills were reorganized by categories (e.g., “avoiding plagiarism” and “following my field’s bibliography formatting guidelines” placed together) in all of the locations that the skills appeared on the survey (question matrices 1, 4, and 9). The final changes to the survey resulted

from the Excel sheets where pilot study participants were provided an opportunity to share suggestions to modify specific survey questions. Based on the pilot study data, four questions were slightly reworded on the main study's survey to provide clarification (e.g., "writing clearly" question changed to "writing with clarity") and one question was added to the survey (demographic question of "What is your country of origin?"). See Appendix H for the final survey for the main study with all modifications from the pilot study data incorporated.

Main Study

Since multiple inferential statistics were conducted in the main study on the same sample of data, which can increase the risk of a false positive occurring (e.g., Type I error), a correction to these analyses occurred using a Bonferroni adjustment (Armstrong, 2014). Using the Bonferroni correction formula, α/n , where α = the critical p value set (e.g., 0.05), and n = the number of analyses in the "family of tests" (e.g., three sets of 25 related t -tests/alternative versions of the t -test performed in this study) the Bonferroni-corrected critical value was $\alpha = .002$ for this study's analyses. However, experts have previously criticized the use of the Bonferroni correction (e.g., Armstrong, 2014; Perneger, 1998). Amongst these criticisms is that correcting multiple comparisons increases the chances of a false negative occurring, or failing to detect a statistically significant event (e.g., Type II error; McDonald, 2014). Therefore, caution was taken in this study to discuss this limitation to the analyses with the Bonferroni correction applied. Additionally, non-corrected significance values (e.g., $p \leq .05$, $p \leq .01$, and $p \leq .001$) were also reported in the results section to provide an alternative interpretation of the results.

Prior to conducting the analyses for the main study, the quantitative data were cleaned using the Twelve Steps of Data Cleaning by Morrow and Skolits (2017). The qualitative data

were cleaned by reading through the responses and deleting any identifying information (e.g., institution name, name of advisor) and replacing it with an “X”. These steps allowed for the data analyses to occur, which are described later in this section organized by the research question the analyses corresponded with. For all of the quantitative analyses in this study, SPSS 27 software for Mac was used. Microsoft Excel for Mac version 16.45 was used for all of the qualitative analyses in this study. Data analyses occurred between December 2020 to early January 2021. The planned analyses for the main study are broken down below by the research question each analysis corresponded to.

Research Question 1: What are R1 non-primary English IDSs’ perceptions of their own English writing skills? To answer this research question, the means and standard deviations were calculated for each Likert-scale question that was part of questions 1 and 2 on the survey. The open-ended qualitative question that aligned with this research question, question 3, was analyzed using thematic analysis (Braun & Clarke, 2006).

Research Question 2: What are R1 non-primary English IDSs’ perceptions of their own English writing skills needed to succeed in their PhD programs? To answer this research question, the means and standard deviations were calculated for each Likert-scale question that was part of questions 4 and 5 on the survey. The open-ended qualitative question that aligned with this research question, question 6, was analyzed using thematic analysis (Braun & Clarke, 2006).

This research question also was examined using two sub-questions. The first sub-question, *“How do IDSs’ perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not*

earn a previous degree from an English-speaking institution?” was analyzed through independent samples *t*-tests or alternative versions of the *t*-test based on assumptions that were violated (e.g., Mann-Whitney *U*-test, Welch’s *t*-test, Welch’s *t*-test on ranked data). Twenty-five independent samples *t*-tests/alternative versions of the *t*-test were analyzed, or one test for each Likert-scale question that was part of questions 4 and 5 on the survey. These analyses examined any differences between IDSs with a previous degree from an English-speaking institution and IDSs without a previous degree from an English-speaking institution on their rating of their perceived English writing needs. The second sub-question, *“How do IDSs’ perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?”* was also analyzed through 25 independent samples *t*-tests/alternative versions of the *t*-test that represented each Likert-scale question that was part of questions 4 and 5 on the survey. These analyses examined any differences between STEM major IDSs and non-STEM major IDSs on their rating of their perceived English writing needs.

Research Question 3: What are R1 non-primary English IDSs’ perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD? To answer this research question, the means and standard deviations were calculated for each Likert-scale question that was part of questions 9 and 10 on the survey. The open-ended qualitative question that aligned with this research question, question 11, was analyzed using thematic analysis (Braun & Clarke, 2006).

This research question was also examined using three sub-questions. The first sub-question, *“How do IDSs’ perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals*

versus IDSs with non-academic career goals?” was analyzed using twenty-five independent samples *t*-tests/alternative versions of the *t*-test, or one test for each Likert-scale question that was part of questions 9 and 10 on the survey. These analyses examined any differences between IDSs with an academic career goal and IDSs with a non-academic career goal on their rating of their perceived English writing skills needed to successfully obtain employment. The second sub-question, *“How do IDSs’ perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?”* was also analyzed using twenty-five independent samples *t*-tests/alternative versions of the *t*-test. These analyses examined any differences between STEM major IDSs and non-STEM major IDSs on their rating of their perceived English writing skills needed to successfully obtain employment. Finally, the third sub-question, *“How do IDSs’ perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?”* was analyzed using twenty-five independent samples *t*-tests/alternative versions of the *t*-test. These analyses examined any differences between IDSs with a previous degree from an English-speaking institution and IDSs without a previous degree from an English-speaking institution on their rating of their perceived English writing skills needed to successfully obtain employment.

Research Question 4: What perceived gaps are there between R1 non-primary English IDSs’ perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?

This final research question was analyzed by examining the differences between the means of

IDSs' perceptions of their own English writing skills needed to successfully obtain employment and the means of IDSs' perceptions of their own current English writing skills. These differences were examined for each of the 25 various writing tasks asked on the survey. These comparisons made between IDSs' perceptions of their own current skills and the skills needed for employment on each of the English writing tasks indicated perceived English writing skill gaps in IDSs. Mean differences were used to analyze this research question instead of dependent samples *t*-tests since a comparison was made between two similar, but different measurements (e.g., IDSs' perceptions of their own current writing skills and IDSs' perceptions of their own writing skills needed for employment). See Table 8 for each research question and its corresponding planned analyses, along with the data visualizations for the analyses.

Summary

This chapter briefly reintroduced the needs assessment study, its purpose, its intention, and the research questions that were explored. The research design of this study was explained, including the population and sampling procedures, how participants were recruited, the measures that were used to collect data, and the procedure for pilot testing the measures. The procedure that participants followed in the study to complete the online survey was also described. Additionally, each of the survey's statements/questions and the research question it aligned to was outlined. The main findings from the pilot study data were discussed, along with the alterations that were made to the main study's survey based on the pilot study results. The chapter concluded by discussing the data cleaning procedures, analyses, and data visualizations that were used to inform each of the main study's research questions. Overall, the research

Table 8: Analysis Plan

Research Question	Proposed Analyses	Data Visualization
1. What are R1 non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills?	means and standard deviations; thematic analysis	dot plot of means; percentage table reflecting main themes
2. What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?	means and standard deviations; thematic analysis	dot plot of means; percentage table reflecting main themes
2a. How do IDSs' perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?	independent samples <i>t</i> -tests/alternative versions of the <i>t</i> -test based on assumptions violated	report significance values; dumbbell dot plot comparing mean differences
2b. How do IDSs' perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?	independent samples <i>t</i> -tests/alternative versions of the <i>t</i> -test based on assumptions violated	report significance values; dumbbell dot plot comparing mean differences
3. What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?	means and standard deviations; thematic analysis	dot plot of means; percentage table reflecting main themes
3a. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals versus IDSs with non-academic career goals?	independent samples <i>t</i> -tests/alternative versions of the <i>t</i> -test based on assumptions violated	report significance values; dumbbell dot plot comparing mean differences
3b. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?	independent samples <i>t</i> -tests/alternative versions of the <i>t</i> -test based on assumptions violated	report significance values; dumbbell dot plot comparing mean differences
3c. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs that did not earn a previous degree from an English-speaking institution?	independent samples <i>t</i> -tests/alternative versions of the <i>t</i> -test based on assumptions violated	report significance values; dumbbell dot plot comparing mean differences

Table 8 Continued: Analysis Plan

Research Question	Proposed Analyses	Data Visualization
4. What perceived gaps are there between non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?	differences between means (perceived writing skills for successful employment and current writing skills)	table displaying values of skill gaps (differences)

design and methodology presented in this chapter provided a vehicle for uncovering information about the study's research questions, which will be presented in its entirety in Chapter 4.

CHAPTER 4

PRESENTATION OF STUDY FINDINGS

Overall, this study explored non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications. This study was conducted in order to gather additional information on IDSs to inform various gaps in the literature and to ensure an adequate alignment between the English writing support services available to non-primary English IDSs at R1 U.S. institutions, the perceptions of their own English writing skills, and their own perceived English writing skills needed to be successful in their desired career post-PhD. To shed light onto this topic, this study utilized nonexperimental quantitative survey research to conduct a national needs assessment amongst non-primary English IDSs currently enrolled at R1 U.S. institutions.

The research questions that framed the data collection for this needs assessment were the following:

- 1) What are R1 non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills?
- 2) What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?

- a. How do IDSs' perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
 - b. How do IDSs' perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?
- 3) What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?
 - a. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals versus IDSs with non-academic career goals?
 - b. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?
 - c. How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?
- 4) What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?

This current chapter presents the main study's findings and is organized into four main sections. First, a detailed description will be provided on how the quantitative and qualitative

data from this study were cleaned in order to prepare the data for the analyses. Additionally, the data analyses that correspond to each of the research questions and sub-questions for this needs assessment will then be presented. This chapter will conclude by presenting the analyses of data collected that were not directly associated with the study's research questions, along with summarizing the overall key findings from the data analyses.

Overview of Data Cleaning and Analyses

Before any data analyses of the study's main findings were conducted, the quantitative and qualitative data were first cleaned in a systematic manner, as described below. This section also briefly describes the general processes that were used to analyze the needs assessment data.

Quantitative Data

The quantitative data, which included all of the closed-ended survey questions (e.g., Likert-style questions) and the demographic questions (e.g., participants' age), were transferred from Qualtrics to SPSS 27 for Mac to conduct the data cleaning and subsequent analyses. All of the quantitative data were cleaned using the Twelve Steps of Data Cleaning by Morrow and Skolits (2017). Following these guidelines, the data were first checked for coding errors. Missing values, including responses such as "I don't know", were specified as missing in the dataset (coded as 99). Also in this step, spelling errors were corrected in the "institution name", "state", and "country" variables. Next, the data were checked for potential outliers using standardized scores (e.g., z-scores). Only the "year in program" and "age" variables were checked for outliers, as these were the only continuous variables where participants were able to write in a numeric answer, which poses the possibility of these variables having outliers. An outlier was defined for this study as a value having a z-score greater than |3.29|. Only one outlier for the age variable (z-

score = 3.57) was detected. The outlier's value was examined, and it was a potential valid age from the population of interest. Due to this, and since the age variable was only used for descriptive statistics in the analyses, the value was kept as is without any modifications (Morrow & Skolits, 2017).

Next, the normality of the dependent variables separated by the independent variable groups for the proposed independent samples *t*-tests were assessed using the Kolmogorov-Smirnov test and using the measurements of skewness and kurtosis for the variables. For all of the variables analyzed, the Kolmogorov-Smirnov test was significant ($p < .001$), indicating the data significantly deviated from normality. However, the Kolmogorov-Smirnov test is conservative, and therefore is not recommended to use as the only marker of normality (Morrow & Skolits, 2017). The skewness and kurtosis values of the variables were examined using Kim's (2013) recommendations for sample sizes greater than 300 that a skewness value greater than |2| or a kurtosis value greater than |7| indicates the data substantially deviates from normality. Overall, there were many variables that severely violated normality based on their skewness and kurtosis values (e.g., kurtosis = 30). The dependent variables grouped by the independent variables that violated normality were recorded in order to run the nonparametric version of the independent samples *t*-test, the Mann-Whitney *U*-test, during the analysis portion (Morrow & Skolits, 2017). Additionally, the sample sizes of the dependent variables separated by the independent variable groups for the proposed independent samples *t*-tests and Mann-Whitney *U*-tests were analyzed to ensure that there were adequate sample sizes in each group. For each proposed analysis, the ratio of the larger sample size to the smaller sample size did not exceed

4:1, indicating fairly equal sample sizes that required no further modifications (Morrow & Skolits, 2017).

Missing data present in the dataset were also addressed. Overall, 393 eligible participants consented to participating in the online survey. 87.5% of all the cases in the dataset had either no or one missing datapoint. All cases with more than 20% missing data present (e.g., participant abandoned survey before completion) were deleted from the dataset (Tabachnick & Fidell, 2019). This resulted in 37 participants, or 9.4% of cases, being removed from the dataset. This made the final overall sample size for the study 356 participants. Next, a missing value analysis was ran on the final sample to examine the missing data further. No variables in the dataset had 5% or more missing values and the missing data were missing completely at random (MCAR; Little's MCAR test χ^2 (3314, N = 357) = 3,398, p = .151). When 5% or less data for each variable are missing in a large dataset in a random pattern, any method utilized to treat the missing data will produce similar results in the analyses. Since this was the case for the missing data present in the dataset, missing data were handled using pairwise deletion to maximize the amount of data used in the analyses (Tabachnick & Fidell, 2019). Finally, a run of the descriptive statistics was performed on all of the variables to ensure that all changes made during the data cleaning procedures were correctly saved in the dataset.

Qualitative Data

The qualitative data, which included all of the open-ended survey questions (e.g., free response questions), were transferred from Qualtrics to Microsoft Excel for Mac version 16.44 to conduct the data cleaning and subsequent analyses. Only the responses from participants in the final sample, as described in the previous section, were used in the qualitative analyses. To clean

the qualitative dataset, all blank responses (e.g., participant did not respond to question) were deleted. Next, the responses were read by the researcher and any spelling or grammatical errors present in the data were corrected for reporting purposes. To finish the data cleaning, the responses were read by the researcher again and any identifying information present in the responses (e.g., institution name, name of advisor) was deleted and replaced with an “X” to preserve the confidentiality of the respondents’ identities (Learning for Action, n.d.). Additionally, reading over the responses as part of the data cleaning process allowed the researcher to become familiar with the data, which accounted for the initial step in the analysis process.

Specifically, all of the qualitative data were analyzed using thematic analysis. The participant responses to each individual open-ended question were coded separately. The coded responses developed were driven by the data, as general descriptions that captured the participant responses were generated by the researcher to represent the codes (Damayanthi, 2019). A maximum of two codes were applied to each response, if applicable. The researcher modified the codes as needed to more accurately capture patterns that emerged from the data. Once all of the responses were initially coded, the responses and corresponding codes were read over again by the researcher. In this iteration, similar codes were collapsed into themes. These themes and theme names were then reviewed and modified accordingly to fit the codes. Finally, the frequency percentages that each theme occurred out of all of the themes coded were calculated and vivid statement examples that represented each theme were selected (Braun & Clarke, 2006).

IDSs' Perceptions of Their Own English Writing Skills (RQ1)

To gather information on the first research question for this study, “*What are R1 non-primary English international doctoral students’ (IDSs) perceptions of their own English writing skills?*”, participants were asked on the survey to rate how strongly they agreed that they could currently perform various English writing skills and develop various English writing tasks based on the work they completed in their PhD program. Participants were also provided an open-ended survey question to share any additional information about their own perceived current English writing skills.

Table 9 presents participants’ perceptions of their own current English writing skills by providing the means and standard deviations of each survey statement, along with the total percentage of IDSs that stated they either “Agreed” or “Strongly Agreed” to the survey statement. Overall, IDSs perceived that their strongest English writing skill was their ability to avoid plagiarism (88.8% agree/strongly agree; *Mean* = 4.44, *SD* = 0.78), followed by their perceived ability to follow their field’s bibliography formatting guidelines (88.5% agree/strongly agree; *Mean* = 4.39, *SD* = 0.80). The two English writing skills that IDSs perceived as their weakest areas were writing with clarity (45.5% agree/strongly agree; *Mean* = 3.31, *SD* = 1.00) and writing without surface-level errors (37.9% agree/strongly agree; *Mean* = 3.00, *SD* = 1.15). Figure 2 compares the top three highest means that IDSs reported as their strongest areas of their current English writing skills along with the three lowest means that IDSs reported as their weakest areas of their current English writing skills.

Table 10 displays participants’ perceptions of their own current English writing skills on various writing tasks. IDSs on average perceived their own English writing skills to be high

Table 9: IDSs' Perceptions of Their Own Current English Writing Skills

Survey Statement	Percentage Agree - Strongly Agree	Mean	SD
I believe that I can perform the following English writing skills well:			
avoiding plagiarism (e.g., taking someone else's work and using it as your own work)	88.8%	4.44	0.78
following my field's bibliography formatting guidelines (e.g., APA, MLA)	88.5%	4.39	0.80
preparing an outline before writing	77.6%	4.06	0.96
organizing ideas/topics in my writing	77.3%	3.99	0.93
drawing conclusions in my writing	80.6%	3.96	0.84
synthesizing multiple sources of information in my writing	72.2%	3.88	0.96
using correct field-related vocabulary	69.6%	3.76	0.93
providing a strong argument in my writing	54.7%	3.49	1.00
writing with clarity	45.5%	3.31	1.00
writing without surface-level errors (e.g., grammar errors)	37.9%	3.00	1.15

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I have not used this writing skill in my PhD program so far (99).

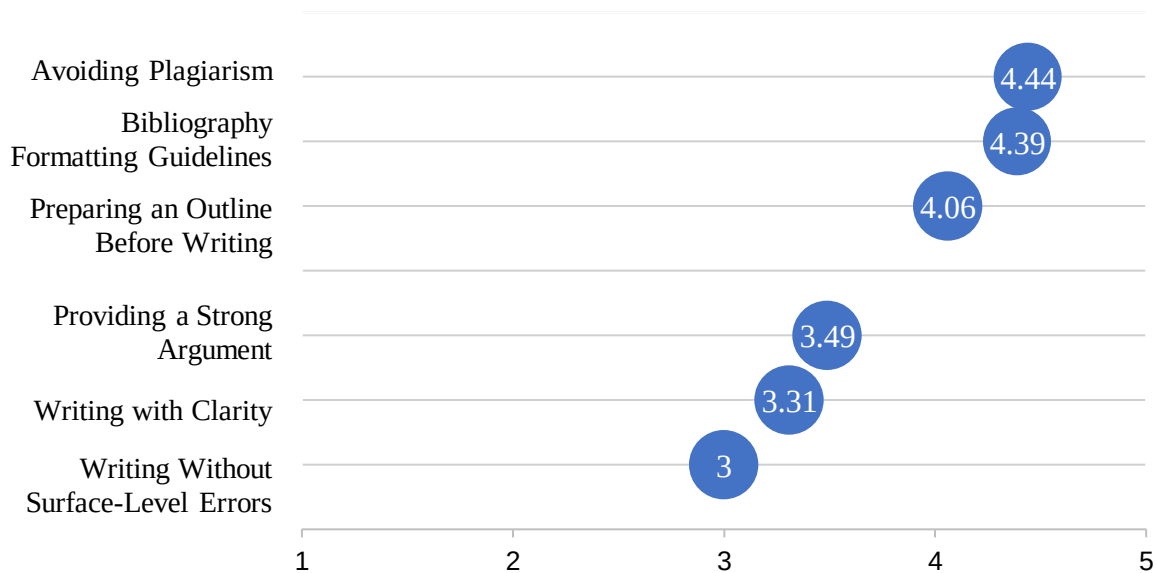


Figure 2: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of Their Own Current English Writing Skills

Table 10: IDSs' Perceptions of Their Own Current English Writing Skills on Various Writing Tasks

Survey Statement	Percentage Agree - Strongly Agree	Mean	SD
I believe that I can develop the following types of English writing tasks well:			
lab/experiment reports	61.2%	4.05	0.90
literature reviews	72.7%	3.93	0.92
abstracts	73.9%	3.87	0.90
memos	58.7%	3.86	0.81
research/project proposals	65.5%	3.81	0.97
infographics (e.g., visual representation of information)	59%	3.79	1.00
technical report writing	54.5%	3.72	0.90
social media posts	52.3%	3.69	1.00
writing for publication	62.6%	3.69	0.99
executive summaries (e.g., short document summarizing larger report)	56.7%	3.63	0.95
article critiques	48.1%	3.37	1.05
academic blog posts	37.7%	3.27	1.04
newspaper articles	28.4%	3.20	1.01
grant writing	31.5%	3.08	1.14
business proposals (e.g., written offer to a prospective sponsor)	23.3%	2.91	1.10

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I have not developed this writing task in my PhD program so far (99).

when writing lab/experiment reports (61.2% agree/strongly agree; $Mean = 4.05$, $SD = 0.90$), literature reviews (72.7% agree/strongly agree; $Mean = 3.93$, $SD = 0.92$), and abstracts (73.9% agree/strongly agree; $Mean = 3.87$, $SD = 0.90$). While formulating lab/experiment reports was rated by participants as their perceived strongest writing task based off of the means, it should be noted that 22.8% of all participants mentioned they had not yet developed this writing task in their PhD program.

Although a large percentage of IDSs stated that there were additional writing tasks they had not yet developed in their PhD program, such as business proposals (27%), grant writing (22.5%), and newspaper articles (31.5%), those that had developed these writing tasks rated them as their perceived weaker areas on average (business proposals - 23.3% agree/strongly agree; $Mean = 2.91$, $SD = 1.10$; grant writing - 31.5% agree/strongly agree; $Mean = 3.08$, $SD = 1.14$; and newspaper articles - 28.4% agree/strongly agree; $Mean = 3.20$, $SD = 1.01$). Figure 3 compares the top three highest means for tasks that IDSs reported as their strongest areas of their current English writing skills along with the three lowest means for tasks that IDSs reported as their weakest areas.

When examining the themes coded in the open-ended question prompting IDSs to share any additional information about their own perceived current English writing skills (as seen in Table 11), IDSs most commonly shared that they experienced difficulty clearly conveying ideas in their writing (15% of respondents) and difficulty with surface-level errors (14%), such as grammatical or punctuation errors. IDSs also frequently shared that they perceived general vocabulary, or “everyday” vocabulary, as difficult to master in their academic writing (13%). Some participants described this difficulty as *“hav[ing] problems in understanding ambiguous*

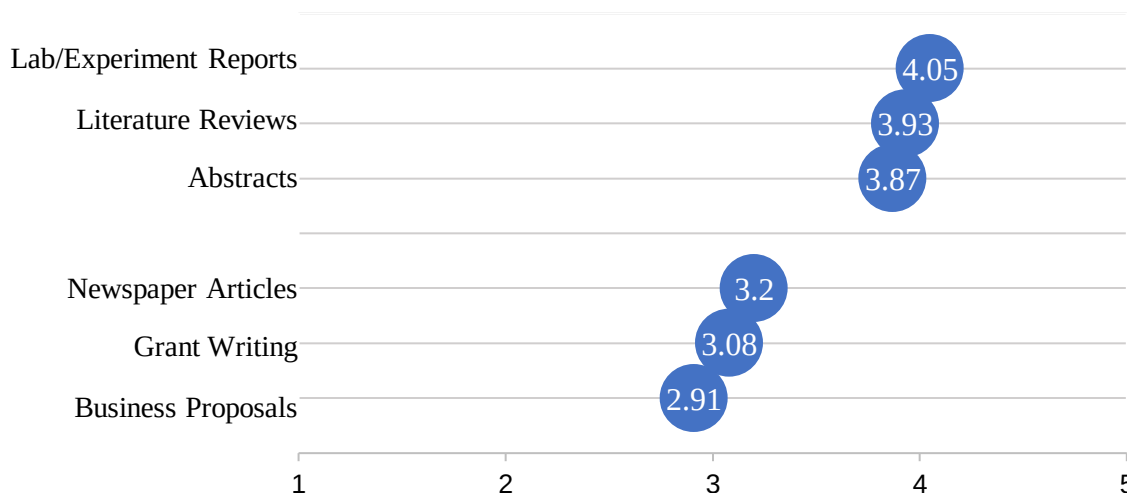


Figure 3: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of Their Own Current English Writing Skills on Various Writing Tasks

Table 11: Most Commonly Reported Themes of IDSs' Own Perceived Current English Writing Skills

Theme	Frequency Percentage	Statement Examples
Difficulty clearly conveying ideas	15%	"...I always worry if I'm not straightforward enough, if I don't sound 'native' enough, etc."
Difficulty with surface-level errors	14%	"I make grammatical errors and my depth of knowledge is questioned as a result."
General vocabulary difficult to master	13%	"...it's sometimes difficult for me to deal with the 'everyday English' within the academic writing."
Assistance needed when writing	8%	"Even though I can perform many writing tasks, I still need to use a spelling corrector, Grammarly, and my work checked by an English speaker."
More opportunities needed to improve writing skills	7%	"There are few to no classes that help grad international students to develop better writing skills."
Writing skills have improved/no challenges experienced	6%	"I have managed to improve my both oral and written skills in the past two years of my graduate studies." "...I don't see myself doing any worse at the aforementioned tasks than my classmates."

Table 11 Continued: Most Commonly Reported Themes of IDSs' Own Perceived Current English Writing Skills

Theme	Frequency Percentage	Statement Examples
Difficulty with sentence structure	6%	"...most of the corrections made to my writing comes from the order of the words in my sentences."
Additional writing time needed	6%	"It takes me at least twice the time compared with native speakers to finish my writing."
Difficulty writing in different genres	5%	"I have been trained for academic writing but when I need to write something outside of my academic discipline (newspaper articles, blog posts, etc.) I feel uncomfortable."
Lowered confidence in English writing	5%	"...I feel insecure when I have to speak/write in English."

*Note: Themes are featured within the table in order of most frequent to least frequent. Themes that occurred less than 5% were suppressed from the table. There was a total of 133 coded segments identified.

words or idioms in English” and having a “*limited vocabulary*” when writing in English. Other IDSs mentioned how they required assistance when writing in English (8%), including the use of spell checkers, grammar checking tools, assistance from their institution’s writing center, and guidance from their advisor on their writing.

IDSs’ Perceptions of Their Own English Writing Skills Needed to Succeed in Their PhD Programs (RQ2)

To gather information on the second research question for this study, “*What are R1 non-primary English IDSs’ perceptions of their own English writing skills needed to succeed in their PhD programs?*”, IDSs were asked on the survey to rate how strongly they agreed that they perceived it was important for them to perform various English writing skills and English writing tasks well in order to succeed in their PhD programs. Participants were also provided an open-ended survey question to share any additional information about their own perceptions of the English writing skills they believed were required to succeed in their own PhD program.

When IDSs were asked to rate their perceptions of the importance of performing well in various English writing skills, participants rated all of the skills as being highly important to possess in order to succeed in their PhD programs (each statement was rated as either “Agree” or “Strongly Agree” by 91% or more IDSs). The perceived top-rated English writing skills needed to succeed in IDSs’ PhD programs on average were avoiding plagiarism (96.4% agree/strongly agree; *Mean* = 4.79, *SD* = 0.57) and writing with clarity (97.1% agree/strongly agree; *Mean* = 4.78, *SD* = 0.57). See Table 12 for the data collected from these survey questions in its entirety. Additionally, IDSs were asked to rate their perceptions of the importance of performing well in various English writing tasks in order to succeed in their PhD programs. This set of questions on

Table 12: IDSs' Perceptions the English Writing Skills Needed to Succeed in Their PhD Programs

Survey Statement	Percentage Agree - Strongly Agree	Mean	SD
In order to succeed in my PhD program, I believe I must be able to perform the following writing skills in English well:			
avoiding plagiarism (e.g., taking someone else's work and using it as your own work)	96.4%	4.79	0.57
writing with clarity	97.1%	4.78	0.57
synthesizing multiple sources of information in my writing	97.4%	4.76	0.54
drawing conclusions in my writing	96.9%	4.76	0.58
providing a strong argument in my writing	95.3%	4.75	0.61
organizing ideas/topics in my writing	96.9%	4.73	0.58
using correct field-related vocabulary	96.9%	4.69	0.59
following my field's bibliography formatting guidelines (e.g., APA, MLA)	91.8%	4.62	0.68
writing without surface-level errors (e.g., grammar errors)	93.9%	4.60	0.71
preparing an outline before writing	91%	4.47	0.76

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99).

the survey produced more variation in participants' answers, as IDSs perceived writing for publication (96.9% agree/strongly agree; $Mean = 4.82$, $SD = 0.51$) and developing abstracts (96.9% agree/strongly agree; $Mean = 4.75$, $SD = 0.54$) as highly important writing tasks to possess strong skillsets in, while writing newspaper articles (38.8% agree/strongly agree; $Mean = 3.21$, $SD = 1.15$) and social media posts (38.2% agree/strongly agree; $Mean = 3.13$, $SD = 1.15$) were perceived on average lower as important writing tasks to master. Table 13 displays this data in further detail, and Figure 4 displays the three highest and lowest ranked writing tasks IDSs perceived needing to perform well on in order to succeed in their PhD programs based on the means.

When examining the themes coded in the open-ended question prompting IDSs to share any additional information about their own perceptions of the English writing skills they believed were required to succeed in their PhD programs (as seen in Table 14), IDSs most commonly perceived that structuring their English writing with clarity (17%) was key to success in their doctoral programs. Other IDSs stated that having strong support when writing in their PhD programs was important (8%), whether this support was in the form of *“a great mentor or reviewer who can give more than simple feedback”*, or professors providing *“useful and actionable feedback”* on IDSs' writing. Participants also highlighted they perceived possessing strong writing skills used for obtaining jobs (6%), like *“teaching statements, research statements, and biographies”* as important to possess. IDSs also perceived writing for a non-technical audience (6%) was a key skill to possess to succeed in their PhD programs, such as writing a manuscript for a journal *“read by teachers rather than researchers”*, which requires writing with *“more emphasis on the practical aspect of your study, rather than the theory”*.

Table 13: IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs

Survey Statement	Percentage Agree - Strongly Agree	Mean	SD
In order to succeed in my PhD program, I believe I must be able to develop the following writing tasks in English well:			
writing for publication	96.9%	4.82	0.51
abstracts	96.9%	4.75	0.54
literature reviews	95.8%	4.69	0.61
research/project proposals	95.2%	4.68	0.62
grant writing	84.8%	4.38	0.91
article critiques	77.3%	4.14	0.88
infographics (e.g., visual representation of information)	75.9%	4.06	1.03
technical report writing	70.2%	3.97	1.10
executive summaries (e.g., short document summarizing larger report)	70%	3.91	1.05
lab/experiment reports	67.2%	3.88	1.18
memos	55.7%	3.66	1.00
business proposals (e.g., written offer to a prospective sponsor)	49.7%	3.53	1.17
academic blog posts	46.1%	3.49	1.06
newspaper articles	38.8%	3.21	1.15
social media posts	38.2%	3.13	1.15

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99).

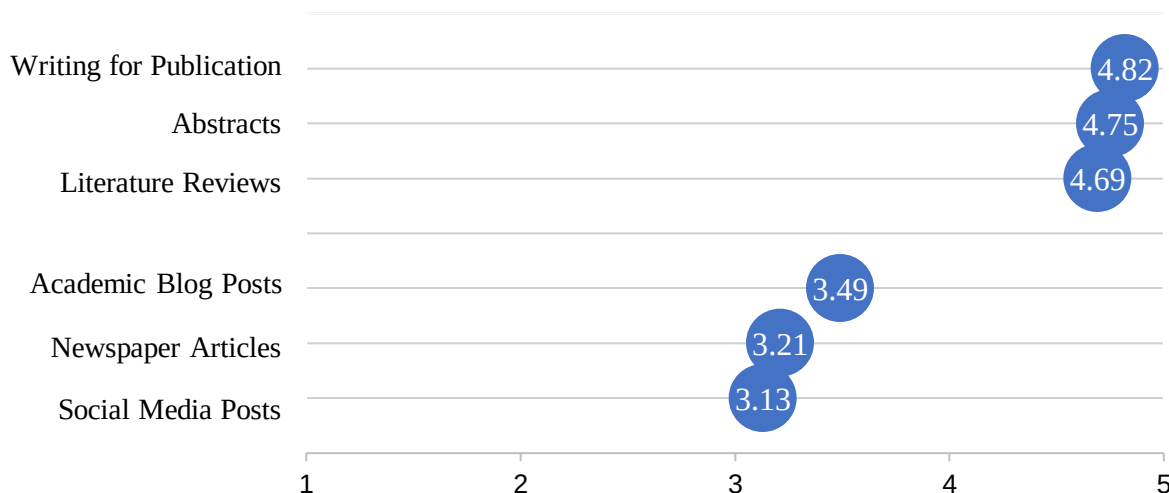


Figure 4: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Program

Table 14: Most Commonly Reported Themes of IDSs' Own Perceived English Writing Skills Needed to Succeed in Their PhD Programs

Theme	Frequency Percentage	Statement Examples
Structuring writing with clarity	17%	"The ability to write a strong, coherent, and straight story."
Having strong support when writing important	8%	"I think having a great mentor or reviewer who can give more than simple feedback would be very beneficial to me."
Publishing manuscripts	6%	"Publications is essential I believe after getting a PhD and when applying for faculty positions."
Selecting correct vocabulary	6%	"Just choosing proper vocabulary that I want to say. Sometimes, the nuance, or the context, does not completely or 100% accurately represent what you want to say or what you have in your mind because English is my secondary language."
Writing for a non-technical audience	6%	"Must understand the audience of the writing, since the nature of the program is to face a potential audience from a variety of backgrounds, not just academics."

Table 14 Continued: Most Commonly Reported Themes of IDSs' Own Perceived English Writing Skills Needed to Succeed in Their PhD Programs

Theme	Frequency Percentage	Statement Examples
Writing skills used for obtaining a job	6%	"There are some specific job application sections that require academic writing such as teaching statements, research statements, and biographies."
All skills previously mentioned in survey important	5%	"All writing skills mentioned are important to succeed in any PhD program."
Developing strong arguments	5%	"Making a strong argument and providing support for it is definitely important."
Synthesizing information	5%	"One should synthesize information and draw the outline before proceeding to the main writing."
Reasonable expectations in PhD program	5%	"The writing skills required are reasonable."

*Note: Themes are featured within the table in order of most frequent to least frequent. Themes that occurred less than 5% were suppressed from the table. There was a total of 63 coded segments identified.

English Writing Needs of IDSs Who Earned a Previous Degree from an English-speaking Institution Versus IDSs Who Did Not (RQ2a)

To answer the second research question's first sub-question, "*How do IDSs' perceptions of their own English writing needs differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs who did not earn a previous degree from an English-speaking institution?*", 25 separate independent samples *t*-tests were proposed. These proposed analyses allowed for a comparison for any potential differences between IDSs who earned a previous degree from an English-speaking institution versus those that have not on their own perceived importance of performing various English writing skills and English writing tasks well in order to succeed in their PhD programs. In the study's sample, 39.9% of IDSs previously earned a degree at a primarily English-speaking institution, while 60.1% of IDSs did not.

Assumptions. Before running the independent samples *t*-tests on the survey data for this sub-question and the additional sub-questions detailed below that involved proposed *t*-tests, several assumptions were checked to ensure that an independent samples *t*-test was appropriate to run on the data. One assumption of a *t*-test is that the dependent variable is measured on an interval or ratio scale (Gignac, 2019). Although all of the independent samples *t*-tests proposed for this study involved dependent variables measured on a 5-point ordinal scale (e.g., "Strongly Disagree" to "Strongly Agree"), researchers have previously found that an ordinal dependent variable measured on at least a 5-point scale will lead to accurate results when analyzed using a *t*-test (de Winter & Dodou, 2010). Therefore, this assumption was considered to be met for the proposed analyses.

Another assumption of the independent samples *t*-test is normality of the dependent variable in each of the independent variable groups (Gignac, 2019). The variables were previously examined for normality during data cleaning, and those variables that severely violated normality (based off of Kim's (2013) cutoffs of deviations from normality indicated by skewness values greater than |2| or kurtosis values greater than |7|) were instead analyzed using the nonparametric version of the independent samples *t*-test, the Mann-Whitney *U*-test (Morrow & Skolits, 2017). The final assumption of the independent samples *t*-test is that there is homogeneity of variance between the two groups. In cases where this assumption was violated by variables (e.g., a significant Levene's *F*-test), and when there was an unequal sample size between the two groups, the data were analyzed using a Welch's *t*-test instead of an independent samples *t*-test (Gignac, 2019).

In cases where the Mann-Whitney *U*-test was performed, the assumption of homogeneity of variance between the two groups was also tested prior to conducting the analyses. For variables which violated this assumption (e.g., a significant Levene's *F*-test based on the median and with adjusted degrees of freedom) and had an unequal sample size between the two groups, a Welch's *t*-test on the mean ranks of the data were employed. This test does not assume homogeneity of variance nor normality in the data (Gignac, 2019; Kasuya, 2001). See the "notes" section under each of the tables in this section to view the specific data that were analyzed using these alternative versions to the independent samples *t*-test.

After the analyses were completed for this sub-question, there were no statistically significant differences found between IDSs who earned a previous degree from an English-speaking institution versus those that have not on their perceptions of their own English writing

skills (e.g., avoiding plagiarism) and English writing tasks (e.g., article critiques) they need to possess in order to succeed in their PhD programs. See Tables 15 and 16 for the means and standard deviations for the data collected on each of the survey items, along with the significance values (all non-significant) calculated from the inferential statistics performed to test for any group differences.

English Writing Needs of STEM Versus non-STEM Major IDSs (RQ2b)

Similarly, to measure the second research question's second sub-question, "*How do IDSs' perceptions of their own English writing needs differ between STEM and non-STEM major IDSs?*", 25 separate independent samples *t*-tests/alternative versions of the *t*-test based on assumptions that the data violated were performed. The sample for this study was comprised of 59.6% IDSs who were a STEM PhD program versus 40.4% of IDSs who were in a non-STEM PhD program. Overall, non-STEM IDSs (mean rank = 188.07) had statistically significant higher scores than STEM IDSs (mean rank = 171.21) on their perceived importance of organizing ideas/topics in their writing, $U = 13,717.5$; $p = 0.037$, $\eta^2 = 0.012$. Based on the η^2 effect size calculated for this Mann-Whitney *U*-test, approximately 1% of the variance in IDSs' perceived importance of organizing ideas/topics in their writing to succeed in their PhD programs can be attributed to if they are in a STEM or non-STEM major. Overall, this is considered a small effect size (Cohen, 1988).

The results also indicated that non-STEM IDSs (mean rank = 187.80) had statistically significant higher scores than STEM IDSs (mean rank = 171.39) on their perceived importance of synthesizing multiple sources of information in their writing, $U = 13,756$; $p = 0.036$, $\eta^2 = 0.012$. The results of this effect size also indicated that 1% of the variance in IDSs' perceived

Table 15: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills Needed to Succeed in Their PhD Programs

Survey Statement	Previous Degree		No Previous Degree		Sig. Value
	Mean ⁵	SD	Mean	SD	
In order to succeed in my PhD program, I believe I must be able to perform the following writing skills in English well:					
avoiding plagiarism (e.g., taking someone else's work and using it as your own work) ⁺	4.80	0.54	4.79	0.59	0.99
following my field's bibliography formatting guidelines (e.g., APA, MLA) ⁺	4.59	0.73	4.64	0.65	0.71
preparing an outline before writing	4.48	0.76	4.47	0.76	0.86
organizing ideas/topics in my writing ⁺	4.75	0.55	4.71	0.60	0.55
synthesizing multiple sources of information in my writing ⁺	4.78	0.54	4.74	0.54	0.37
using correct field-related vocabulary ⁺	4.67	0.62	4.71	0.58	0.52
drawing conclusions in my writing ⁺	4.74	0.60	4.78	0.56	0.45
providing a strong argument in my writing ⁺	4.75	0.64	4.75	0.60	0.77
writing with clarity ⁺	4.82	0.55	4.76	0.59	0.17
writing without surface-level errors (e.g., grammar errors) ⁺	4.68	0.66	4.56	0.73	0.07

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: test results of $p > .05$. Therefore, no significance regarding previous degree earned at English-speaking institution and perceived English writing needs.

⁵ Technically, a Mann-Whitney *U*-test and a Welch's *t*-test on ranked data are both tests that compare the difference between two group's mean ranks instead of the difference between their means. Therefore, the means in the tables and figures in this section where either a Mann-Whitney *U*-test or a Welch's *t*-test on ranked data were performed are provided to simplify the results for conceptualization purposes only (for reporting purposes). The means did not contribute to the interpretation of either the Mann-Whitney *U*-tests or the Welch's *t*-tests on ranked data that were performed in the analyses.

Table 16: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs

Survey Statement	Previous Degree		No Previous Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to succeed in my PhD program, I believe I must be able to develop the following writing tasks in English well:					
abstracts ⁺	4.77	0.54	4.73	0.54	0.31
academic blog posts	3.55	1.09	3.45	1.05	0.40
article critiques	4.16	0.91	4.13	0.86	0.75
business proposals (e.g., written offer to a prospective sponsor)	3.53	1.19	3.53	1.15	0.99
executive summaries (e.g., short document summarizing larger report) [°]	3.84	1.14	3.96	0.98	0.29
grant writing	4.30	0.99	4.44	0.85	0.18
infographics (e.g., visual representation of information)	4.01	1.13	4.10	0.96	0.39
lab/experiment reports	3.83	1.19	3.91	1.17	0.56
literature reviews ⁺	4.73	0.56	4.67	0.63	0.59
memos	3.65	1.04	3.66	0.98	0.97
newspaper articles	3.27	1.19	3.16	1.12	0.40
research/project proposals ⁺	4.65	0.69	4.69	0.58	0.82
social media posts	3.17	1.20	3.11	1.12	0.62
technical report writing	3.96	1.08	3.97	1.11	0.91
writing for publication ⁺	4.81	0.56	4.30	0.47	0.80

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (°) were tested with a Welch's *t*-test.

****Note: *t*-test and Mann-Whitney *U*-test results of $p > .05$. Therefore, no significance regarding previous degree earned at English-speaking institution and perceived English writing needs.

importance of synthesizing multiple sources of information in their writing in order to succeed in their PhD programs can be attributed to if they are in a STEM or non-STEM major, with non-STEM majors rating this as a higher importance overall. Additionally, non-STEM IDSs (mean rank = 190.05) had statistically significant higher scores than STEM IDSs (mean rank = 170.66) on the perceptions of the importance of providing a strong argument in their writing, $U = 13,601$; $p = 0.01$, $\eta^2 = 0.019$. Around 2% of the variance in IDSs' perceived importance of providing a strong argument in their writing to succeed in their PhD programs can be attributed to if they are in a STEM or non-STEM major, which is considered a small effect size (Cohen, 1988). For the full results of the differences measured between STEM and non-STEM major IDSs on their perceptions of the English writing skills needed to succeed in their PhD programs, see Table 17.

This sub-question also measured if there were any differences between STEM and non-STEM major IDSs on their perceptions of their English writing skills on various writing tasks needed to succeed in their PhD programs. Overall, there were five survey statements that were statistically significant between the two groups, as outlined below, and also as shown in Table 18 along with Figure 5.

- STEM IDSs ($M = 3.68$, $SD = 1.09$) had statistically significant higher scores than non-STEM IDSs ($M = 3.29$, $SD = 1.24$) on their perceptions of the importance of performing well on developing business proposals in order to succeed in their PhD programs, $t(348) = -3.09$, $p = .002$, $d = 0.34$. The Cohen's d effect size indicates that on average, STEM IDSs rated their perceptions of the importance of developing business proposals 0.34 standard deviations higher than non-STEM IDSs, which is a small effect size (Cohen, 1988).

Table 17: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills Needed to Succeed in Their PhD Programs

Survey Statement	STEM Degree		Non-STEM Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to succeed in my PhD program, I believe I must be able to perform the following writing skills in English well:					
avoiding plagiarism (e.g., taking someone else's work and using it as your own work) ⁺	4.75	0.65	4.86	0.40	0.11
following my field's bibliography formatting guidelines (e.g., APA, MLA) ⁺	4.58	0.74	4.67	0.58	0.43
preparing an outline before writing	4.48	0.76	4.46	0.75	0.81
organizing ideas/topics in my writing ⁺	4.67	0.67	4.82	0.41	0.04*
synthesizing multiple sources of information in my writing ⁺	4.71	0.60	4.83	0.41	0.04*
using correct field-related vocabulary ⁺	4.71	0.62	4.67	0.56	0.25
drawing conclusions in my writing ⁺	4.72	0.67	4.83	0.42	0.26
providing a strong argument in my writing ⁺	4.67	0.71	4.86	0.40	0.01**
writing with clarity ⁺	4.75	0.62	4.83	0.49	0.21
writing without surface-level errors (e.g., grammar errors) ⁺	4.58	0.77	4.64	0.61	0.89

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney U-test.

***Note: * = $p < .05$; ** = $p < .01$.

Table 18: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs

Survey Statement	STEM Degree		Non-STEM Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to succeed in my PhD program, I believe I must be able to develop the following writing tasks in English well:					
abstracts ⁺	4.75	0.55	4.75	0.53	0.96
academic blog posts	3.58	1.05	3.36	1.07	0.06
article critiques	4.08	0.93	4.23	0.79	0.13
business proposals (e.g., written offer to a prospective sponsor)	3.68	1.09	3.29	1.24	0.002**

Table 18 Continued: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs

Survey Statement	STEM Degree		Non-STEM Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to succeed in my PhD program, I believe I must be able to develop the following writing tasks in English well:					
executive summaries (e.g., short document summarizing larger report) ^o	4.09	0.92	3.64	1.17	<.001***
grant writing	4.44	0.86	4.29	0.97	0.13
infographics (e.g., visual representation of information) ^o	4.32	0.86	3.69	1.15	<.001***
lab/experiment reports ^o	4.36	0.85	3.17	1.23	<.001***
literature reviews ⁺	4.64	0.67	4.77	0.48	0.09
memos	3.69	0.94	3.61	1.08	0.47
newspaper articles	3.23	1.11	3.17	1.20	0.60
research/project proposals ⁺	4.65	0.61	4.71	0.65	0.18
social media posts	3.21	1.10	3.02	1.21	0.13
technical report writing ^o	4.29	0.83	3.49	1.25	<.001***
writing for publication ⁺	4.81	0.54	4.84	0.47	0.65

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (°) were tested with a Welch's *t*-test.

****Note: ** = $p < .01$; *** = $p < .001$; a bolded *p*-value indicates a significant value using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

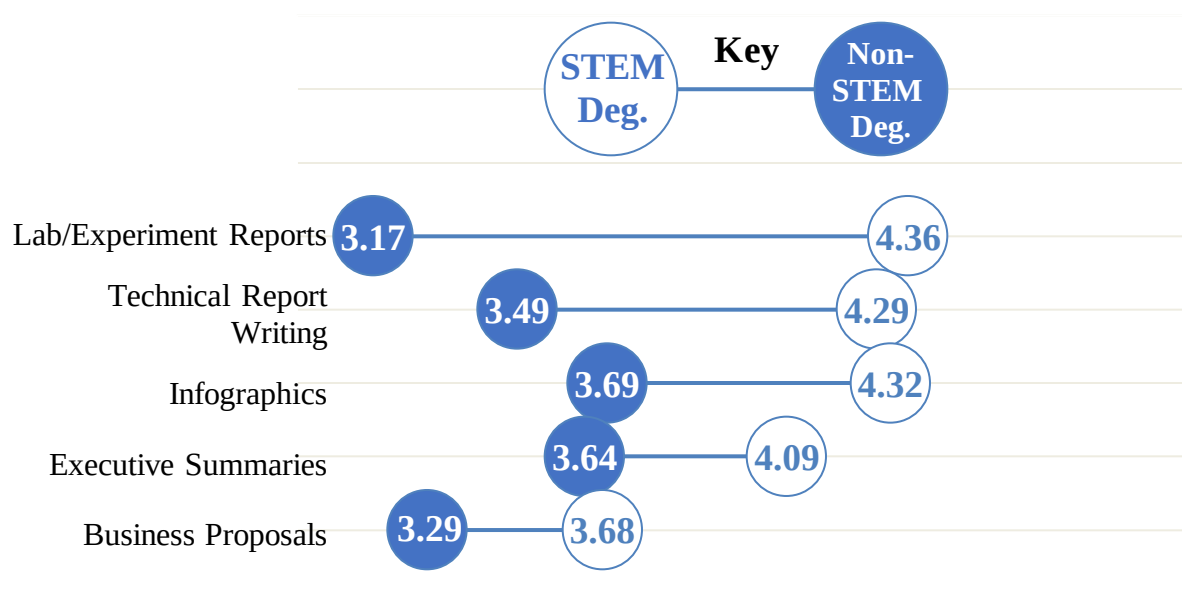


Figure 5: Top Five Largest Differences in the Means Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Succeed in Their PhD Programs

- STEM IDSs ($M = 4.09$, $SD = 0.92$) had statistically significant higher scores than non-STEM IDSs ($M = 3.64$, $SD = 1.17$) on their perceptions of the importance of performing well on developing executive summaries in order to succeed in their PhD programs, $t(256.58) = -3.88$, $p < .001$, Glass's Δ (g) = 0.49. The Glass's Δ effect size indicates that on average, STEM IDSs rated their perceptions of the importance of developing executive summaries 0.49 standard deviations higher than non-STEM IDSs, which is roughly a medium effect size (Cohen, 1988).
- STEM IDSs ($M = 4.32$, $SD = 0.86$) had statistically significant higher scores than non-STEM IDSs ($M = 3.69$, $SD = 1.15$) on their perceptions of the importance of performing well on developing infographics, $t(244.87) = -5.54$, $p < .001$, $g = 0.73$. The Glass's Δ effect size indicates that on average, STEM IDSs rated their perceptions of the importance of developing infographics 0.73 standard deviations higher than non-STEM IDSs, which is a medium effect size (Cohen, 1988).
- STEM IDSs ($M = 4.36$, $SD = 0.85$) had statistically significant higher scores than non-STEM IDSs ($M = 3.17$, $SD = 1.13$) on their perceptions of the importance of performing well on developing lab experiments/reports, $t(232.23) = -10.01$, $p < .001$, $g = 1.39$. On average, STEM IDSs rated their perceptions of the importance of developing lab experiments/reports 1.39 standard deviations higher than non-STEM IDSs, which is a large effect size (Cohen, 1988).
- STEM IDSs ($M = 4.29$, $SD = 0.83$) had statistically significant higher scores than non-STEM IDSs ($M = 3.49$, $SD = 1.25$) on their perceptions of the importance of performing well on technical report writing, $t(228.78) = -6.70$, $p < .001$, $g = 0.96$. On average, STEM IDSs rated

their perceptions of the importance of technical report writing 0.96 standard deviations higher than non-STEM IDSs, which is a large effect size (Cohen, 1988).

IDSs' Perceptions of Their Own English Writing Skills Required to Successfully Obtain Employment in Their Desired Career post-PhD (RQ3)

To gather information on the third research question for this study, “*What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?*”, participants were asked on the survey to rate how strongly they agreed that it was important that they performed various English writing skills and developed various English writing tasks well in order to successfully obtain employment in their desired career post-PhD. Participants were also provided an open-ended survey question to share any additional information about their own perceived English writing skills they believed were required to successfully obtain employment in their desired career post-PhD. For all of the analyses pertaining to this research question and its sub-questions, the entire sample of data collected was used in the analyses, including the 9.8% of IDSs that reported not planning on obtaining employment post-PhD in a primarily English-speaking country. Since this was a small percentage of the overall sample collected, these IDSs were kept in the sample used to perform the analyses.

Table 19 presents participants' perceptions of their own English writing skills needed to successfully obtain employment in their desired career post-PhD by providing the means and standard deviations of each survey statement, along with the total percentage of IDSs that stated they either “Agreed” or “Strongly Agreed” to the survey statement. For all of the writing skills participants were asked to rate on the survey, the majority of IDSs perceived that they were all

Table 19: IDSs' Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in their Desired Career Post-PhD

Survey Statement	Percentage Agree-Strongly Agree	Mean	SD
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing skills in English well:			
writing with clarity	93.6%	4.88	0.46
drawing conclusions in my writing	93%	4.87	0.47
providing a strong argument in my writing	93%	4.86	0.49
using correct field-related vocabulary	93.6%	4.83	0.49
avoiding plagiarism (e.g., taking someone else's work and using it as your own work)	90.4%	4.81	0.63
organizing ideas/topics in my writing	92.4%	4.81	0.55
synthesizing multiple sources of information in my writing	90.7%	4.81	0.57
writing without surface-level errors (e.g., grammar errors)	91%	4.73	0.64
following my field's bibliography formatting guidelines (e.g., APA, MLA)	82.8%	4.55	0.86
preparing an outline before writing	85.1%	4.55	0.80

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

important writing skills to possess (82% of IDSs or more “agreed” or “strongly agreed” with each of the survey statements). The top two highest rated writing skills based on the means that IDSs perceived were important to possess to obtain employment in their desired career post-PhD were writing with clarity (93.6% agree/strongly agree; *Mean* = 4.88, *SD* = 0.46) and drawing conclusions in their writing (93% agree/strongly agree; *Mean* = 4.87, *SD* = 0.47).

When examining IDSs’ perceptions of the English writing skills on various writing tasks needed to obtain employment in their desired career post-PhD, IDSs on average perceived developing research/project proposals (94.9% agree/strongly agree; *Mean* = 4.77, *SD* = 0.58) and abstracts (93.8% agree/strongly agree; *Mean* = 4.75, *SD* = 0.62) as the most important writing tasks to possess strong writing skills on. However, newspaper articles (48% agree/strongly agree; *Mean* = 3.54, *SD* = 1.17) and social media posts (50.9% agree/strongly agree; *Mean* = 3.57, *SD* = 1.20) were rated by IDSs as the least important writing tasks to possess strong writing skills on in order to successfully obtain employment in their desired career post-PhD. The complete set of analyses for these survey statements can be found in Table 20. Additionally, Figure 6 compares the top three highest means that IDSs perceived as important writing tasks to be able to perform well in order to obtain employment post-PhD along with the three lowest means that IDSs perceived as the least important writing tasks.

When examining the themes coded in the open-ended question prompting IDSs to share any additional information about their own perceptions of the English writing skills they believed were required to successfully obtain employment in their desired career post-PhD (see Table 21), IDSs most commonly perceived that doing so simply involved gaining additional practice or confidence in their writing (17%). As one IDS student stated, they believed that

Table 20: IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in their Desired Career Post-PhD

Survey Statement	Percentage Agree-Strongly Agree	Mean	SD
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing tasks in English well:			
research/project proposals	94.9%	4.77	0.58
abstracts	93.8%	4.75	0.62
writing for publication	91%	4.73	0.70
literature reviews	89.6%	4.63	0.76
grant writing	85.2%	4.60	0.82
executive summaries (e.g., short document summarizing larger report)	77%	4.31	0.98
infographics (e.g., visual representation of information)	80.1%	4.30	0.99
article critiques	79.2%	4.27	0.92
technical report writing	75%	4.24	1.09
business proposals (e.g., written offer to a prospective sponsor)	63.5%	4.04	1.14
memos	64.9%	4.00	1.07
lab/experiment reports	63.2%	3.97	1.24
academic blog posts	59%	3.83	1.11
social media posts	50.9%	3.57	1.20
newspaper articles	48%	3.54	1.17

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

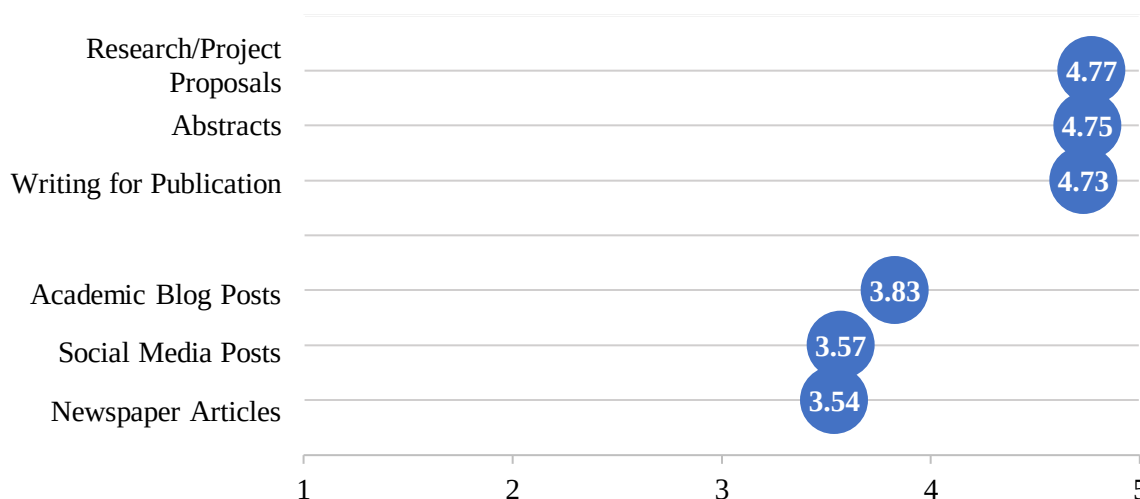


Figure 6: Top Three Highest Means and Bottom Three Lowest Means of IDSs' Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Table 21: Most Commonly Reported Themes of IDSs' Own Perceived English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Theme	Frequency Percentage	Statement Examples
Gaining additional practice/confidence in writing	17%	"With time, I believe that I will enhance my writing skills to match the standards of my research field."
N/A	12%	"I think the above items are comprehensive."
Writing publications	6%	"Having enough publications on resume/CV."
Strong writing skills needed for job documents	6%	"...you should acquire the self-promoting writing skills in job docs such as cover letters, teaching statements, research statements, and diversity statements to get yourself a position."
Additional writing assistance needed	5%	"I think I'd need more feedback from some professors regarding my English writing and oral skills. I feel that some of them only assess the content but don't give me any advice about how to improve the form."
Strong synthesizing skills	5%	"... compressing information, e.g., summarizing different sources, may be pivotal in studying potential employers and making good first impressions."

Table 21 Continued: Most Commonly Reported Themes of IDSs' Own Perceived English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Theme	Frequency Percentage	Statement Examples
Writing for appropriate audience/genre	5%	"My desired career post-PhD might need the skill to communicate with the public. Therefore, how to transform complex ideas into a common language for normal people is more important."
Writing with clarity	5%	"As a scholar, arguing my statement is very important. However, to argue my statement in a clear and logical way, good writing skills are needed."

**Note:* Themes are featured within the table in order of most frequent to least frequent. Themes that occurred less than 5% were suppressed from the table. There was a total of 78 coded segments identified.

“practice makes perfect” with their writing, which will help them gain the skills needed to obtain employment. This student also stated that they often attempted to *“try and eliminate the fear”* that surrounds them when writing in English to help further their English writing skills that they perceive are required in post-PhD jobs. IDSs also frequently stated that focusing on developing enough publications (6%) in graduate school was needed to successfully obtain employment post-PhD, along with ensuring that their writing skills used in job documents were strong (6%). Students mentioned a variety of job-related writing tasks, such as *“CVs, personal statements, personal websites”*, along with *“teaching statements, research statements, and diversity statements”* that they perceived as needing to possess strong writing skillsets on in order to successfully obtain employment in their desired career post-PhD.

Perceptions of English Writing Skills Required to Obtain Employment of IDSs with Academic Career Goals Versus IDSs with Non-academic Career Goals (RQ3a)

To answer the third research question’s first sub-question, *“How do IDSs’ perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs with academic career goals versus IDSs with non-academic career goals?”*, 25 separate independent samples *t*-tests/alternative versions of the *t*-test based on assumptions that the data violated were performed. Overall, 55.9% of respondents stated they desired to pursue an academic career post-PhD, while 21.3% of respondents desired to pursue a non-academic career. The 21.3% of respondents who stated they were *“undecided at this time”* in regard to their career plans post-PhD were excluded from the sample the analyses were performed on for this sub-question. However, the 37.6% of respondents who stated they were *“undecided at this time”* in regard to obtaining employment in a primarily English-speaking

country were included in the sample the analyses were performed on. Overall, there were five survey statements that were statistically significant between the academic and non-academic career minded IDSs on the various English writing skills measured, as outlined below.

- IDSs with academic career goals (mean rank = 132.65) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 116.18) on the perceived importance of performing well on avoiding plagiarism in order to successfully obtain employment in their desired career post-PhD, $U = 5,737$; $p = 0.004$, $\eta^2 = 0.033$. Based on the effect size calculated, approximately 3% of the variance in IDSs' perceived importance of performing well on avoiding plagiarism in order to successfully obtain employment in their desired career post-PhD can be attributed to if they have academic or non-academic career goals, which is considered to be a small effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 134.22) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 120.80) on the perceived importance of performing well on using correct field-related vocabulary in order to successfully obtain employment in their desired career post-PhD, $U = 6,069.5$; $p = 0.022$, $\eta^2 = 0.001$. However, the effect size indicates that only 0.1% of the variance measured in this survey statement can be attributed to if IDSs have academic or non-academic career goals, which is considered to be a very small effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 139.90) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 98.20) on the perceived importance of performing well on following their field's bibliography formatting guidelines, $t(99.15) = 4.77$, $p < .001$, $g = 0.63$. The Glass's Δ effect size indicates that on average, IDSs

with academic career goals rated their perceptions of the importance of performing well on following their field's bibliography formatting guidelines 0.63 standard deviations higher than IDSs with non-academic career goals, which is a medium effect size (Cohen, 1988).

- IDSs with academic career goals (mean rank = 135.55) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 115.60) on the perceived importance of performing well on drawing conclusions in their writing, $t(88.4) = 3.03$, $p = .003$, $g = 0.38$. The Glass's Δ effect size indicates that on average, IDSs with academic career goals rated this survey statement 0.38 standard deviations higher than IDSs with non-academic career goals, which is a small effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 135.70) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 118.67) on the perceived importance of performing well on providing a strong argument in their writing, $t(92.28) = 2.60$, $p = .011$, $g = 0.33$. The Glass's Δ effect size indicates that on average, IDSs with academic career goals rated this survey statement 0.33 standard deviations higher than IDSs with non-academic career goals, which is a small effect size (Cohen, 1988).

To see the full results for this sub-question, see Table 22. Additionally, Figure 7 displays the top five largest differences in the means between IDSs with academic and non-academic career goals on their perceptions of the English writing skills needed to successfully obtain employment post-PhD.

When examining the results of the inferential statistics performed to measure the differences between these two groups of IDSs on their perceptions of the English writing skills

Table 22: Differences Between IDSs with Academic and non-Academic Career Goals on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Academic Career		Non-Academic Career		Sig. Value
	Mean	SD	Mean	SD	
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing skills in English well:					
avoiding plagiarism (e.g., taking someone else's work and using it as your own work) ⁺	4.86	0.60	4.74	0.56	0.004**
following my field's bibliography formatting guidelines (e.g., APA, MLA) ^{+ °}	4.70	0.74	4.13	1.08	<.001***
preparing an outline before writing ⁺	4.56	0.83	4.50	0.79	0.30
organizing ideas/topics in my writing ⁺	4.83	0.56	4.82	0.48	0.54
synthesizing multiple sources of information in my writing ⁺	4.85	0.52	4.73	0.68	0.17
using correct field-related vocabulary ⁺	4.89	0.42	4.78	0.51	0.02*
drawing conclusions in my writing ^{+ °}	4.93	0.38	4.75	0.55	0.003**
providing a strong argument in my writing ^{+ °}	4.91	0.41	4.75	0.58	0.011*
writing with clarity ⁺	4.91	0.41	4.85	0.47	0.08
writing without surface-level errors (e.g., grammar errors) ⁺	4.77	0.58	4.73	0.61	0.34

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (°) were tested with a Welch's *t*-test.

****Note: The data of survey statements marked with a (+ °) were tested with a Welch's *t*-test on ranked data.

*****Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; a bolded *p*-value indicates a significant value using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

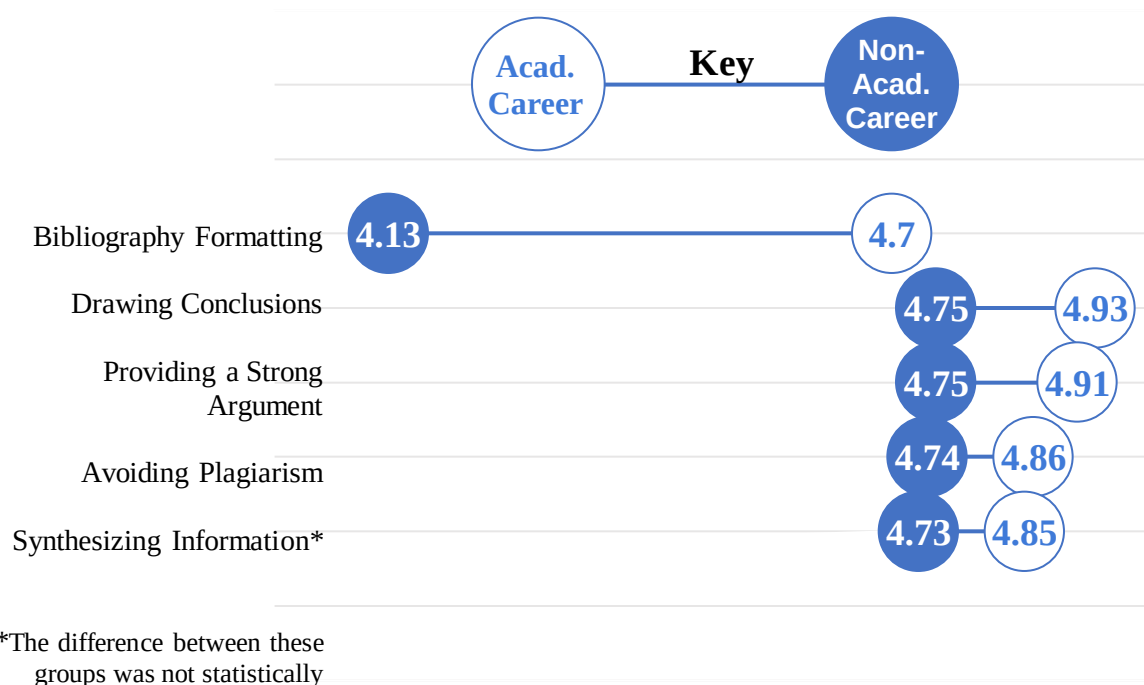


Figure 7: Top Five Largest Differences in the Means Between IDSs with Academic and non-Academic Career Goals on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

on various writing tasks needed to successfully obtain employment post-PhD, 11 out of the 15 survey statements measured had a statistically significant difference between the two groups.

The significant differences observed between the two groups are outlined below in a bullet point list. To see the full results for this sub-question, see Table 23.

- IDSs with non-academic career goals ($M = 4.49$, $SD = 0.85$) had statistically significant higher scores than IDSs with academic career goals ($M = 3.84$, $SD = 1.22$) on the perceived importance of performing well on business proposals, $t(189.72) = -4.84$, $p < .001$, $g = 0.85$; large effect size (Cohen, 1988).
- IDSs with non-academic career goals ($M = 4.66$, $SD = 0.63$) had statistically significant higher scores than IDSs with academic career goals ($M = 4.15$, $SD = 1.11$) on the perceived importance of performing well on executive summaries, $t(227.86) = -4.69$, $p < .001$, $g = 0.63$; medium effect size (Cohen, 1988).
- IDSs with non-academic career goals ($M = 4.67$, $SD = 0.62$) had statistically significant higher scores than IDSs with academic career goals ($M = 4.18$, $SD = 1.07$) on the perceived importance of performing well on infographics, $t(225.88) = -4.57$, $p < .001$, $g = 0.62$; medium effect size (Cohen, 1988).
- IDSs with non-academic career goals ($M = 4.57$, $SD = 0.81$) had statistically significant higher scores than IDSs with academic career goals ($M = 4.06$, $SD = 1.18$) on the perceived importance of performing well on technical report writing, $t(197.24) = -4.02$, $p < .001$, $g = 0.81$; large effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 149.00) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 102.00) on the perceived

Table 23: Differences Between IDSs with Academic and non-Academic Career Goals on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Academic Career		Non-Academic Career		Sig. Value
	Mean	SD	Mean	SD	
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing tasks in English well:					
abstracts ⁺ °	4.89	0.41	4.36	0.93	<.001***
academic blog posts	3.83	1.10	3.79	1.24	0.82
article critiques [°]	4.39	0.81	3.96	1.15	0.004**
business proposals (e.g., written offer to a prospective sponsor) [°]	3.84	1.22	4.49	0.85	<.001***
executive summaries (e.g., short document summarizing larger report) [°]	4.15	1.11	4.66	0.63	<.001***
grant writing ⁺ °	4.75	0.67	4.17	1.12	<.001***
infographics (e.g., visual representation of information) [°]	4.18	1.07	4.67	0.62	<.001***
lab/experiment reports	3.81	1.30	4.10	1.17	0.11
literature reviews ⁺ °	4.82	0.53	4.15	1.06	<.001***
memos	3.92	1.09	4.25	0.98	0.03*
newspaper articles	3.50	1.18	3.64	1.21	0.41
research/project proposals ⁺ °	4.89	0.41	4.51	0.75	<.001***
social media posts	3.54	1.17	3.75	1.26	0.19
technical report writing [°]	4.06	1.18	4.57	0.81	<.001***
writing for publication ⁺ °	4.95	0.33	4.26	1.04	<.001***

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (°) were tested with a Welch's *t*-test.

****Note: The data of survey statements marked with a (+ °) were tested with a Welch's *t*-test on ranked data.

*****Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; a bolded *p*-value indicates a significant value using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

importance of performing well on abstracts, $t(91.37) = 5.62, p < .001, g = 0.68$; medium effect size (Cohen, 1988).

- IDSs with academic career goals (mean rank = 144.94) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 107.64) on the perceived importance of performing well on grant writing, $t(101.85) = 4.31, p < .001, g = 0.54$; medium effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 150.46) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 95.86) on the perceived importance of performing well on literature reviews, $t(97.05) = 6.25, p < .001, g = 0.78$; large effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 146.46) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 108.16) on the perceived importance of performing well on research/project proposals, $t(91.29) = 4.68, p < .001, g = 0.58$; medium effect size (Cohen, 1988).
- IDSs with academic career goals (mean rank = 149.36) had statistically significant higher scores than IDSs with non-academic career goals (mean rank = 95.72) on the perceived importance of performing well on writing for publication, $t(77.77) = 6.56, p < .001, g = 0.79$; large effect size (Cohen, 1988).
- IDSs with non-academic career goals ($M = 4.25, SD = 0.98$) had statistically significant higher scores than IDSs with academic career goals ($M = 3.92, SD = 1.09$) on the perceived importance of performing well on memos, $t(253) = -2.25, p = .025, d = 1.06$; large effect size (Cohen, 1988).

Perceptions of English Writing Skills Required to Obtain Employment of STEM Versus non-STEM Major IDSs (RQ3b)

To answer the third research question's second sub-question, "*How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between STEM and non-STEM major IDSs?*", 25 separate independent samples *t*-tests/alternative versions of the *t*-test based on assumptions that the data violated were performed. The sample for this study was comprised of 59.6% IDSs who were a STEM PhD program versus 40.4% of IDSs who were in a non-STEM PhD program. Out of the inferential statistics performed to measure the differences between these two groups on the English writing skills measured, only one survey statement was found to be statistically significant. Non-STEM IDSs (mean rank = 177.14) had statistically significant higher scores than STEM IDSs (mean rank = 158.93) on their perceived importance of performing well on following bibliography formatting guidelines in order to successfully obtain employment in their desired career post-PhD, $U = 11,918$; $p = 0.031$, $\eta^2 = 0.014$. The effect size calculated indicates that approximately 1% of the variance measured in IDSs' perceived importance of performing well on following bibliography formatting guidelines in order to successfully obtain employment in their desired career post-PhD can be attributed to if IDSs were in a STEM or non-STEM major, which is considered to be a small effect size (Cohen, 1988). See Table 24 for the complete results of these analyses.

When measuring the differences between STEM and non-STEM IDSs on their perceptions of their English writing skills on various writing tasks needed to successfully obtain

Table 24: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Survey Statement	STEM Degree		Non-STEM Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing skills in English well:					
avoiding plagiarism (e.g., taking someone else's work and using it as your own work) ⁺	4.79	0.64	4.83	0.60	0.45
following my field's bibliography formatting guidelines (e.g., APA, MLA) ⁺	4.47	0.91	4.65	0.79	0.03*
preparing an outline before writing ⁺	4.58	0.78	4.52	0.83	0.59
organizing ideas/topics in my writing ⁺	4.79	0.57	4.84	0.52	0.32
synthesizing multiple sources of information in my writing ⁺	4.79	0.59	4.84	0.53	0.23
using correct field-related vocabulary ⁺	4.84	0.46	4.81	0.54	0.63
drawing conclusions in my writing ⁺	4.87	0.43	4.86	0.52	0.70
providing a strong argument in my writing ⁺	4.85	0.47	4.87	0.51	0.29
writing with clarity ⁺	4.88	0.42	4.87	0.51	0.72
writing without surface-level errors (e.g., grammar errors) ⁺	4.72	0.65	4.74	0.63	0.77

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (°) were tested with a Welch's *t*-test.

****Note: * = $p < .05$.

employment in their desired career post-PhD, there were many significant differences observed between the two groups. The ten different survey statements that had a statistically significant difference between STEM and non-STEM IDSs are described in a bullet point list below. To see the full results for this sub-question, see Table 25.

- STEM IDSs ($M = 3.69$, $SD = 1.19$) had statistically significant higher scores than non-STEM IDSs ($M = 3.40$, $SD = 1.19$) on the perceived importance of performing well on social media posts, $t(287.38) = -2.20$, $p = .029$, $d = 0.25$; small effect size (Cohen, 1988).
- STEM IDSs ($M = 3.93$, $SD = 1.05$) had statistically significant higher scores than non-STEM IDSs ($M = 3.68$, $SD = 1.16$) on the perceived importance of performing well on academic blog posts, $t(263.69) = -2.00$, $p = .047$, $g = 0.23$; small effect size (Cohen, 1988).
- STEM IDSs ($M = 4.21$, $SD = 0.98$) had statistically significant higher scores than non-STEM IDSs ($M = 3.79$, $SD = 1.32$) on the perceived importance of performing well on business proposals, $t(213.58) = -3.01$, $p = .003$, $g = 0.42$; small effect size (Cohen, 1988).
- STEM IDSs ($M = 4.46$, $SD = 0.81$) had statistically significant higher scores than non-STEM IDSs ($M = 4.09$, $SD = 1.17$) on the perceived importance of performing well on executive summaries, $t(209.97) = -3.10$, $p = .002$, $g = 0.45$; medium effect size (Cohen, 1988).
- STEM IDSs ($M = 4.45$, $SD = 0.81$) had statistically significant higher scores than non-STEM IDSs ($M = 4.07$, $SD = 1.18$) on the perceived importance of performing well on infographics, $t(219.68) = -3.35$, $p = .001$, $g = 0.48$; medium effect size (Cohen, 1988).
- STEM IDSs ($M = 4.33$, $SD = 0.97$) had statistically significant higher scores than non-STEM IDSs ($M = 3.40$, $SD = 1.40$) on the perceived importance of performing well on lab/experiment reports, $t(201.01) = -6.53$, $p = .001$, $g = 0.96$; large effect size (Cohen, 1988).

Table 25: Differences Between STEM and non-STEM Major IDSs on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Survey Statement	STEM Degree		Non-STEM Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing tasks in English well:					
abstracts ⁺	4.72	0.58	4.79	0.67	0.02*
academic blog posts [°]	3.93	1.05	3.68	1.16	0.05*
article critiques	4.24	0.89	4.33	0.95	0.37
business proposals (e.g., written offer to a prospective sponsor) [°]	4.21	0.98	3.79	1.32	0.003**
executive summaries (e.g., short document summarizing larger report) [°]	4.46	0.81	4.09	1.17	0.002**
grant writing ⁺	4.54	0.87	4.69	0.73	0.16
infographics (e.g., visual representation of information) [°]	4.45	0.81	4.07	1.18	.001***
lab/experiment reports [°]	4.33	0.97	3.40	1.40	<.001***
literature reviews ⁺	4.57	0.77	4.74	0.74	0.002**
memos	4.09	1.01	3.87	1.15	0.07
newspaper articles	3.62	1.13	3.41	1.24	0.10
research/project proposals ⁺	4.75	0.60	4.80	0.56	0.24
social media posts	3.69	1.19	3.40	1.19	0.03*
technical report writing [°]	4.53	0.83	3.77	1.28	<.001***
writing for publication ⁺	4.68	0.73	4.80	0.66	0.04*

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (°) were tested with a Welch's *t*-test.

****Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; a bolded *p*-value indicates a significant value using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

- STEM IDSs ($M = 4.53$, $SD = 0.83$) had statistically significant higher scores than non-STEM IDSs ($M = 3.77$, $SD = 1.28$) on the perceived importance of performing well on technical report writing, $t(193.90) = -5.99$, $p < .001$, $g = 0.91$; this is a large effect size observed (Cohen, 1988).
- Non-STEM IDSs (mean rank = 184.55) had statistically significant higher scores than STEM IDSs (mean rank = 167.49) on the perceived importance of performing well on abstracts, $U = 13,221$; $p = 0.022$, $\eta^2 = 0.015$; approximately 1% of the variance in the survey statement data can be attributed to if IDSs are in a STEM or non-STEM major; this is a small effect size observed (Cohen, 1988).
- Non-STEM IDSs (mean rank = 187.85) had statistically significant higher scores than STEM IDSs (mean rank = 162.86) on the perceived importance of performing well on literature reviews, $U = 12,270.5$; $p = 0.002$, $\eta^2 = 0.027$; roughly 3% of the variance in the survey statement data can be attributed to if IDSs are in a STEM or non-STEM major; this is a small effect size observed (Cohen, 1988).
- Non-STEM IDSs (mean rank = 181.92) had statistically significant higher scores than STEM IDSs (mean rank = 167.64) on the perceived importance of performing well on writing for publication, $U = 13,288$; $p = 0.044$, $\eta^2 = 0.012$; approximately 1% of the variance in the survey statement data can be attributed to if IDSs are in a STEM or non-STEM major; this is a small effect size observed (Cohen, 1988).

Perceptions of English Writing Skills Required to Obtain Employment of IDSs Who Earned a Previous Degree from an English-Speaking Institution Versus IDSs that Have Not (RQ3c)

To answer the third research question's final sub-question, "*How do IDSs' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD differ between IDSs who earned a previous degree from an English-speaking institution versus IDSs that did not earn a previous degree from an English-speaking institution?*", 25 separate independent samples *t*-tests/alternative versions of the *t*-test based on assumptions that the data violated were performed. In the study's sample, 39.9% of IDSs previously earned a degree at a primarily English-speaking institution, while 60.1% of IDSs did not.

Out of the inferential statistics performed to measure the differences between these two groups on the English writing skills measured, four statements were found to be significant between the groups. Overall, IDSs with a previous degree from an English-speaking institution (mean rank = 176.06) had statistically significant higher scores than IDSs without a previous degree from an English-speaking institution (mean rank = 162.69) on the perceived importance of performing well on organizing ideas/topics in their writing, $U = 14,505$; $p = 0.044$, $\eta^2 = 0.012$. The effect size calculated indicates that approximately 1% of the variance in the survey statement data can be attributed to if IDSs had a previous degree from an English-speaking institution or not, which is considered to be a small effect size (Cohen, 1988).

Additionally, IDSs with a previous degree from an English-speaking institution (mean rank = 102.50) had statistically significant higher scores than IDSs without such a degree (mean rank = 68.00) on the perceived importance of providing a strong argument in their writing in

order to obtain employment in their desired career post-PhD, $t(324.88) = 11.83, p < .001, g = 1.83$. On average, IDSs with a previous degree from an English-speaking institution rated their perceptions of the importance of providing a strong argument in their writing 1.83 standard deviations higher than IDSs without such a degree, which is a large effect size (Cohen, 1988).

Additionally, IDSs with a previous degree from an English-speaking institution (mean rank = 102.5) had statistically significant higher scores than IDSs without such a degree (mean rank = 67.5) on their perceptions of the importance of writing with clarity in order to obtain employment in their desired career post-PhD, $t(290.29) = 13.08, p < .001, g = 2.52$. The effect size calculated indicated a very large effect size (Cohen, 1988). Furthermore, IDSs with a previous degree from an English-speaking institution (mean rank = 103.50) had statistically significant higher scores than IDSs without such a degree (mean rank = 68.50) on their perceptions of the importance of writing without surface-level errors, $t(317.41) = 9.57, p < .001, g = 1.59$. The effect size calculated for this difference indicated a large effect size (Cohen, 1988). The analyses calculated for this sub-question in its entirety can be found in Table 26.

Out of the inferential statistics performed to measure the differences between these two groups on the English writing skills on various writing tasks measured, only two survey statements had a statistically significant difference between the two groups. IDSs with a previous degree from an English-speaking institution ($M = 4.40, SD = 0.88$) had statistically significant higher scores than IDSs without one ($M = 4.19, SD = 0.93$) on their perceptions of the importance of writing article critiques well in order to obtain employment in their desired career post-PhD, $t(339) = -2.17, p = .030, d = 0.24$. On average, IDSs with a previous degree from an English-speaking institution rated their perceptions of the importance of writing article critiques

Table 26: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Previous Degree		No Previous Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing skills in English well:					
avoiding plagiarism (e.g., taking someone else's work and using it as your own work) ⁺	4.87	0.49	4.76	0.70	0.18
following my field's bibliography formatting guidelines (e.g., APA, MLA) ⁺	4.57	0.89	4.53	0.85	0.33
preparing an outline before writing ⁺	4.61	0.74	4.51	0.84	0.29
organizing ideas/topics in my writing ⁺	4.87	0.47	4.77	0.60	0.04*
synthesizing multiple sources of information in my writing ⁺	4.86	0.51	4.78	0.61	0.08
using correct field-related vocabulary ⁺	4.83	0.38	4.83	0.56	0.27
drawing conclusions in my writing ⁺	4.90	0.35	4.85	0.53	0.48
providing a strong argument in my writing ⁺ °	4.91	0.31	4.82	0.57	<0.001***
writing with clarity ⁺ °	4.96	0.21	4.82	0.56	<0.001***
writing without surface-level errors (e.g., grammar errors) ⁺ °	4.85	0.45	4.65	0.73	<0.001***

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (+ °) were tested with a Welch's *t*-test on ranked data.

****Note: * = $p < .05$; *** = $p < .001$; a bolded *p*-value indicates a significant value using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

well 0.24 standard deviations higher than IDSs without such a degree, which is a small effect size (Cohen, 1988). Additionally, IDSs with a previous degree from an English-speaking institution (mean rank = 104.00) had statistically significant higher scores than IDSs without one (mean rank = 69.50) on their perceptions of the importance of writing literature reviews well in order to obtain employment in their desired career post-PhD, $t(327.46) = 8.62, p < .001, g = 1.36$. The effect size calculated for this difference indicated a large effect size (Cohen, 1988). The analyses calculated for this sub-question in its entirety can be found in Table 27.

Perceived Gaps Between IDSs' English Writing Skills and the English Writing Skills

Required to Obtain Employment in Their Desired Career post-PhD (RQ4)

To answer this study's fourth and final research question, "*What perceived gaps are there between non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?*", the means of all IDSs' perceptions of their own current English writing skills were subtracted from the means of all IDS' perceptions of their own English writing skills required to obtain employment in their desired career post-PhD. The differences calculated between these means indicated the perceived gap between IDSs' current skills and their anticipated skills that are required by their employers post-PhD. A positive difference indicated a skill gap, or that on average, IDSs stated that their anticipated English writing skills needed post-PhD were higher than their current English writing skills. A negative difference indicated an abundance of skill, or that on average, IDSs stated that their anticipated English writing skills needed post-PhD were lower than their current English writing skills.

Table 27: Differences Between IDSs Who Earned a Previous Degree from an English-speaking Institution and Those Who Did Not on their Perceptions of the English Writing Skills on Various Writing Tasks Needed to Successfully Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Previous Degree		No Previous Degree		Sig. Value
	Mean	SD	Mean	SD	
In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing tasks in English well:					
abstracts ⁺	4.78	0.62	4.72	0.62	0.12
academic blog posts	3.93	1.18	3.77	1.05	0.17
article critiques	4.40	0.88	4.19	0.93	0.03*
business proposals (e.g., written offer to a prospective sponsor)	4.02	1.18	4.06	1.12	0.79
executive summaries (e.g., short document summarizing larger report)	4.33	1.02	4.30	0.97	0.75
grant writing ⁺	4.64	0.78	4.57	0.84	0.54
infographics (e.g., visual representation of information)	4.32	1.05	4.29	0.96	0.80
lab/experiment reports	3.95	1.27	3.98	1.22	0.81
literature reviews ^{+ °}	4.75	0.71	4.56	0.79	<0.001***
memos	4.12	1.01	3.92	1.11	0.09
newspaper articles	3.54	1.19	3.53	1.16	0.91
research/project proposals ⁺	4.81	0.53	4.74	0.61	0.12
social media posts	3.57	1.19	3.58	1.21	0.97
technical report writing	4.23	1.10	4.25	1.08	0.84
writing for publication ⁺	4.75	0.71	4.72	0.70	0.42

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99), I Don't Know (99).

**Note: The data of survey statements marked with a (+) were tested with a Mann-Whitney *U*-test.

***Note: The data of survey statements marked with a (+ °) were tested with a Welch's *t*-test on ranked data.

****Note: * = $p < .05$; *** = $p < .001$; a bolded *p*-value indicates a significant value using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

Out of all of the English writing skills and writing tasks that were measured on the survey, IDSs stated on average that they perceived some level of skill gaps except on two of the writing tasks measured, which were writing lab/experiment reports (0.08 perceived level of abundance of skill) and developing social media posts (0.12 perceived level of abundance of skill). In other words, IDSs on average stated that they perceived they were *overly prepared* in these two areas of writing for their desired careers post-PhD. In contrast, the areas where IDSs stated they experienced the largest perceived skill gaps were in writing without surface-level errors (1.73 level of skill gap), writing with clarity (1.57 level of skill gap), grant writing (1.52 level of skill gap), and providing a strong argument when writing (1.37 level of skill gap). In other words, IDSs on average stated that they perceived they were *not currently adequately prepared* with their English writing skills to successfully obtain employment for their desired careers post-PhD in 23 of the 25 areas of English writing measured on the survey. See Table 28 for the full list of IDSs' perceived skill gaps in various areas of their English writing skills and see Table 29 for the full list of IDSs' perceived skill gaps in various English writing tasks.

Additional Survey Results

There was one additional open-ended question that was added to the survey, "*What/whom has influenced your perceptions regarding your writing needs/skills (e.g., feedback from your advisor)?*" that did not directly relate to one of the research questions for this study. Rather, this question was asked to participants as a more of an exploratory area that may point to areas of future research. The most commonly reported influences on IDSs' perceptions were their advisor or supervisor (44%), followed by professors or instructors of classes (15%), and their peers (14%). IDSs commonly mentioned that their peers included "*lab mates*", being

Table 28: Perceived Skill Gaps Between IDSs' English Writing Skills and the English Writing Skills Required to Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Skill Mean	Employment Skill Mean	Skill Gap
I believe that I can perform the following English writing skills well:			
avoiding plagiarism (e.g., taking someone else's work and using it as your own work)	4.44	4.81	0.37
following my field's bibliography formatting guidelines (e.g., APA, MLA)	4.39	4.55	0.16
preparing an outline before writing	4.06	4.55	0.49
organizing ideas/topics in my writing	3.99	4.81	0.82
synthesizing multiple sources of information in my writing	3.88	4.81	0.93
using correct field-related vocabulary	3.76	4.83	1.07
drawing conclusions in my writing	3.96	4.87	0.91
providing a strong argument in my writing	3.49	4.86	1.37
writing with clarity	3.31	4.88	1.57
writing without surface-level errors (e.g., grammar errors)	3.00	4.73	1.73

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99). Skill gap = employment skill mean – skill mean.

Table 29: Perceived Skill Gaps on Various Writing Tasks Between IDSs' English Writing Skills and the English Writing Skills Required to Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Skill Mean	Employment Skill Mean	Skill Gap
I believe that I can develop the following types of English writing tasks well:			
abstracts	3.87	4.75	0.88
academic blog posts	3.27	3.83	0.56
article critiques	3.37	4.27	0.90
business proposals (e.g., written offer to a prospective sponsor)	2.91	4.04	1.13
executive summaries (e.g., short document summarizing larger report)	3.63	4.31	0.68
grant writing	3.08	4.60	1.52
infographics (e.g., visual representation of information)	3.79	4.30	0.51
lab/experiment reports	4.05	3.97	-0.08

Table 29 Continued: Perceived Skill Gaps on Various Writing Tasks Between IDSs' English Writing Skills and the English Writing Skills Required to Obtain Employment in Their Desired Career Post-PhD

Survey Statement	Skill Mean	Employment Skill Mean	Skill Gap
I believe that I can develop the following types of English writing tasks well:			
literature reviews	3.93	4.63	0.70
memos	3.86	4.00	0.14
newspaper articles	3.20	3.54	0.34
research/project proposals	3.81	4.77	0.96
social media posts	3.69	3.57	-0.12
technical report writing	3.72	4.24	0.52
writing for publication	3.69	4.73	1.04

*Note: Rating scale for each statement: Strongly Disagree (1), Disagree (2), Neither Agree nor Disagree (3), Agree (4), Strongly Agree (5), Missing (99). Skill gap = employment skill mean – skill mean.

involved in “*writing groups*”, and by learning from the “*experiences from other PhD international students*”. Some IDSs mentioned that reading academic books and articles (7%) influenced their perceptions of their writing needs and skills. Reading other author’s work allowed IDSs to “*soak in a lot of styles for writing, reporting results, and analyses*”. For the full list of commonly reported themes and their percentages of occurrence in the responses to this survey question, refer to Table 30.

Summary

Overall, both closed-ended and open-ended survey questions were collected and analyzed in this study in order to shed light onto the four main research questions and their sub-questions. In total, 356 non-primary English IDSs currently studying in 65 various institutions across 34 U.S. states made up the sample that was utilized for the data analyses. Some common areas of English writing that IDSs perceived to have a lower skill ability on were writing without surface-level errors, writing with clarity, and providing a strong argument in their writing. Most IDSs perceived all of the English writing tasks and skills that were asked on the survey to be important skills to possess in order to succeed in their PhD programs, with the exception of some writing tasks, such as business proposals, executive summaries, and infographics. For these three writing tasks, non-STEM major IDSs did not perceive as strong of a need to possess skills in developing these writing tasks in order to succeed in their PhD programs as compared to STEM major IDSs.

In general, the majority of IDSs perceived the need to possess strong English writing skills in the various writing skills and writing tasks on the survey in order to successfully obtain employment in their desired careers post-PhD, with the exception of some writing tasks like developing newspaper articles and social media posts. However, there were some statistically

Table 30: Most Commonly Reported Themes on How IDSs' Perceptions of their Own Writing Skills Were Formed

Theme	Frequency Percentage	Statement Examples
Advisor/Supervisor	44%	"My advisor guided me very well."
Professors/Instructors	15%	"Feedback from course professors..."
Peers	14%	"...writing tips shared from senior PhD students..."
Reading Academic Books/Articles	7%	"When I read A LOT in preparation for my comprehensive exams, I soaked in a lot of styles for writing, reporting results, and analyses."
Committee Members	4%	"Definitely feedback from my committee members."
Journal Reviewers	4%	"Reviewers' comments on a submitted manuscript..."
Personal Experience	4%	"Personal struggles with the dissertation writing process..."
Writing Center	4%	"My university writing center has been a great source of reassurance and knowledge."

*Note: Themes are featured within the table in order of most frequent to least frequent. Themes that occurred less than 4% were suppressed from the table. There was a total of 309 coded segments identified.

significant differences observed between specific groups of IDSs on these perceptions, such as IDSs with a previous degree from an English-speaking institution having significantly higher scores than IDSs without such a degree on their perceptions of the importance of writing with clarity in order to obtain employment in their desired career post-PhD, $t(290.29) = 13.08$, $p < .001$, $g = 2.52$. When examining the survey data in general, IDSs on average stated that they perceived they were *not currently adequately prepared* to successfully obtain employment for their desired careers post-PhD in 23 of the 25 areas of English writing measured on the survey. IDSs most commonly perceived that gaining this preparation for the anticipated English writing skills required in their employment post-PhD simply involved gaining additional practice or confidence in their English writing skills and abilities.

The following chapter, which will conclude this document, will summarize this study's main findings in more detail within the context of the previous literature reviewed. The main findings of this study will also be interpreted in context of the theoretical framework used for this study. A brief discussion of this study's implications for enhancing non-primary English IDSs' doctoral experience and recommendations for future research on this topic will also be conducted in Chapter 5.

CHAPTER 5

DISCUSSION

The purpose of this current needs assessment was to measure non-primary English international doctoral students' (IDSs) perceptions of their own English writing skills, their own English writing needs in their PhD programs, and their own perceptions of the anticipated employer expectations of their English writing skills post-PhD. These students were enrolled at institutions across the United States that had R1 Doctoral University Carnegie Classifications. By further understanding non-primary English IDSs' perceived writing skill gaps, specifically students from demographics such as STEM and non-STEM major IDSs and IDSs who desire to peruse a non-academic career as opposed to an academic career, targeted academic assistance towards students' specific areas of perceived need could be provided by U.S. R1 institutions.

To gather more information on these areas, a quantitative study that employed a national survey which contained closed-ended survey questions with supplemental open-ended questions was utilized. The overall sample size collected for the study included 356 participants from 65 various R1 institutions across 34 U.S. states. The sample also included 52 various languages that participants considered to be their strongest language who originated from 57 different countries around the world. The main findings that transpired from each of the four research questions examined in this study are presented below.

Research Question 1: What are R1 non-primary English IDSs' perceptions of their own English writing skills?

IDSs' perceptions of their own current English writing skills were collected on 10 various aspects of academic English writing skills and 15 different writing tasks (e.g., abstracts).

Participants were also provided an open-ended question to share in general their perceptions of their own English writing skills. IDSs in this study's sample perceived that their strongest English writing skill was their ability to avoid plagiarism (88.8% agree/strongly agree; *Mean* = 4.44, *SD* = 0.78), followed by their perceived ability to follow their field's bibliography formatting guidelines (88.5% agree/strongly agree; *Mean* = 4.39, *SD* = 0.80). Another area that IDSs perceived to be a strength in their writing was organizing their ideas and topics (77.3% agree/strongly agree; *Mean* = 3.99, *SD* = 0.93).

These were all surprising findings, as previous studies have indicated that international graduate students experience difficulty with properly citing academic work in their writing using their field's bibliography format (Ravichandran et al., 2017), avoiding plagiarism (Hsu, 2011; Ravichandran et al., 2017; Simpson, 2018), and organizing information when writing (Sidman-Taveau & Karathanos-Aguilar, 2015). This study's sample contradicted these previous findings by non-primary English IDSs perceiving some of their strongest areas in academic writing to be in these three skills. One reason for this contradiction in findings may be due to differences in data collection methods, as the current study utilized a self-report survey, where previous studies gathered information through other methods, such as direct observation (Sidman-Taveau & Karathanos-Aguilar, 2015) and analyzing student writing samples (Sidman-Taveau & Karathanos-Aguilar, 2015; Simpson, 2018). This may potentially suggest that non-primary English IDSs perceive themselves at being stronger at such skills like avoiding plagiarism than what their actual current skillset level is.

IDSs stated that they perceived writing with clarity to be one of their weaker areas when writing in academic English (45.5% agree/strongly agree they possessed strong skills; *Mean* =

3.31, $SD = 1.00$). This finding was also reflected in the most commonly occurring theme (15%) in the open-ended question being IDSs experiencing difficulty when clearly conveying ideas in their writing. As previous researchers have indicated, academic English is often regarded as a unique and specialized writing genre (Dressen-Hammouda, 2008; Madden & Stinnett, 2016) that is rarely overtly taught to international students before beginning their higher education careers (Hsu, 2011). This may indicate why IDSs stated they find it difficult to clearly convey ideas in their writing, as non-primary English IDSs' native languages may have not emphasized a clear and concise writing style. As one IDS stated in the open-ended question, *"as a Spanish speaker, it has been hard for me to learn to be concise and avoid going through the branches when explaining an idea."* Another IDS explained that, *"...I always worry if I'm not straightforward enough, if I don't sound 'native' enough, etc."* These findings also align with previous literature that indicates IDSs often experience a bias from instructors and advisors to write in English with a greater proficiency in multilingualism than they actually possess (Kang, 2010; Rhee, 2010). These results indicate the importance of advisors and instructors of non-primary English IDSs at U.S. R1 institutions to explicitly state and instruct about the writing expectations and styles when writing in academic English in their particular field, while holding realistic expectations for non-primary English IDSs' writing abilities. This may help IDSs become more aware of the expectations of English academic writing and can allow IDSs to gain additional practice writing using the structure of this particular writing genre in a respectful and supporting environment.

Many students also expressed they perceived writing without surface-level errors to be one of their weaker skillsets (37.9% agree/strongly agree they possessed strong skills; $Mean = 3.00$, $SD = 1.15$; 14% stated area of weakness in open-ended question), which aligns with the

findings of previous researchers who indicated that international graduate students often find difficulty in using correct grammatical structures in their writing (Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015). Another area IDSs from this study's sample indicated as a challenge in their writing was mastering "everyday English" vocabulary, such as writing in more conversational tones. Previous research has indicated that international graduate students struggle with selecting the proper word choices and academic vocabulary to use in their writing (Sidman-Taveau & Karathanos-Aguilar, 2015), but this finding from the current study expands upon this research to include non-academic vocabulary as an area challenging to non-primary English IDSs as well. As one IDS stated in the open-ended question, *"I have problems understanding ambiguous words or idioms in English."* This indicates an area that merits further attention in English instruction for IDSs studying at U.S. R1 institutions.

Furthermore, IDSs on average rated their skillsets in grant writing to be one of their perceived weakest areas (31.5% agree/strongly agree they possessed strong skills; *Mean* = 3.08, *SD* = 1.14). Even more troublesome was the finding that 22.5% of IDSs in this study's sample stated that they had not yet performed any grant writing in their PhD programs thus far. Doctoral students need to fully understand how to write strong grant proposals that are worthy of funding, especially STEM-major students (Ramsey & Baethe, 2013). Therefore, these findings indicate an area of training that requires additional attention in IDSs' doctoral education. Advisors and instructors of non-primary English IDSs should take every opportunity to incorporate grant writing into IDSs' doctoral experiences, whether in their research assistantship tasks or by writing a "mock" grant proposal in a course, to strengthen IDSs' skillsets in this crucial area.

Research Question 2: What are R1 non-primary English IDSs' perceptions of their own English writing skills needed to succeed in their PhD programs?

IDSs' perceptions of the English writing skills needed to succeed in their PhD programs were collected on the same various aspects of academic English writing skills and different writing tasks that were measured in this study's first research question. Breakdowns of these questions to examine any differences between STEM and non-STEM major IDSs, along with IDSs who previously earned a bachelor's or master's degree at an English-speaking institution versus those that have not were analyzed. Participants were also provided an open-ended question on the survey to share in general their perceptions of their own English writing skills they believed were required to be successful in their PhD programs.

In general, IDSs from this study's sample perceived writing tasks that were for non-technical audiences (e.g., writing newspaper articles (38.8% agree/strongly agree; *Mean* = 3.21, *SD* = 1.15) and social media posts (38.2% agree/strongly agree; *Mean* = 3.13, *SD* = 1.15)) to be less important to possess strong skillsets on in order to succeed in their PhD programs compared to their perceptions of the importance of possessing strong skillsets on technical writing tasks (e.g., writing for publication (96.9% agree/strongly agree; *Mean* = 4.82, *SD* = 0.51) and developing abstracts (96.9% agree/strongly agree; *Mean* = 4.75, *SD* = 0.54)). One explanation for why IDSs in this study's sample perceived writing tasks for non-technical audiences to be less important to possess strong skillsets on is that a large percentage of IDSs stated that they had not yet performed these non-technical writing skills in their PhD programs (e.g., 27% of IDSs had not yet developed a business proposal and 31.5% had not yet written a newspaper article).

This finding aligns with previous literature that indicated that writing for a broad audience is a skillset rarely focused upon in doctoral programs (McAlpine, 2017).

However, all doctoral students, including IDSs, need to receive adequate training to write and effectively communicate their research to non-technical audiences, as this is a crucial skillset to possess (Kloepper, 2017). Therefore, this indicates a need for IDSs at U.S. R1 institutions to receive formal training on writing for non-technical audiences while enrolled in their PhD programs. Program coordinators and department heads should consider adding required coursework to doctoral programs that specifically focuses on instructing about and providing assistance on non-technical writing to enhance IDSs' abilities to be strong communicators of their research to broad audiences.

On average, IDSs in this study's sample perceived all of the English writing skills asked on the survey as being highly important to possess in order to succeed in their PhD programs, as each statement was rated as either "Agree" or "Strongly Agree" by 91% or more IDSs. Students specifically stated that writing with clarity (97.1% agree/strongly agree; *Mean* = 4.78, *SD* = 0.57) was an important area to possess a strong skillset on. This finding was also reiterated in the open-ended question that asked IDSs' perceptions of their own English writing skills they believed were required to be successful in their PhD programs, as the most commonly reported theme was structuring writing with clarity (17%). This finding is concerning, as IDSs perceived writing with clarity as one of their weakest areas of skill. This may indicate a mismatch between IDSs' perceived current skillsets and the perceived skillsets needed to succeed in their PhD programs, indicating an area of need for focus on additional educational workshops and trainings at U.S. R1

institutions that target non-primary English IDSs' abilities to write with clarity on writing tasks they commonly perform in their PhD programs.

When examining IDSs in this study's sample who earned a previous bachelor's or master's degree at a primarily English-speaking institution as opposed to IDSs who did not, there were no statistically significant differences between these groups' perceptions of the English writing skills they needed to be successful in their PhD programs. Although a previous study indicated that international graduate students' English proficiency is significantly correlated with the amount of time they spend in the U.S. (Bastien et al., 2018), non-primary English IDSs who have not earned a previous bachelor's or master's degree at a primarily English-speaking institution before attending their PhD programs at R1 institutions may not perceive that they have any unique English writing needs in order to succeed in their PhD programs.

An area of difference that was observed in IDSs' perceptions of their own English writing skills needed to be successful in their PhD programs occurred between STEM and non-STEM major IDSs in this study's sample. This finding aligns with scholars that previously emphasized that academic English writing styles often vary by academic discipline (Moon et al., 2020; Xu & Hu, 2019), indicating that different fields commonly structure their writing in ways that emphasize the need to master specific writing techniques compared to other fields. Some of these significant differences observed included non-STEM IDSs perceiving organizing ideas in their writing ($p = 0.04$), synthesizing information ($p = 0.04$), and providing a strong argument in their writing ($p = 0.01$)⁶ to be more important skillsets to possess in order to succeed in their PhD

⁶ These three differences between STEM and non-STEM IDSs were not statistically significant using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

programs than STEM IDSs, albeit these were all small effect sizes that were observed in the differences between the two groups ($\eta^2 = 0.012$, $\eta^2 = 0.012$, and $\eta^2 = 0.019$, respectively), indicating that these findings do not hold much practical significance. The small effect sizes also indicate that *both* STEM and non-STEM IDSs perceived these writing skills to be important to succeed in their PhD programs, but there is just a small difference between these groups' perceptions.

A potential explanation for why non-STEM IDSs perceived providing a strong argument in their writing to be slightly more important in their PhD programs may be attributed to STEM IDSs potentially having increased interactions with their supervisor due to working on grants together more so than non-STEM IDSs (Le & Gardner, 2010). This may pose additional cultural tensions in regards to writing between STEM IDSs and their supervisors, which may lead to STEM IDSs not taking full ownership of their writing (Wang & Li, 2011) and perceiving less of a need to provide strong arguments in their writing. However, information on this area is not well known and could benefit from additional research examining these cultural differences in writing that may be more present in STEM major IDSs whose primary language is not English.

One finding from this current study that was surprising was that there were no statistically significant differences between STEM and non-STEM IDSs in their perceptions of needing to avoid plagiarism well in order to succeed in their PhD programs. A previous study indicated that STEM IDSs experienced additional difficulties in plagiarism and thus a heightened demand in avoiding plagiarism in their writing during graduate school more so than non-STEM IDSs experienced (Simpson, 2018). However, this was not found in this study's sample.

Furthermore, STEM IDSs from this study's sample in general perceived that possessing strong skills to develop a business proposal was important to succeed in their PhD programs more so than non-STEM IDSs, although a small effect size between the two groups was observed ($p = .002$, $d = .34$). This result is backed by scholars that have indicated that STEM students often need to possess stronger technical writing skillsets due to the highly narrow scope of most STEM fields (Le & Gardner, 2010). This finding from the study is somewhat concerning, as IDSs in general stated that developing a business proposal was their perceived weakest skillset out of all of the writing tasks presented to them on the survey (23.3% agree/strongly agree they possessed strong skills; $Mean = 2.91$, $SD = 1.10$). Therefore, PhD instructors and program coordinators in U.S. R1 institutions, especially those in STEM fields, should consider adding additional opportunities in their doctoral coursework and programs to allow non-primary English IDSs to gain experience writing and receiving constructive feedback on developing a well-constructed business proposal in order to improve their skillsets to meet the level of need to succeed in their PhD programs.

Research Question 3: What are R1 non-primary English IDSs' perceptions of their own English writing skills required to successfully obtain employment in their desired career post-PhD?

IDSs' perceptions of the English writing skills needed to successfully obtain employment in their desired career post-PhD were collected on the same various aspects of academic English writing skills and different writing tasks that were measured in this study's first and second research questions. Breakdowns of these questions to examine any differences between IDSs with academic and non-academic career goals, STEM and non-STEM major IDSs, and IDSs

who previously earned a bachelor's or master's degree at an English-speaking institution versus those that have not were analyzed. Participants were also provided an open-ended question on the survey to share in general their perceptions of their own English writing skills they believed were required to successfully obtain employment in their desired career post-PhD.

Overall, IDSs perceived that all of the writing skills asked on the survey were important to possess in order to obtain a job in their desired career path after graduation, especially writing with clarity (93.6% agree/strongly agree; *Mean* = 4.88, *SD* = 0.46). Once again, this finding is troubling, as IDSs perceived writing with clarity as one of their weakest areas of skill. This may indicate a mismatch between non-primary English IDSs' perceived current skillsets and the perceived skillsets needed to successfully obtain employment in their desired career post-PhD. This reiterates the need for additional focus on educational workshops and trainings at U.S. R1 institutions that focus on strengthening non-primary English IDSs' abilities to write with clarity while in graduate school to adequately prepare them for their careers.

In general, IDSs' perceptions of the types of English writing tasks they needed to possess strong skillsets on in order to successfully obtain employment in their desired careers post-PhD were very similar to the writing tasks they perceived as needing to possess strong skillsets on in order to succeed in their PhD programs. IDSs stated that developing research/project proposals (94.9% agree/strongly agree; *Mean* = 4.77, *SD* = 0.58), abstracts (93.8% agree/strongly agree; *Mean* = 4.75, *SD* = 0.62), and developing publications (6% stated in open-ended question) were important writing tasks to perform well on in order to achieve employment post-PhD, while writing newspaper articles (48% agree/strongly agree; *Mean* = 3.54, *SD* = 1.17) and social media posts (50.9% agree/strongly agree; *Mean* = 3.57, *SD* = 1.20) were not as highly needed skillsets.

These findings may potentially indicate that a false message is being communicated to IDSs that writing for non-technical audiences, such as writing newspaper articles, is not an important skillset to possess to obtain employment post-PhD, when in fact, this is a crucial ability to possess no matter IDSs' chosen career path (Kloepper, 2017). This message may be transmitted to IDSs by the lack of non-technical writing often produced in their PhD programs (e.g., 27% of IDSs had not yet developed a business proposal and 31.5% had not yet written a newspaper article), which may be contributing to IDSs' perceptions that these skills will not be readily used in their careers. This indicates the importance of instructors of IDSs at U.S. R1 institutions incorporating writing assignments into their courses that provide students the opportunity to practice writing to communicate their research to non-technical audiences.

When examining the open-ended question that corresponded to this research question, the theme that occurred most frequently was IDSs perceiving that they needed additional practice/confidence in their writing (17% stated in open-ended question) in order to successfully obtain employment in their desired career post-PhD. Similarly, another theme that emerged from this question was IDSs stating that they perceived needing additional writing assistance (5% stated in open-ended question) in order to be prepared for the writing demands they perceived to be part of their desired careers after graduation. These themes also occurred in the open-ended questions that corresponded with the first and second research questions. IDSs also stated that their perceptions of their own writing skills were most commonly formed by their advisor or supervisor (44%), professors or instructors (15%), and their peers (14%).

Synthesizing these findings together indicate that IDSs are most greatly shaped in regard to their writing skills by their advisor or supervisor, which emphasizes the importance of having

a supportive mentor that can provide IDSs the adequate additional writing assistance and practice IDSs perceive they need for their careers post-PhD. To provide quality mentorship to IDSs, researchers such as Moon and colleagues (2020) have suggested that mentors should focus less on correcting IDSs' grammatical errors present in their writing and focus more on providing guidance on structuring IDSs' writing to fit the specific guidelines followed in a particular academic field. IDSs in this study's sample reflected this finding from the literature. As one IDS stated, *"I feel that some of them [professors] only assess the content but don't give me any advice about how to improve the form [of my writing]."* Another IDS student described that having *"a great mentor or reviewer who can give more than simple feedback"* was key to success in their writing tasks performed in their PhD programs. This indicates that non-primary English IDSs' advisors and instructors, along with writing centers at U.S. R1 institutions, should strive to provide feedback on IDSs' writing that is focused on following the academic writing structure that is commonly found in the student's field. Not only may this assist IDSs in their success in graduate school but may also assist in their ability to successfully obtain employment in their desired career post-PhD.

Furthermore, the finding that IDSs' perceptions of their writing skills are also shaped by their peers, such as by *"lab mates"* and being involved in *"writing groups"*, indicates the importance of providing multiple opportunities for non-primary English IDSs to collaborate with other doctoral students on writing tasks. This may not only provide IDSs with additional practice they perceive they need in their writing to be adequately prepared for their jobs but also boost their confidence in their writing abilities. PhD programs that stress student collaboration on writing tasks, such as developing manuscripts and posters to present at conferences, may also

provide the added benefit of expanding IDSs' social networks, as language and cultural barriers can make it difficult for students to connect with others (Smith & Khawaja, 2011).

When examining the differences between IDSs with academic career goals and IDSs with non-academic career goals on their perceptions of the English writing skills needed to succeed in their careers post-PhD, there were several significant differences observed. Not only does this information fill the gap in the literature that previously existed regarding the specific writing skills required in non-academic careers post-PhD (McAlpine, 2017), but this information also provides insight into areas of targeted writing assistance that can be provided to specific groups of IDSs. One of the differences observed between the groups in this study's sample was that non-academic career goal IDSs perceived technical writing tasks, such as writing executive summaries ($p < .001$, $g = 0.63$), business proposals ($p < .001$, $g = 0.85$), and memos ($p = .025$, $d = 1.06$)⁷, to be more important to possess strong writing skills on in order to obtain employment in their desired career compared to academic career goal IDSs. This aligns with the literature which states that succinct, technical writing tasks are more commonly performed in non-academic jobs (McAlpine, 2017).

However, these technical writing tasks that non-academic career IDSs perceived to be more important to obtain employment appear to not be heavily focused upon in IDSs' PhD programs (e.g., 55.7% of IDSs agreed/strongly agreed that memos were important writing tasks to develop well in order to succeed in their PhD programs) and that IDSs do not perceive themselves as possessing strong abilities in these specific writing tasks (e.g., 23.3% of IDSs

⁷ The difference between academic and non-academic career goal IDSs on their perceptions of possessing strong skillsets to develop memos in order to obtain employment in their desired career was not statistically significant using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

agreed/strongly agreed that they could develop a business proposal well). The results from this study also align with the literature that indicates non-academic writing tasks are often not focused upon in doctoral programs (Woodson et al., 2018). This finding should call into action instructors of IDSs at U.S. R1 institutions to incorporate these technical writing tasks into their writing assignments in courses they teach. Encouraging IDSs to communicate their research findings through a business proposal goes beyond the “traditional” research paper assignment. This would provide non-academic career goal IDSs with the opportunity to develop these crucial writing skills which promote the dissemination of their research to a broader audience, which will be required in their future careers.

Furthermore, academic career goal IDSs in this study’s sample perceived that it was more important to possess strong writing skills with grant writing and writing for publication in order to obtain employment in their desired career compared to non-academic career goal IDSs ($p < .001$, $g = 0.54$; $p < .001$, $g = 0.79$, respectfully). This aligns with previous findings that recent PhD graduates in academic careers rated publishing and grant writing to be more important skills to possess to be successful in their careers than PhDs in non-academic careers (Morrison et al., 2011). The finding from this study’s sample that academic career goal IDSs perceived writing for publication as highly needed skills to possess may explain why this same group of IDSs perceived avoiding plagiarism⁸ and following the correct bibliography formatting guidelines in their writing as more important in their careers post-PhD than non-academic career goal IDSs ($p = 0.004$, $\eta^2 = 0.033$; $p < .001$, $g = 0.63$, respectfully). These are two skillsets that are

⁸ The difference between academic and non-academic career goal IDSs on their perceptions of possessing strong skillsets on avoiding plagiarism in order to obtain employment in their desired career was not statistically significant using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

considerably relied upon when writing for publication. This finding indicates that not only should the specific writing structure when developing manuscripts for publication be overtly taught to IDSs, especially for academic career goal IDSs, but also the skillsets that are utilized when writing for publication, such as correctly citing others' work, should also be focused upon as an additional area of writing assistance provided to IDSs.

There were additional differences observed between STEM and non-STEM major IDSs in their perceived English writing skills needed to succeed in their careers post-PhD. These differences observed in this study's sample included STEM IDSs perceiving technical writing skills, such as developing business proposals ($p = .003$, $g = 0.42$)⁹, executive summaries ($p = .002$, $g = 0.45$), and technical reports ($p < .001$, $g = 0.91$) as more important skillsets to possess to successfully obtain employment than non-STEM IDSs. This aligns with the literature that STEM-related careers require more technical and structured writing tasks such as developing business proposals (Ramsey & Baethe, 2013). There was, however, a small effect size observed in the perceptions of the importance of developing business proposals well to obtain employment between the groups. This indicates that there was only a small observed difference in perceptions between the two groups and that developing business proposals is a skill which is perceived as needed post-PhD, regardless of the IDS's field of study.

Moreover, many of the same differences observed in this study's sample in which STEM IDSs perceived writing areas as more important to possess to obtain employment post-PhD were also the same areas of writing that non-academic career goal IDSs perceived as areas that were

⁹ The difference between STEM and non-STEM IDSs on their perceptions of possessing strong skillsets to develop business proposals in order to obtain employment in their desired career was not statistically significant using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

more important to possess to obtain employment post-PhD. These specific areas of writing included developing business proposals, executive summaries, infographics, and technical reports. This finding indicates specific areas of needed additional assistance that U.S. R1 institutions can provide which may be especially helpful for non-primary English IDSs that are in STEM majors who wish to pursue non-academic career goals post-PhD. These areas of additional assistance may be particularly helpful in areas where IDSs rated their current skillsets particularly low, such as in developing business proposals and executive summaries.

Additionally, the comparisons between IDSs in this study's sample who received a previous bachelor's or master's degree at an English-speaking institution versus those who did not on the perceptions of their own English writing skills needed to successfully obtain employment uncovered some additional differences as well. This information filled a gap in the literature that previously existed, while also providing additional insight into areas of further education in writing that may be beneficial to IDSs. On average, IDSs with a previous degree earned at an English-speaking institution perceived that specific characteristics of academic English writing, such as writing with clarity ($p < .001$, $g = 2.52$) and providing a strong argument in their writing ($p < .001$, $g = 1.83$) were more important to possess strong skillsets on in order to successfully obtain employment in their desired career post-PhD compared to IDSs without a previous degree from an English-speaking institution.

These results, combined with the large effect sizes observed between the two groups, may indicate that IDSs that have spent additional time studying at an English-speaking institution may be more familiar with the structure of academic English writing and thus more aware of the expectations that will be held by their future employers in regard to their writing

post-PhD. Therefore, these results may indicate that U.S. R1 institutions should more explicitly communicate the academic English writing expectations to non-primary English IDSs, specifically those that have not yet earned a degree at an English-speaking institution, in order to prepare students for the writing demands that will be present in their careers upon graduation. However, this specific reasoning behind the group differences observed in this study is not yet well known, indicating an area that requires future research to understand if this proposed reasoning between the two groups' perceptions of their English writing skills needed to successfully obtain employment holds true.

Research Question 4: What perceived gaps are there between R1 non-primary English IDSs' perceptions of their own English writing skills and their perceptions of their own English writing skills required to obtain employment in their desired career post-PhD?

The fourth and final research question of this study compared non-primary English IDSs' perceptions of their own writing skills to the perceptions of their own English writing skills they believe they must possess to successfully obtain employment. IDSs on average stated that they perceived they were not currently adequately prepared with their English writing skills to successfully obtain employment for their desired careers post-PhD in 23 of the 25 areas of English writing measured on the survey. This concerning finding of IDSs stating a perceived need in many areas of their English writing corresponds to the results of the open-ended questions that aligned with the results from the three other research questions in this study, which all indicated that IDSs perceived needing additional writing assistance and perceived a strong importance in having adequate support from others during the writing process.

It is recommended that U.S. R1 institutions focus specifically on providing additional writing support to IDSs in their perceived areas of highest need, which include writing without surface-level errors (1.73 level of skill gap), writing with clarity (1.57 level of skill gap), grant writing (1.52 level of skill gap), and providing a strong argument when writing (1.37 level of skill gap). Since data collection for this study occurred during the fall 2020 semester during the COVID-19 pandemic, this study provides unique insight into the perceived writing difficulties of non-primary English IDSs while they completed their coursework and their dissertation writing virtually while potentially living in their home countries due to travel restrictions on some international students entering the U.S. or obtaining visas due to the pandemic (Uniquet UK, 2020). Thus, IDSs' unique writing needs during online remote instruction may be highlighted in this study's results.

To assist with IDSs' perceived areas of need, advisors and mentors of IDSs, along with institutional writing centers, can assist with IDSs' argumentation in their writing through empowering IDSs by reminding them that they are the future experts in their fields, and thus should reflect this expertise by having a strong voice in their writing. Assisting IDSs in structuring their writing to provide reasoning and evidence to support their arguments presented in their writing can also assist IDSs in providing strong arguments. Focusing on developing strong argumentation skills with academic career minded IDSs may be especially beneficial, as this group of IDSs perceived developing a strong argument in their writing to be needed more in their careers post-PhD than non-academic career IDSs ($p = .011$, $g = 0.33$)¹⁰. Additionally, the

¹⁰ The difference between academic and non-academic career goal IDSs on their perceptions of possessing strong skillsets on developing a strong argument in their writing in order to obtain employment in their desired career was not statistically significant using the Bonferroni-corrected critical value for this study ($\alpha = .002$).

employment of peer collaborations amongst IDSs in PhD programs may benefit IDSs' abilities to write without surface-level errors. Some IDSs in this study reported modeling their own writing, including their grammar, off of others' work in their field (7% stated in open-ended question), which may indicate that this collaboration with peers can assist IDSs in writing with a lower number of surface-level errors. Employing these strategies, amongst others, may provide targeted services to strengthen the specific areas of writing needs of non-primary English IDSs.

Limitations of Study

Although this study's findings led to the greater understanding of non-primary English IDSs' perceived English writing skills and needs, the study is not without several limitations. Many of the institutional directors that the researcher contacted during the recruitment phase of this study declined to send an invitation to participate in the research study to IDSs they had contact with at their institution. Several of the directors stated that they declined to assist with recruitment specifically due to the current political climate between international students and the United States government. Recent policy changes to international students entering and remaining in the United States that occurred around the time this study took place formed a weariness in many international students' perceived level of acceptance experienced by others while studying in the U.S. (Uniquist UK, 2020). Therefore, the current political climate when this study took place may have led to the participants having limited trust with the researcher and thus were not completely honest with their survey responses or chose to not respond to the survey entirely.

Additionally, IDSs were recruited to participate in the study using non-probability sampling techniques (e.g., self-selection, convenience, and snowball sampling; Johnson &

Christensen, 2017). Therefore, the results of this study cannot be generalized to the entire population of non-primary English IDSs studying at R1 institutions across the U.S. Another similar limitation was that the study's sample was not representative of the population, as IDSs' biological sex was somewhat skewed towards female (approximately 63%), although receiving a higher response rate from females compared to males is typical of online surveys (Keusch, 2015). Furthermore, IDSs in this sample desired to pursue academic careers (around 56%) more so than non-academic careers (around 21%), compared to approximately 70% of all IDSs who committed to non-academic careers in the U.S. in 2018 compared to only around 30% of IDSs who committed to academic careers (NSF & NCSES, 2019). However, many academic fields have more PhD graduates than tenure track academic jobs available each year (Woodson et al., 2018). This imbalance, combined with an increasingly demanding work environment in academia (McAlpine, 2017), may indicate that many IDSs initially desire to pursue an academic career but ultimately obtain a non-academic career post-PhD due to the difficulties of obtaining an academic job. If this holds true, this may explain why the study's sample was skewed towards more IDSs who desired to obtain academic careers post-PhD than non-academic careers; thus, this sample may actually accurately reflect the population of IDSs' career goals post-PhD.

Additionally, some sub-groups of the population under investigation in this study may have experienced a language barrier that prevented them from participating in the study, such as IDSs that had very low English proficiency levels. This may have altered the findings of the study. Furthermore, for those IDSs that did participate in the study, they completed the survey in their non-primary language. Therefore, the quality of the data collected (e.g., validity) may have been affected since respondents did not complete the survey in their primary language (Wenz et

al., 2021). Furthermore, specific terminology may have been used on the survey that is more commonly used in the literature (e.g., “writing without surface-level errors”) to explain aspects of academic writing that may have differed from the terminology that IDSs typically use. A pilot study was conducted to gather IDSs’ feedback and suggested changes to the terminology used on the survey to mitigate this limitation, but it may have potentially still existed.

Another limitation of this study was that only IDSs’ “felt need” was measured, or their perceptions of their own English writing skills based on their perceived short-term (e.g., skills needed in PhD program) and long-term needs (e.g., skills needed in post-PhD job). While gathering input from individuals on their felt needs can provide valuable insight into areas of need, other methods of measuring need can provide additional insight. Need can be measured through normative need as stated by specific standards set by experts (e.g., scholars in the field of English writing). Need can also be defined through expressed need which is inferred through the services individuals use (e.g., IDSs’ use of English writing workshops at institutions; Marosszeky et al., 2006). Although it was beyond the scope of the study, including additional measures of need would have provided a more holistic view on IDSs’ English writing needs in this study (Marosszeky et al., 2006).

Practical Implications

Overall, this study’s findings contributed to the overall body of literature on non-primary English IDSs’ perceived writing skills, their perceptions of their own writing skills needed to achieve in their PhD programs, and their perceptions of their own writing skills that are required to successfully obtain employment in their desired career goals. Additionally, this study’s findings build upon the knowledge of the different perceived English writing needs experienced

by specific demographics of IDSs, such as that IDSs with a previous degree earned at an English-speaking institution perceived writing with clarity ($p < .001$, $g = 2.52$) and providing a strong argument in their writing ($p < .001$, $g = 1.83$) as more important to possess strong skillsets on in order to successfully obtain employment in their desired career post-PhD compared to IDSs without a previous degree from an English-speaking institution. This information expands the field's understanding of how specific characteristics of IDSs may affect their perceived English writing skills and needs.

Additionally, there are several recommended actions for advisors, instructors, doctoral programs, graduate schools, and support services such as writing centers that interact with non-primary English IDSs at U.S. R1 institutions to implement based on this study's findings of IDSs' perceptions of their own English writing skills and needs. The information discovered in this needs assessment illuminates areas of targeted increased writing support that can specifically meet the perceived writing needs that non-primary English IDSs hold from distinct groups. This information provides insight into the additional trainings, workshops, and coursework that would be beneficial for U.S. R1 institutions to offer in order to provide targeted services to strengthen the English writing needs of specific demographics of non-primary English IDSs.

One of these specific areas of targeted focus instructors of IDSs and doctoral programs at U.S. R1 institutions can incorporate into their coursework assignments is requiring students to write in both technical and non-technical writing genres, such as transforming their research findings into a defensible manuscript and a defensible business proposal. Specifically, providing practice and support for developing technical writing tasks should be especially targeted towards IDSs with non-academic career goals and IDSs in STEM majors, as IDSs from

these specific demographics perceived non-technical writing tasks, such as social media posts, as being more important to possess strong skillsets on in order to successfully obtain employment in their desired careers post-PhD. Practice can be provided to students through trainings, workshops, and boot camps developed by institutional support systems, such as writing centers and libraries, which focus on providing techniques to IDSs on effectively writing to communicate their research to a non-technical audience.

Researchers such as Druschke and colleagues (2018) strongly recommend that students partake in such training starting in their first semester of graduate school in order to gain copious amounts of experience in writing effectively for several different audiences. Additionally, institutional teaching/learning centers along with writing centers can provide workshops which guide faculty members on how to incorporate into their coursework instruction and assignments so that students can utilize specific tones, structures, and styles in their writing to present information to non-technical audiences. Institutions that have implemented this workshop with faculty have experienced an increase in the writing productivity of graduate students publishing non-technical writing in magazines and newspapers (Druschke et al., 2018). To further promote students' writing skillsets for non-technical audiences, doctoral programs can provide course credits for students who participate in internships on producing writing genres that communicate research to the general public, such as writing website articles and blog posts (Druschke et al., 2018; Woodson et al., 2018). If implemented by institutions, these practices will be especially useful for all IDSs, specifically IDSs in STEM majors and IDSs who have non-academic career goals post-PhD, to help promote their skillsets in the dissemination of their research to a broader audience.

The results from this study can inform best practices for advisors and professors at U.S. R1 institutions that mentor non-primary English IDSs on how to provide feedback on IDSs' writing that will be valuable to improving IDSs' skillsets. Advisors and professors should be mindful of IDSs' educational backgrounds, such as if IDSs have earned a previous bachelor's or master's degree at an English-speaking institution or not, which may indicate their level of familiarity with the structure of writing in academic English. Students that have spent less time studying at a primarily English-speaking institution should be overtly coached by their mentor on how academic writing is specifically structured in the student's field of study, which is often a crucial area of assistance that is not provided by many mentors of international students (Hsu, 2011; Starke-Meyerring, 2011).

Additionally, expanded coursework specifically for IDSs at R1 institutions that focuses on student understanding of the structure of academic writing in English can promote IDSs' perceived skillsets. As suggested by this needs assessment, this coursework would be beneficial specifically for IDSs without a bachelor's or master's degree at an English-speaking institution. The University of Pennsylvania currently offers such a course for IDSs (University of Pennsylvania, 2021) that can be used as a model for other institutions who wish to implement a similarly structured course. Another institution developed a semester-long workshop that promoted focused writing sessions for non-primary English IDSs while instructing students on writing in academic English, which led to an increase in IDSs' perceived writing skills (Mckenna & Kyser, 2021). However, these courses are limited at R1 institutions that focus specifically on the writing needs of non-primary English IDSs, indicating a needed expansion.

Institutional support systems, such as writing centers and libraries, can also expand mentors' capabilities of assisting IDSs by providing workshops for mentors on best practices on assisting non-primary English IDSs who are new to writing in academic English. These trainings should focus on prompting mentors, especially those that have been in their fields of study for quite some time, to be more cognizant of the structure and process of writing in academic English in their respective fields, as oftentimes, writing becomes habitualized (Starke-Meyerring, 2011). Mentors of IDSs should be provided resources on how to achieve this along with the specific information and guidance that mentors should provide to non-primary English IDSs in order to assist with students' academic writing structure abilities.

This study's results can also inform policy changes to fund additional academic services at U.S. R1 institutions to support non-primary English IDSs' writing abilities. One area the data from this study supports, which is backed by previous findings (e.g., Moon et al., 2020), is the expansion of institutions' writing centers to employ writing tutors that specialize in assisting the unique writing needs experienced by non-primary English IDSs. Furthermore, this study supports the expansion of institutions hiring writing tutors who specialize in academic writing across various disciplines. This would help negate a problem that IDSs often express, including from the results of this study, that tutors at writing centers should focus less on correcting IDSs' grammatical errors in their writing, and more on providing assistance with structuring their writing to fit the specific guidelines followed in IDSs' academic fields (Moon et al., 2020). Providing expanded support through R1 institutions' writing centers is critical to ensuring that IDSs can successfully meet the English writing demands of attending a research-intensive institution (CCIHE, 2018a).

The findings from this study can also help lobby for additional funding for U.S. R1 institutions to provide expanded peer-to-peer writing support. IDSs in this study's sample reported that their perceptions of their writing skills are often formed based off of their peers, which alludes towards the importance of institutions providing a peer support structure for IDSs where they can seek for help on their writing. Institutions that have implemented peer-to-peer writing support have received positive feedback from IDSs (Simpson, 2018; Simpson et al., 2016), supporting this implication from the study's results further. Graduate programs that promote a peer-based writing assistance program where a first-year IDS and an upper-level IDS pair together may provide IDSs a comfortable environment to connect with their peers and ask questions about their writing. Furthermore, this structure of peer-to-peer writing support systems can promote IDSs' confidence around their English writing abilities, through first-year IDSs receiving feedback on their writing, and through upper-level IDSs taking on a leadership role by sharing their knowledge and advice regarding English writing with their peers (Simpson, 2018). Doctoral programs that adapt and implement this model of peer-to-peer writing support into their own programs may promote an increase in non-primary English IDSs' writing productivity and confidence in writing.

Furthermore, since this study's results indicated that peers are an important aspect of non-primary English IDSs' writing, this solicits for the expansion of peer writing groups to support IDSs' writing during their doctoral programs. Such writing groups structured into doctoral coursework has been advocated for by other researchers as well (Aitchison, 2014; Tyndall et al., 2019). The formation of peer writing groups with faculty oversight in doctoral programs has been encouraged by Tyndall and colleagues (2019) to assist with promoting shared knowledge

between students and with facilitating peer edits on writing for coursework. Writing groups also provide a space for students to build relationships amongst their peers, promoting the development of their identity as a researcher, which can lead to an increase in doctoral students' confidence in their writing (Tyndall et al., 2019). Therefore, instructors of non-primary English IDSs at R1 institutions should structure peer writing groups directly into their courses, as IDSs could tremendously benefit from the intended outcomes that may occur through their involvement in peer writing groups.

This study overall highlighted an expansive need in the perceptions of non-primary English IDSs' writing skills. IDSs that encounter such academic challenges in their English writing during their doctoral programs may experience heightened depression and anxiety, which may be a factor amongst many other reasons as to why international students typically report a high rate of mental health problems (Mesidor & Sly, 2016). Therefore, this study's results highlighted the importance of providing support services specifically for international students at U.S. R1 institutions, such as culturally sensitive psychological counseling, to promote positive psychological well-being in IDSs. Communicating these positive services are available for IDSs to assist with their psychological adjustment to living and studying in the United States are crucial to promoting IDSs' overall well-being (Mesidor & Sly, 2016). This may lead to a stability in non-primary English IDSs' mental health, which may allow IDSs to focus with heightened clarity on learning to enhance their English writing skills.

If such support services, such as mental health and writing services, specifically designed to meet the needs of international students are implemented by U.S. R1 institutions, graduate schools can advertise these services as part of their recruitment strategies for increasing and

sustaining non-primary English IDSs that commit to attending U.S. R1 institutions. These resources specifically tailored to IDSs may be the deciding factor for students to attend a specific institution in the U.S. who may otherwise be apprehensive or daunted by the perceived academic English writing abilities needed to succeed in doctoral programs. Providing increased writing resources for IDSs at U.S. R1 institutions may also reduce the time for completion of a doctoral degree for non-primary English IDSs. In this study's sample alone, almost 20% of IDSs reported currently being in their 5th year of doctoral studies or higher. This may indicate that providing additional writing assistance targeted towards IDSs' writing needs specifically, which is a challenging aspect for IDSs (Casanave, 2019; Hsu, 2011; Laufer & Gorup, 2019), may promote a lowered average number of years that students take to complete a PhD program.

Overall, the findings from this study stress the importance of providing non-primary English IDSs at U.S. R1 institutions numerous opportunities and resources to practice and improve their English writing skillsets in order to increase their confidence around their perceived English writing abilities. Implementing these recommended actions into U.S. R1 institutions can ensure an adequate alignment between the writing support services available to non-primary English IDSs, the perceptions of their own writing skills, and their own perceived writing skills needed to be successful in their specific career pursuits post-PhD.

Recommendations for Future Research

It is suggested that future research investigates areas of this current study that were narrowed due to the scope of the study. For example, future research should examine if there are specific groups of non-primary English IDSs (e.g., academic career goal versus non-academic; STEM versus non-STEM) that have larger perceived gaps between their English writing skills

and their anticipated English writing skills needed for successful employment. Future studies can also focus on different classifications of non-primary English IDSs beyond what was investigated in this needs assessment, such as students in different years of their PhD programs, to examine for any potential differences in their perceived English writing skills or needs.

Future studies should also compare the results from this study to the perceived English writing skills and needs expressed by doctoral students whose primary language is English for any potential similarities or differences in the results. For example, do doctoral students whose primary language is English perceive their skills on writing with clarity to be one of their weaker skillsets on average, similar to non-primary English IDSs? Additionally, future needs assessments should investigate how the results from this study compare to the perceived English writing skills and needs expressed by non-primary English international students currently enrolled in other academic degree programs (e.g., Associate's, Bachelor's, Master's) at non-R1 institutions. The results from these needs assessments may uncover the unique perceived English writing needs of international students in various academic programs enrolled at different U.S. institution types.

It is also recommended that future research investigates IDSs' English writing needs through different measurements than what was used in this current study (e.g., self-reported need). Additional studies could examine IDSs' needs by surveying or interviewing IDSs' instructors and advisors to gather their viewpoints on the writing skills and needs of IDSs. Furthermore, U.S. employers that frequently hire non-primary English IDSs can be focused upon in future studies to investigate their perceptions of the English writing skillsets IDSs should possess in order to successfully obtain employment upon graduation. Similarly, future studies

could investigate this topic by measuring IDSs' English writing proficiency skills by collecting English writing samples from non-primary English IDSs and evaluating the samples using a rubric. These methods of measuring need would go beyond students' own perceived need and provide a more holistic view of IDSs' English writing needs.

Future studies should also use qualitative methods (e.g., focus groups, interviews) to investigate further into the specific areas of English writing from this study's results in which IDSs perceived themselves as possessing lower skillsets. Due to the current study using a quantitative methodology, it did not allow for follow-up questions or in-depth discussions with participants on their specific English writing needs. Therefore, the use of a qualitative research study could mitigate this limitation of the current study and lead to a better understanding of non-primary English IDSs' own meaning of their perceived writing needs along with their personal experiences when writing. Furthermore, the use of a qualitative methodology to examine this topic could examine IDSs' competency in English on a continuum to represent their different levels of proficiency. Examining English proficiency in this manner would align with how scholars in the field of linguistics typically view language proficiency (Otwinowska, 2016), which would allow for a more comprehensive study of the topic under investigation than the current study permitted.

The results from this current study alluded to additional areas that merit further research. These areas include specifically examining non-primary English IDSs' perceived skillsets and needs in fully understanding non-academic vocabulary that they encounter during their doctoral programs. Additionally, a greater understanding of the theoretical underpinnings as to why IDSs who received a previous bachelor's or master's degree at a primarily English-speaking institution

may perceive specific characteristics of academic English writing, such as writing with clarity, as more important skillsets to possess in order to successfully obtain employment in their desired career post-PhD compared to IDSs without a previous degree from an English-speaking institution.

Furthermore, this study's results alluded to the question of what comprises strong mentorship of non-primary English IDSs to assist with strengthening their writing needs while remaining culturally competent? How can professors, advisors, and writing centers tailor their mentorship strategies when assisting in specific aspects of writing with non-primary English IDSs while being cognizant of students' individual values and educational backgrounds? What are the best practices in training mentors to have realistic expectations of non-primary English IDSs' proficiency levels when writing in English? Future investigations into these questions may ensure that IDSs' mentors are providing adequate instruction to IDSs on their writing that is equivalent to the assistance that primary English doctoral students receive.

Conclusions

The results from this study indicate that non-primary English IDSs require additional assistance and support in their writing, yet many doctoral programs do not offer formal training in writing (Badenhorst et al., 2015; Sanger & Baer, 2019; Starke-Meyerring, 2011), and those institutions that do provide writing support to international students vary in their quality and availability of support services for IDSs (Moon et al., 2020; Ravichandran et al., 2017; Sidman-Taveau & Karathanos-Aguilar, 2015). With the results from this study providing a more comprehensive understanding than what was previously known of the specific English writing skills and needs perceived by non-primary English IDSs studying at U.S. R1 institutions from

specific demographics, it is crucial that doctoral programs, faculty, and writing centers at these institutions utilize this information to provide targeted writing assistance to non-primary English IDSs in order to ensure IDSs have a positive, successful, and enriching graduate school experience.

Some of the key findings of this study included non-primary English IDSs currently enrolled at U.S. R1 institutions perceiving their own current skills in writing with clarity to be one of their weaker skillsets that was measured on this study's survey, yet IDSs perceived this as an especially important skillset to possess in order to succeed in both their PhD programs and to successfully obtain employment in their careers post-PhD. Additionally, succinct, technical writing tasks, such as developing business proposals and executive summaries, were perceived by IDSs with non-academic career goals and IDSs in STEM majors as being more important skills to possess in order to successfully obtain employment in their desired careers post-PhD, despite IDSs perceiving their current skillsets in developing these writing tasks to be one of their weaker areas in regard to writing. Additionally, since data collection during this study occurred during the COVID-19 pandemic, non-primary English IDSs' unique writing needs while learning remotely may also be highlighted in this study's results.

Ultimately, by U.S. R1 institutions providing increased English writing assistance to non-primary English IDSs in their specific areas of need, such as the areas previously highlighted, IDSs potentially may be more likely to persist and succeed in their doctoral programs (Sowell et al., 2009). Additionally, the implementation of these study's findings will allow for institutions to be affirmed that they are adequately preparing non-primary English IDSs with the powerful English writing skills they need for a successful career post-PhD. This will mutually benefit both

institutions and IDSs by fulfilling their shared mission of graduating IDSs with a coveted PhD and launching IDSs into a fruitful and rewarding career.

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APPENDICES

APPENDIX A: PILOT STUDY RECRUITMENT EMAIL

Hello, this is Brenna Butler and Dr. Jennifer Ann Morrow. You are being invited to provide your expert review of our materials for a research study about the writing needs of non-primary English international doctoral students (IDSs) currently enrolled at institutions that have an R1 Doctoral University Carnegie Classification across the United States. We would like to gather feedback from experts in this area (both from content experts and from international doctoral students) on our draft of the online survey that participants will be asked to complete in a future research project. There are minimal risks to this study and responses will be kept completely confidential by the researchers.

The evaluation of the survey should take you 15 minutes or less to complete. Your participation is voluntary. If you wish to participate in this study, please answer the eligibility questions below (*only applicable to individuals that are non-experts*), review the informed consent attached to this email, and email the signed informed consent to the researchers (contact information shown below) as your acceptance to be an expert reviewer. We will then email you the draft of the survey and the evaluation survey to complete. All participants will receive a \$10 Amazon gift card for their time and expertise.

For potential participants in target population (individuals that are non-experts), the following section appeared in the recruitment email.

To ensure that you are eligible to participate in the expert review, please answer the following three questions by **highlighting** the response that best represents you.

1. Are you currently enrolled in a PhD program in the United States?
 - a. Yes
 - b. No

2. Are you an international student who is not a citizen, national, or permanent resident of the United States, or does not consider the United States your country of origin?
 - a. Yes
 - b. No

3. *Do you self-identify English as a primary language(s)?
 - a. Yes
 - b. No

*Scholars have suggested that one may consider English to be their primary language(s) if it is: a) their inherited language exposed to from birth, b) their language of expertise for speaking, writing, and reading comprehension, c) the functioning language that they choose to use, and d)

the language that they self-identify with based on their ethnic, cultural, or national community (Otwinowska, 2016; Tan, 2014)

Thank you for your time! Please let us know if you have any questions.

Brenna Butler, Ph.D. Candidate
Evaluation, Statistics, and Measurement
The University of Tennessee
bberry10@vols.utk.edu

Jennifer Ann Morrow, Ph.D.
Associate Professor
Evaluation, Statistics, and Measurement
The University of Tennessee
jamorrow@utk.edu

IRB NUMBER: UTK IRB-20-06014-XP
IRB APPROVAL DATE: 09/07/2020

APPENDIX B: PILOT STUDY INFORMED CONSENT

The following information is provided to inform you about this expert review project and your participation in it. Please read this form carefully and feel free to ask any questions you may have. Your participation is voluntary and there is no penalty for refusing to participate in the study.

INTRODUCTION

Hello, and thank you for your interest in providing your expert review of our study materials! My name is Brenna Butler, and under the supervision of my advisor, Dr. Jennifer Ann Morrow, we are conducting a study to learn more about the writing needs of non-primary English international doctoral students (IDSs) currently enrolled at institutions that have an R1 Doctoral University Carnegie Classification across the United States. We would like to first gather feedback from expert reviewers on the online survey that participants will be asked to complete in a future research project. There are minimal risks to this study and responses will be kept completely confidential by the researchers. If you would be interested in providing your expert review of our materials, please continue reading the consent form below.

You are being invited to participate in a research study. The information is provided to you about the study. Please read this form carefully. Your participation is voluntary. You are also free to withdraw from this study at any time. We would like to invite you to evaluate a brief online survey that intends to measure non-primary English international doctoral students' current writing skills, their writing needs, and their anticipated writing skills they must possess to successfully obtain employment in their desired career post-PhD. We invite you to provide your feedback relating to the validity of the survey questions and the clarity of the overall survey questions.

INFORMATION ABOUT PARTICIPANTS' INVOLVEMENT IN THE STUDY

This research study consists of a confidential survey asking about your evaluation of the online survey. Additionally, you will be asked on the survey if you would like to be contacted if the researchers have follow-up questions about your evaluation answers. The evaluation of the survey should take you 15 minutes or less to complete.

RISKS

The level of risks associated with the current study are minimal. You may feel uncomfortable sharing your opinions; however, please know that all responses will be kept completely confidential by the researchers. Please answer as honestly as possible in order to provide the most accurate information. However, if you have a feeling of discomfort at any time, you may choose to terminate your participation in the study.

BENEFITS

The researchers hope the expert reviewers might benefit from the information collected, as survey data will be used to improve the online survey that international doctoral students will participate in for a future research study. The information from this future study will be utilized to contribute to the knowledge on non-primary English international doctoral students' writing skills and needs studying at R1 institutions across the United States.

CONFIDENTIALITY

The information you provide on the surveys will be kept completely confidential. Only the researchers will have access to your answers and the data will be stored on the secure password protected computers owned by the study's researchers and/or the University of Tennessee. The information you include in this consent form will also be stored on the secure password protected computers owned by the study's researchers and/or the University of Tennessee. No references will be made in any reports that could link you as a participant to the study or the data.

Your information may be used for future research studies or shared with other researchers for use in future studies without obtaining additional informed consent from you. If this happens, all of your identifiable information will be removed before any future use or sharing with other researchers.

COMPENSATION FOR PARTICIPATION

In appreciation for sharing your time and expertise with the research team, you will be provided with a \$10 Amazon gift card. This gift card will be electronically sent to you via email after you have completed your participation in the study.

CONTACT INFORMATION

If you have questions at any time about the study or the procedures, you may contact the researchers at the University of Tennessee: Brenna Butler (bberry10@vols.utk.edu) and Jennifer Ann Morrow (jamorrow@utk.edu). If you have questions about your rights as a participant, contact the University of Tennessee, IRB Compliance Officer at (865-974-7697; utkirb@utk.edu).

PARTICIPATION

Your participation in this study is completely voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty. If you become uncomfortable sharing your evaluation feedback during the survey, then you are free to skip any question or stop the survey at any time without penalty and without any loss of benefits to which you are otherwise entitled. If you choose to not turn in your responses

to the researchers after answering the survey questions, your data will be destroyed and will not be used in any data analyses.

If you decide to finish the evaluation survey, know that all data obtained will be collected with confidentiality.

CONSENT

I have read and understood the above information. I have had the opportunity to print a copy of this form. I agree to be an expert reviewer in this study.

X _____
Signature of Participant

Date

X _____
Signature of Researcher

Date

IRB NUMBER: UTK IRB-20-06014-XP
IRB APPROVAL DATE: 09/07/2020

APPENDIX C: PILOT STUDY FEEDBACK SURVEY

Before beginning with the evaluation, please type your name below so we can keep track of who has completed the evaluation. Remember, your answers will stay completely confidential.

Name: _____

Thank you for your participation in this pilot study review! We appreciate your time in improving our survey instrument that will be used in a future study.

What is the future study about?

The future study that will utilize the survey instrument you will evaluate, which intends to measure the following content areas (e.g., constructs): non-primary English international doctoral students' current English writing skills, their writing needs, and their anticipated writing skills they must possess to successfully obtain employment in their desired career post-PhD.

Pilot Study Feedback Survey

Instructions: After viewing the online survey, please answer the following questions regarding your evaluation of the online survey. Please provide your answers by **highlighting** the response that best fits your opinion. **Please note any suggestions for rewording the survey questions on the Excel sheet, which contains each survey question and the research question it corresponds to.**

Content of Questions

I thought that...

**The following question was shown to content experts only:*

1. the survey questions measured all facets/aspects of the content areas (e.g., constructs) (also known as content validity)

**The following question was shown to potential participants in target population only:*

1. the survey questions measured the content areas (e.g., constructs) they intended to measure (also known as face validity).

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

2. the survey directions were worded clearly.

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

3. the survey questions were worded clearly.

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

4. the content of the survey questions are appropriate for the intended audience (non-primary English international doctoral students).

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

5. it is easy for IDSs to self-identify English as their primary language(s) or not at the beginning of the survey (eligibility question number 3).

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

6. There are different ways to ask about the English proficiency of IDSs other than asking students if English is their primary language or not (eligibility question number 3 on the survey). One of these ways is to ask IDSs if English is their strongest language. Would you suggest for the question at the beginning of the survey to be asked this way, or some other way? Please describe your answer in the text box below.

7. What additional comments regarding the content of the survey questions would you like to provide?

Layout/Format of Questions

I thought that...

1. the survey would take respondents the estimated time of 15-20 minutes to complete.

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

2. the order of the questions asked on the survey made logical sense.

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

3. the amount of questions on the survey was appropriate.

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

4. the layout of the questions made the survey easy to read.

Strongly Disagree – Disagree – Neither Agree nor Disagree – Agree – Strongly Agree

5. Do you think any of the questions should be re-ordered to make more logical sense? If so, please describe in detail the question(s) that should be re-ordered and how you would suggest re-ordering the question(s) to make more logical sense.

--

6. What additional comments regarding the layout and/or the format of the survey questions would you like to provide?

Email address you would like your \$10 Amazon gift card electronically sent to: _____

Thanks again for your time! Please upload this completed Word document, along with any suggested wording changes to the survey questions in the Excel document, to the UTK Google Drive Folder. Then, please email Brenna at: bberry10@vols.utk.edu when you have uploaded these two documents to notify the researchers that you have finished.

Please feel free to email the researchers, Brenna (bberry10@vols.utk.edu) and Dr. Morrow (jamorrow@utk.edu) at any time if you have additional questions.

APPENDIX D: RECRUITMENT STATEMENT FOR MAIN STUDY

Hello!

My name is Brenna Butler, and I am a doctoral student inviting you to participate in a research study about the writing needs of international doctoral students (IDSs) whose strongest language is not English who are currently enrolled at institutions across the United States. This research study consists of a brief online survey asking about your writing needs during your PhD program that should take you between 15-20 minutes to complete. The data from this survey will be shared with higher education individuals that work with IDSs who make decisions regarding graduate student resources and policies.

There are minimal risks to this study and responses will be kept completely confidential by the researchers. All potential participants can enter a raffle for a chance to receive one of 20 books on scholarly writing (“The Dissertation Journey” by Carol Roberts or “Writing Your Journal Article in 12 Weeks” by Wendy Laura Belchner), or one of 10 \$15 Amazon gift cards. All potential participants can receive a scholarly writing guide that includes videos and a handout with resources developed by the researchers that provide tips on improving your scholarly writing skills.

Your participation is voluntary. If you wish to participate in this study, and/or enter the raffle for a scholarly book or gift card, and/or receive the writing guide, please click on the link below:

[survey link appeared here]

Do you know of an international doctoral student that might be interested in participating? Please feel free to pass this survey link along to them!

Thank you for your time!

Brenna Butler, Ph.D. Candidate
Evaluation, Statistics, and Measurement
The University of Tennessee
bberry10@vols.utk.edu

Jennifer Ann Morrow, Ph.D.
Associate Professor
Evaluation, Statistics, and Measurement
The University of Tennessee
jamorrow@utk.edu

IRB APPROVAL DATE: 10/13/2020
IRB EXPIRATION DATE: 09/06/2021

APPENDIX E: SOCIAL MEDIA RECRUITMENT STATEMENT FOR MAIN STUDY

I'm Brenna Butler, a doctoral student, inviting international doctoral students studying in the U.S. to participate in a research study that is a 15-20-minute confidential, online survey about their writing needs. To participate in this survey and/or to enter a raffle for 1 of 20 scholarly writing books or for 1 of 10 \$15 Amazon Gift cards, visit **[survey link appeared here]** All potential participants can receive a scholarly writing guide with videos and a resource handout. Contact bberry10@vols.utk.edu with any questions.

IRB APPROVAL DATE: 10/13/2020
IRB EXPIRATION DATE: 09/06/2021

APPENDIX F: RECRUITMENT FLYER FOR MAIN STUDY**We want your feedback!**

I'm Brenna, a doctoral student, inviting **international doctoral students whose strongest language is not English** studying in the U.S. to participate in a research study about their writing needs during their PhD program. Take 15-20 minutes to complete a confidential online survey about your writing needs.

Enter a raffle for 1 of 20 books on scholarly writing, or for 1 of 10 \$15 Amazon Gift cards! All potential participants can receive a scholarly writing guide that includes videos and a handout with resources.

Link to participate in study: [survey link appeared here]

For more information, please contact:

Brenna Butler, Ph.D. Candidate
The University of Tennessee
Email: bberry10@vols.utk.edu

Jennifer Ann Morrow, Ph.D.
Associate Professor
The University of Tennessee
Email: jamorrow@utk.edu

Scan QR code to participate
in the study:



IRB APPROVAL DATE: 10/13/2020
IRB EXPIRATION DATE: 09/06/2021

APPENDIX G: INFORMED CONSENT FOR MAIN STUDY

Thank you for your interest in participating in the study! We are interested in learning more about international doctoral students whose strongest language is not English and their perceptions of their English writing skills and writing needs experienced when writing that are currently enrolled at institutions across the United States. We are also interested in better understanding these students' perceptions of the English writing skills needed to successfully obtain employment post-PhD. You are being invited to participate in this research study, which consists of an online survey. All potential participants can enter a raffle for a chance to receive one of 20 books on scholarly writing ("The Dissertation Journey" by Carol Roberts or "Writing Your Journal Article in 12 Weeks" by Wendy Laura Belchner), or one of 10 \$15 Amazon gift cards. All potential participants can receive a scholarly writing guide that includes videos and a handout with resources previously developed by the researchers that provide tips on improving one's scholarly writing skills. The guide can be accessed by all potential participants that would like to receive it when data collection for this study ends (anticipated to be by February 2021).

If you would be interested in participating, please click the "arrow" below to proceed to the consent form. We appreciate your interest in our project!

IRB NUMBER: UTK IRB-20-06014-XP
IRB APPROVAL DATE: 10/13/2020
IRB EXPIRATION DATE: 09/06/2021

The following information is provided to inform you about this research project and your participation in it. Please read this form carefully and feel free to ask any questions you may have. Your participation is voluntary and there is no penalty for refusing to complete this survey.

INTRODUCTION

Hello! My name is Brenna Butler, and under the supervision of my advisor, Dr. Jennifer Ann Morrow, we are conducting a study to learn more about international doctoral students whose strongest language is not English and their perceptions of their writing skills that are currently enrolled at institutions across the United States.

Your participation in this research study consists of a confidential online survey asking about the perceptions of your English writing skills, abilities, and needs during your PhD program, along with the English writing skills you believe you will require to obtain employment in your desired

career goal post-PhD. The survey should take you between 15-20 minutes to complete. There are minimal risks to this study and all responses will be kept completely confidential by the researchers. If you are interested in learning more about this study, please continue reading below.

You are being asked to take part in this research study. This information is provided to tell you about the study. Please read this form carefully. Your participation is voluntary. You are also free to withdraw from this study at any time.

CONFIDENTIALITY

The information you enter through the survey will be kept completely confidential. Only researchers will have access to your answers and the data will be stored on the secure password protected computers owned by the study's researchers and/or the University of Tennessee. This consent form will be stored in UT's IRB-approved and password-protected survey platform. No references will be made in any reports that could link you as a participant to the study or the data.

Your information may be used for future research studies or shared with other researchers for the use in future studies without obtaining additional informed consent from you. If this happens, all of your identifiable information will be removed before any future use or sharing with other researchers.

RISKS

The level of risks associated with the current study are minimal. You may feel uncomfortable sharing your perceptions of your writing skills and needs; however, please know that your information will be kept completely confidential with the research team. If you have a feeling of discomfort at any time, you may choose to terminate your participation in the study.

BENEFITS

The researchers hope participants might benefit from the information collected, as survey data will be used to contribute to the knowledge on international doctoral students whose strongest language is not English and the perceptions of their writing skills and needs experienced when writing that are studying at institutions across the United States. The data from this survey will be shared with higher education individuals that work with international doctoral students who make decisions regarding graduate student resources and policies.

COMPENSATION FOR PARTICIPATION

All potential participants can enter a raffle for a chance to receive one of 20 books on scholarly writing ("The Dissertation Journey" by Carol Roberts or "Writing Your Journal Article in 12 Weeks" by Wendy Laura Belchner), or one of 10 \$15 Amazon gift cards. All potential

participants can receive a scholarly writing guide that includes videos and a handout with resources previously developed by the researchers that provide tips on improving one's scholarly writing skills. The guide can be accessed by all potential participants that would like to receive it when data collection for this study ends (anticipated to be by February 2021).

CONTACT INFORMATION

If you have questions at any time about the study or the procedures, or you experience adverse effects as a result of your participation, you may contact the researchers at the University of Tennessee, Brenna Butler (bberry10@vols.utk.edu), and Jennifer Ann Morrow (jamorrow@utk.edu), or you may contact the University of Tennessee, IRB Compliance Officer at (865-974-7697; utkirb@utk.edu).

PARTICIPATION

Your participation in this study is completely voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty. If you become uncomfortable sharing your perceptions of your scholarly writing needs throughout the survey, then you are free to skip any question or stop the survey at any time without penalty and without any loss of benefits to which you are otherwise entitled. If you do not wish to participate in this research study, then simply close the web browser window.

IRB NUMBER: UTK IRB-20-06014-XP
IRB APPROVAL DATE: 10/13/2020
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CONSENT

Please choose the option below that best represents your consent and click the "Next" button to submit your answer.

- a) I agree to participate in the research study, and I would like to be entered into the raffle for a scholarly book or a \$15 Amazon gift card. If I would like the scholarly writing guide, I will receive a link at the end of the survey to access it when it becomes available.
- b) I agree to participate in the research study, but I would not like to be entered into the raffle for a scholarly book or a \$15 Amazon gift card. If I would like the scholarly writing guide, I will receive a link at the end of the survey to access it when it becomes available.

- c) I do not agree to participate in the research study, but I would like to be entered into the raffle for a scholarly book or a \$15 Amazon gift card. If I would like the scholarly writing guide, I will receive a link on the next screen to access it when it becomes available.
- d) I do not agree to participate in the research study, and I would not like to be entered into the raffle for a scholarly book or a \$15 Amazon gift card. If I would like the scholarly writing guide, I will receive a link on the next screen to access it when it becomes available.

Branching (if option a selected): Thank you for your interest in our study! Please type your name below to indicate that you agree to be a participant in the study.

I have read and understood the information in the informed consent. I have had the opportunity to print a copy of this form. I agree to be a participant in this study.

Participant Name: _____

Today's Date: _____

Please fill out the following contact information to enter into the raffle for a scholarly book or a \$15 Amazon gift card.

Name: _____

School Email: _____

Please click the “arrow” button below to fill out the survey. **[branches to online survey for main study]**

(if option b selected) Thank you for your interest in our study! Please type your name below to indicate that you agree to be a participant in the study.

I have read and understood the information in the informed consent. I have had the opportunity to print a copy of this form. I agree to be a participant in this study.

Participant Name: _____

Today's Date: _____

Please click the “continue” button below to fill out the survey. **[branches to online survey for main study]**

(if option c selected) Please fill out the following contact information to enter into the raffle for a scholarly book or a \$15 Amazon gift card.

Name: _____

School Email: _____

If you would like to access the scholarly writing guide when it becomes available (around February 2021), please save the following link: [scholarly writing guide link appeared here]

Do you know of an international graduate student that might be interested in participating in this study? Please feel free to pass this survey link along to them: **[survey link appeared here]**
Thank you for your time! You may now exit out of your browser.

(if option d selected) Thank you for your time! If you would like to access the scholarly writing guide when it becomes available (around February 2021), please save the following link:
[scholarly writing guide link appeared here]

Do you know of an international graduate student that might be interested in participating in this study? Please feel free to pass this survey link along to them: **[survey link appeared here]**

You may now exit out of your browser.

[illegible]

infographics (e.g., visual representation of information)	☐	☐	☐	☐	☐	☐
lab/experiment reports	☐	☐	☐	☐	☐	☐
literature reviews	☐	☐	☐	☐	☐	☐
memos	☐	☐	☐	☐	☐	☐
newspaper articles	☐	☐	☐	☐	☐	☐
research/project proposals	☐	☐	☐	☐	☐	☐
social media posts	☐	☐	☐	☐	☐	☐
technical report writing	☐	☐	☐	☐	☐	☐
writing for publication	☐	☐	☐	☐	☐	☐

3. What additional information would you like to share about your own perceived current English writing skills?

Perceived Writing Needs:

4. Please answer the following questions how they best describe your own perceptions of the English writing skills required to succeed in your PhD program.

In order to succeed in my PhD program, I believe I must be able to perform the following writing skills in English well:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
avoiding plagiarism (e.g., taking someone else's work and using it as your own work)	☐	☐	☐	☐	☐
following my field's bibliography formatting guidelines (e.g., APA, MLA)	☐	☐	☐	☐	☐

preparing an outline before writing	☐	☐	☐	☐	☐
organizing ideas/topics in my writing	☐	☐	☐	☐	☐
synthesizing multiple sources of information in my writing	☐	☐	☐	☐	☐
using correct field-related vocabulary	☐	☐	☐	☐	☐
drawing conclusions in my writing	☐	☐	☐	☐	☐
providing a strong argument in my writing	☐	☐	☐	☐	☐
writing with clarity	☐	☐	☐	☐	☐
writing without surface-level errors (e.g., grammar errors)	☐	☐	☐	☐	☐

5. Please answer the following questions how they best describe your own perceptions of the English writing skills required to succeed in your PhD program.

In order to succeed in my PhD program, I believe I must be able to develop the following writing tasks in English well:	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
abstracts	☐	☐	☐	☐	☐
academic blog posts	☐	☐	☐	☐	☐
article critiques	☐	☐	☐	☐	☐
business proposals (e.g., written offer to a prospective sponsor)	☐	☐	☐	☐	☐
executive summaries (e.g., short document summarizing larger report)	☐	☐	☐	☐	☐
grant writing	☐	☐	☐	☐	☐
infographics (e.g., visual representation of information)	☐	☐	☐	☐	☐
lab/experiment reports	☐	☐	☐	☐	☐
literature reviews	☐	☐	☐	☐	☐
memos	☐	☐	☐	☐	☐

newspaper articles	☐	☐	☐	☐	☐
research/project proposals	☐	☐	☐	☐	☐
social media posts	☐	☐	☐	☐	☐
technical report writing	☐	☐	☐	☐	☐
writing for publication	☐	☐	☐	☐	☐

6. What additional information would you like to share about your own perceptions of the English writing skills you believe are required to succeed in your PhD program?

Perceived Writing Skills Needed to Successfully Obtain Employment in Desired Career Post-PhD:

7. After you earn your PhD (and post-doc, if applicable), do you plan on obtaining employment in a primarily English-speaking country?
 - a. No
 - b. Yes
 - c. I am undecided at this time
 - d. Prefer not to answer

8. Which of the following statements best describe your career plans after you earn your PhD (and after your post-doc, if applicable)?
 - a. Pursue a tenure or non-tenure track faculty position at a higher education institution
 - b. Pursue a non-academic career (e.g., non-faculty academic career, or a business, self-employment, government/public administration, nonprofit, or elementary/secondary education career)
 - c. I am undecided at this time
 - d. Prefer not to answer

9. Please answer the following questions based on your own perceptions of the English writing skills you believe are required to successfully obtain employment in **your desired career post-PhD**.

business proposals (e.g., written offer to a prospective sponsor)	☐	☐	☐	☐	☐	☐
executive summaries (e.g., short document summarizing larger report)	☐	☐	☐	☐	☐	☐
grant writing	☐	☐	☐	☐	☐	☐
infographics (e.g., visual representation of information)	☐	☐	☐	☐	☐	☐
lab/experiment reports	☐	☐	☐	☐	☐	☐
literature reviews	☐	☐	☐	☐	☐	☐
memos	☐	☐	☐	☐	☐	☐
newspaper articles	☐	☐	☐	☐	☐	☐
research/project proposals	☐	☐	☐	☐	☐	☐
social media posts	☐	☐	☐	☐	☐	☐
technical report writing	☐	☐	☐	☐	☐	☐
writing for publication	☐	☐	☐	☐	☐	☐

11. What additional information would you like to share about your own perceptions of the English writing skills you believe are required to successfully obtain employment in your desired career post-PhD?

12. What/whom has influenced your perceptions regarding your writing needs/skills (e.g., feedback from your advisor)?

Demographic Questions:

The following questions ask about general information about you as a graduate student. Please answer the following questions based on how they best represent your current status as a graduate student. If you prefer to not respond to the question, then please leave your answer blank.

1. What is your current year in your PhD program?

1st

2nd

3rd

4th

5th

6th

Other: ____ (**open-ended numeric response limited to 2 characters**)

2. What is the name of the institution that you currently attend for your PhD program?

(open-ended response)

3. What is the state that your institution is located in?

(drop-down menu of states)

4. Is your PhD program in STEM* (science, technology, engineering, mathematics)?

Yes

No

*Note: if you're not sure if your program is considered STEM, please click on the following link **in a new web browser**:

https://benefits.va.gov/gibill/docs/fgib/STEM_Program_List.pdf and search for the name of your PhD program. If your program is on this list, then your PhD program is in STEM.

5. What is your highest degree already earned?

Bachelor's Degree

Master's Degree

Other ____ (**open-ended response**)

6. Did you earn your bachelor's and/or master's degree at a primarily English-speaking institution (e.g., United States, United Kingdom, Australian institutions)?

Yes

No

7. What do you consider your strongest language (e.g., the language you are most proficient in)?

(open-ended response)

8. What is your country of origin?

(open-ended response)

9. What is your age?

(open-ended numeric response limited to 2 characters)

10. What is your biological sex?

Male

Female

Other

11. How did you find out about this survey?

Email/Announcement Sent to You

Listserv Post

Social Media Post

Through Someone Else

Other: _____ (open-ended response)

12. Would you be willing to participate in a follow-up interview with the researchers about your survey responses?

Yes **(branch to question 12)**

No **(branch to “Statement for Option of Additional Questions”)**

13. If you are selected to participate in a follow-up interview, please enter your school email below for the researchers to contact you:

Email: _____

Closing Statement

Thank you for your participation in the survey! Your responses have been recorded. If you would like to access the scholarly writing guide when it becomes available (around February 2021), please save the following link: [scholarly writing guide link appeared here]

If you know of any international doctoral students that may be interested in completing this survey, please forward the following survey link to them: **[link to survey appeared here]**

You may exit from the survey now. If you would like further information about this research study or have any questions, the student researcher can be reached at the following email address: bberry10@vols.utk.edu.

Thank you again for your time and participation in this survey!

Brenna Butler, Ph.D. Candidate
Evaluation, Statistics, and Measurement
The University of Tennessee

Jennifer Ann Morrow, Ph.D.
Associate Professor
Evaluation, Statistics, and Measurement
The University of Tennessee

IRB APPROVAL DATE: 10/13/2020
IRB EXPIRATION DATE: 09/06/2021

APPENDIX I: QUESTION SOURCES FOR ONLINE SURVEY IN MAIN STUDY

Source (See References for full Citation)	Original Item	Revised Item
		First Question Stem: I believe that I can perform the following English writing skills well: Second Question Stem: In order to succeed in my PhD program, I believe I must be able to perform the following writing skills in English well: Third Question Stem: In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing skills in English well:
(Butler & Morrow, 2020)	I am confident in my ability to avoid plagiarism (e.g., taking someone else's work and using it as your own work)	avoiding plagiarism (e.g., taking someone else's work and using it as your own work)
Butler et al. (in press)	Please indicate how much support you typically require from others (peers/tutors/professors) during the process of writing an academic paper (scale of "1" indicating "No Need" to "5" indicating "Very High Need"): drawing conclusions	drawing conclusions in my writing
Butler et al. (in press)	In the past, what is the likelihood that you needed assistance with the following communication skills during your graduate studies at UT? (scale of "1" indicating "Not at all Likely" to "5" indicating "Very Likely"): Correct bibliography format (e.g., APA formatting)	following my field's bibliography formatting guidelines (e.g., APA, MLA)
(Butler & Morrow, 2020)	I am confident in my ability to clearly organize ideas/topics in my scholarly work	organizing ideas/topics in my writing
Butler et al. (in press)	Please indicate how much support you typically require from others (peers/tutors/professors) during the process of writing an academic paper (scale of "1" indicating "No Need" to "5" indicating "Very High Need"): preparing an outline before starting writing	preparing an outline before writing
(Butler & Morrow, 2020)	I am confident in my ability to provide a strong argument in my scholarly work	providing a strong argument in my writing

(Butler & Morrow, 2020)	I am confident in my ability to synthesize multiple sources of information	synthesizing multiple sources of information in my writing
Song (2014)	Do you find the following areas problematic for you when you are preparing a paper for English-medium publication? (scale of “1” indicating “Strongly Disagree” to “7” indicating “Strongly Agree”): choosing correct field-related vocabulary	using correct field-related vocabulary
(Butler & Morrow, 2020)	I am confident in my ability to write scholarly work clearly	writing with clarity
Butler et al. (in press)	After receiving feedback from a faculty member/advisor on my graduate writing assignments, my revisions usually involve: <u>Select ALL that apply</u> . Option choice of, “Changes to surface-level errors, such as grammar and punctuation”	writing without surface-level errors (e.g., grammar errors)
		First Question Stem: I believe that I can develop the following types of English writing tasks well: Second Question Stem: In order to succeed in my PhD program, I believe I must be able to develop the following writing tasks in English well: Third Question Stem: In order to successfully obtain employment in my desired career post-PhD, I believe that it is important that I can perform the following writing tasks in English well:
Xu (1991)	Please rate each variable in terms of the degree to which you have encountered difficulty performing the task: write abstracts/summaries	abstracts
Butler et al. (in press)	Which of the following writing tasks have you done in your graduate program at UT? <u>Select ALL that apply</u> . Option choice of, “Writing a critique/article review”	article critiques
Ramsey & Baethe (2013)	Developed by researcher; see “Measures” section of Chapter 3 for justification on the development of this item	business proposals (e.g., written offer to a prospective sponsor)
McAlpine (2017); Woodson et al. (2018)	Developed by researcher; see “Measures” section of Chapter 3 for justification on the development of this item	executive summaries (e.g., short document summarizing larger report)
Butler et al. (in press)	In the past, what is the likelihood that you needed assistance with the following communication skills during your graduate studies at UT? (scale of “1” indicating “Not at all	grant writing

	Likely” to “5” indicating “Very Likely”): Grant writing.	
Developed by researcher	Developed by researcher	infographics (e.g., visual representation of information)
Butler et al. (in press)	Which of the following writing tasks have you done in your graduate program at UT? <u>Select ALL that apply.</u> Option choice of, “Writing a lab report/experiment report”.	lab/experiment reports
Butler et al. (in press)	Which of the following writing tasks have you done in your graduate program at UT? <u>Select ALL that apply.</u> Option choice of, “Writing a literature review”.	literature reviews
McAlpine (2017); Woodson et al. (2018)	Developed by researcher; see “Measures” section of Chapter 3 for justification on the development of this item	memos
McAlpine (2017)	Developed by researcher; see “Measures” section of Chapter 3 for justification on the development of this item	newspaper articles
Developed by researcher	Developed by researcher	academic blog posts
Butler et al. (in press)	Which of the following writing tasks have you done in your graduate program at UT? <u>Select ALL that apply.</u> Option choice of, “Writing a research/project proposal”.	research/project proposals
McAlpine (2017)	Developed by researcher; see “Measures” section of Chapter 3 for justification on the development of this item	social media posts
Butler et al. (in press)	Which of the following writing tasks have you done in your graduate program at UT? <u>Select ALL that apply.</u> Option choice of, “Writing a technical report”.	technical report writing
Butler et al. (in press)	In the past, what is the likelihood that you needed assistance with the following communication skills during your graduate studies at UT? (scale of “1” indicating “Not at all Likely” to “5” indicating “Very Likely”): Articles for publication.	writing for publication

VITA

Brenna Marie Berry Butler is originally from Clearfield, Pennsylvania. Brenna earned a Bachelor of Science degree in Psychology with a Quantitative Skills Emphasis from The Pennsylvania State University (University Park, PA) in 2017. Upon graduation, she began her doctoral studies at the University of Tennessee (Knoxville, TN), where Brenna gained experience working on evaluation, assessment, and research projects in both her coursework and as a Graduate Research Assistant for three of the Evaluation, Statistics, and Measurement faculty members at the University of Tennessee. Brenna has coauthored evaluation and assessment reports, local and national conference presentations, and manuscripts for publication. Brenna Butler graduated from the University of Tennessee, Knoxville in May of 2021 with a Ph.D. in Educational Psychology and Research, with a concentration in Evaluation, Statistics, and Measurement.