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LAURA KNIJNIK BAUMVOL

LANGUAGE PRACTICES FOR KNOWLEDGE PRODUCTION AND DISSEMINATION: THE CASE OF BRAZIL

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Coorientadora: Dra. Ana Beatriz Arêas da Luz Fontes

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Resumo

O uso do inglês como língua global para comunicação acadêmica e científica tem se tornado central para acelerar o progresso científico. Um número crescente de estudos no campo do Inglês para Fins de Pesquisa e Publicação (Cargill & Burgess, 2008) tem abordado uma variedade de temas relacionados a pesquisadores e acadêmicos cuja primeira língua não é o inglês (Burgess et al, 2014; Li & Flowerdew, 2009; Hanauer & Englander, 2011). No entanto, investigações sobre o contexto brasileiro ainda são escassas. A presente pesquisa aborda tal lacuna ao examinar (1) o uso das línguas portuguesa e inglesa entre as oito comunidades científicas conforme a classificação adotada pelas agências de fomento brasileiras em i) publicações (artigos em revistas acadêmicas, livros completos, capítulos de livros e artigos completos em conferências), ii) apresentações em eventos acadêmicos e iii) colaborações internacionais de pesquisa; e (2) a proficiência em língua inglesa dos acadêmicos e sua possível relação com a língua escolhida para produzir e difundir conhecimento. Duas extensas bases de dados coletadas foram analisadas através de um paradigma quantitativo: um questionário eletrônico de larga escala (*Questionnaire study*) e Currículos Lattes de acadêmicos que trabalham em instituições de ensino superior no Brasil (*CV study*). Os resultados apontaram as seguintes tendências em comum entre os dois estudos: (1) acadêmicos nas áreas de conhecimento que integram as ciências mais ‘duras' (Ciências Agrárias, Ciências Biológicas, Engenharia, Ciências Exatas e da Terra e Ciências da Saúde) tendem a usar inglês para produzir e difundir conhecimento em uma escala muito maior do que aqueles ligados às ciências menos ‘duras’ (Ciências Sociais Aplicadas, Ciências Humanas e Linguística, Letras e Artes); e (2) acadêmicos de três das cinco áreas que constituem as ciências mais 'duras' (Ciências Biológicas, Engenharia, e Ciências Exatas e da Terra) têm maior proficiência autoavaliada em língua inglesa em relação àqueles das outras áreas de conhecimento, e acadêmicos na área de Ciências Humanas têm menor proficiência autoavaliada em língua inglesa em comparação àqueles de todas as outras

áreas de conhecimento. Portanto, a preferência do inglês em relação ao português por acadêmicos de Ciências Biológicas, Engenharia e Ciências Exatas e da Terra poderia estar associada ao fato de apresentarem uma autoavaliação mais alta na proficiência dessa língua, entre vários outros fatores que influenciam as práticas linguísticas para produção e difusão de conhecimento. Os resultados obtidos podem fornecer elementos para a implementação de políticas nacionais e institucionais, bem como investimentos no ensino superior brasileiro, visando fornecer apoio linguístico para atender às necessidades de diferentes comunidades disciplinares e melhorar a proficiência em língua inglesa de seus membros.

Palavras-chave: ensino superior brasileiro - Inglês para Fins de Pesquisa e Publicação - produção e disseminação de conhecimento - práticas linguísticas acadêmicas

Abstract

The use of English as a global common language for academic and scientific communication has become central to accelerate scientific progress. This has stimulated a growing number of studies in the field of English for Research and Publication Purposes (Cargill & Burgess, 2008) focusing on non-anglophone scholars (Burgess et al, 2014; Li & Flowerdew, 2009; Hanauer & Englander, 2011). However, investigations about the Brazilian context are still scarce. The present research addresses this gap by examining (1) the use of the English and Portuguese languages in the eight disciplinary communities according to the classification of Brazilian funding agencies in i) publications (articles in academic journals, full books, book chapters, and full papers in conference proceedings), ii) presentations given in academic events, and iii) international research collaborations; and (2) scholars' English proficiency and its potential relationship with the language used to share knowledge. Two large datasets were analyzed under quantitative paradigm: a large-scale online questionnaire (*Questionnaire study*), and Lattes CVs of scholars working in Brazil's higher education (HE) institutions (*CV study*). Common trends were identified in the results of both studies: (1) scholars in the fields that integrate the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*) tend to use English to produce and disseminate knowledge to a much greater extent than those in the 'softer' sciences (*Applied Social Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts*); and (2) academics from three of the five fields that integrate the 'harder' sciences (*Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*) have higher self-rated English proficiency than the other fields, and scholars in the field of *Human Sciences* have lower self-rated English proficiency in comparison to all other fields. Therefore, the preference of English over Portuguese by *Biological Sciences*, *Engineering*, and *Exact and Earth Sciences* scholars might be associated with their higher self-rated English proficiency, among various other factors that influence

knowledge production and dissemination language practices. It is hoped that the results obtained can inform national and institutional language policies and investments in Brazilian HE institutions, so as to provide language support to meet the needs of scholars from different disciplinary communities and to improve their English proficiency.

Keywords: Brazilian higher education - English for Research and Publication Purposes - knowledge production and dissemination - scholarly language practices

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Chapter 1: Introduction

The United Nations has continuously emphasized the contribution of higher education (HE) to poverty eradication, sustainable development, and global progress in official documents such as the Millennium Development Goals (MDG) and Education for All (EFA). HE is viewed as a 'public good' and strategic imperative which acts as a major force in building an inclusive and diversified knowledge-based society and in promoting progress in research and innovation. In this sense, the internationalization of research occupies a central role in the advancement of society. It helps bridge the development gap by increasing knowledge transfer processes, especially for developing countries, and fosters national knowledge capabilities through international research networks and collaborations, assuring more variegated sources of high-quality researchers and knowledge production, on a regional and global scale (Unesco, 2009).

In the Brazilian context, it is clear that the qualification and expansion of research involve (1) the country's inclusion into the new world order of knowledge through the dissemination of academic, scientific, and technological expertise generated in local HE institution and (2) the greater access by Brazilian scholars[1] and scientists to the knowledge produced globally. In other words, the advancement of Brazilian HE and society are conditioned to the circulation of research carried out in the country and to promotion of exchanges with other nations. In these two processes, language plays a decisive role, as it is the medium through which a myriad of knowledge production and dissemination[2] practices are developed. This requires a common understanding between academics from different origins, which has been implemented

[1] In this study, the words "scholars", "academics", and "professors" will be used interchangeably.

[2] The term "knowledge production and dissemination" encompasses multiple activities conducted by scholars, among which various types of publications, presentations in academic events, and international research collaborations.

in modern times by the nearly universal adoption of English as a global language of science (Ammon 2001, 2006, 2010; De Swaan, 2001b; Montgomery, 2013; Lillis & Curry 2010a; Solovova, Santos & Verissimo, 2018).

My interest in further understanding the Brazilian HE scenario, more specifically its internationalization processes, has evolved throughout my years of experience in academic settings. This experience includes working in HE institutions and being involved in institutional internationalization initiatives; reading and discussing studies conducted on the theme; engaging in formal and informal discussions in transdisciplinary academic events along with my supervisor Dr. Simone Sarmento; and broadening my international understanding of multilingual HE contexts during my recent PhD visiting scholar period at Simon Fraser University in Canada.

Based on these experiences, I realized that although research focusing on the role played by languages on internationalizing HE has been rapidly advancing around the world (Dearden, 2015; Lauridsen & Lillemose, 2015; Murray & Nallaya, 2016; Van Damme, 2001; Zegers & Wilkinson, 2008), there are still very few quantitative studies conducted with methodological rigor regarding the use of additional languages[3] (ALs), especially English, by Brazilian scholars in their various academic and scientific activities. In addition, my family background of researchers working in the natural sciences and humanities has also contributed to my awareness

[3] Using 'additional language' rather than 'foreign or second language' considers the contributions of adding a language to the cultural and linguistic repertoire that one already has. The term 'foreign' can suggest undesirable connotations such or strange or exotic, while 'additional' emphasizes the belief that additional languages are not necessarily inferior nor superior nor a replacement for someone's first language (Jordão, 2014; Judd, Tan & Walberg, 2001;)

of the peculiarities of each field of knowledge or academic discipline[4] regarding the use of languages for research and teaching practices. I was particularly puzzled by the fact that some academic disciplines were considerably more internationalized than others and that the use of the English language seemed to be taken for granted in the more internationalized areas. For instance, I observed that scholars from academic disciplines such as physics, chemistry, and biology had largely been using English for publishing their research findings, presenting in academic events, collaborating with other researchers, and had been developing isolated initiatives to teach courses in English in Brazilian HE institutions. In contrast, I noticed that the fields of knowledge and academic disciplines with which I have had the most involvement – education and applied linguistics – did not feel the need to share their research internationally and were, thus, much more isolated from the knowledge produced globally. Informally, I have been calling this an "authophagous" process, due to the self-consuming characteristic of the academic disciplines from humanities and social sciences in Brazil. In this process, scholars mostly access and produce knowledge inside their local Brazilian disciplinary communities, perpetuating their seclusion and hindering the development and circulation of the scholarly knowledge generated in the country.

When conceiving my doctoral research project, the aim was to systematically investigate multiple issues related to the use of ALs, especially English, by scholars working in Brazilian HE institutions, which I had been following and discussing with peers and my supervisor since

[4] In the present research, the term "field of knowledge" will be used to refer to a major field of study or field of work composed by different academic disciplines or subject disciplines, according to the classification officially adopted by CNPq and the Lattes Platform (CNPQ, n.d.). The terms "academic disciplines" or "subject disciplines" will be used to refer to specific areas that compose different fields of knowledge, such as psychology, economics, applied linguistics, sociology, math, physics, etc.

2014. The intention was to gather comprehensive reliable data that could provide insights which could contribute to the further development of internationalization of Brazilian HE and research.

Initially, the focus of my doctoral investigation was going to be the analyses of data regarding the use of English by Brazilian scholars to teach content from different academic disciplines, an approach called Content and Language Integrated Learning (CLIL) (Dafouz & Smit, 2016; Fortanet, 2013; Smit & Dafouz, 2012) that has also become known in non-English dominant settings as English as a Medium of Instruction (EMI) (Baumvol & Sarmento, 2016; Dearden, 2015; Macaro, 2017). However, during the trajectory, the focus shifted as I became interested in examining a larger mass of data related to the use of Portuguese and ALs, especially English, in various activities of knowledge production and dissemination conducted by scholars working in Brazilian HE institutions and the possible connection to their English proficiency.

As Skudlik (1991) argued, in order to understand the status of English and other languages in academic and scientific communication, we must examine not only data regarding the entire global academic scientific community, as done in the seminal works of Tsunoda (1983) and Ammon (1998, as cited in Hamel, 2007, 2003, 2006, 2010), but also the practices within each country. Several authors (Ammon, 2006; Burgess et al, 2014; Hanauer & Englander, 2011; Lopez-Navarro, 2015; among others) have emphasized the importance of mapping the publication patterns of a country's scholars, i.e., what, when and why they use their country's first language and/or English to produce and disseminate knowledge. However, in the Brazilian context only a few empirical studies were found regarding the use of languages in knowledge production and dissemination processes (Martinez & Graf, 2016; Meneghini & Packer, 2007; Motta-Roth et al, 2016) and Brazilian scholars' English proficiency (Vasconcelos et al, 2008).

Therefore, the general objective of the present investigation is to examine, through a quantitative methodological approach (1) the Brazilian scenario of knowledge production and

dissemination involving the analyses of multiple activities conducted in Portuguese and English by scholars from different fields of knowledge working in Brazilian HE institutions, more specifically publications, presentations in academic events, and international research collaborations; and (2) the self-rated English proficiency of scholars working in Brazilian HE institutions.

This study is aligned with the theoretical and methodological frameworks adopted by investigations in a field known as English for Research and Publication Purposes (ERPP) (Cargill & Burgess, 2008; Lillis & Curry, 2006a), which has recently developed as a branch of English for Academic Purposes (EAP). ERPP focuses on examining perspectives, policies, and pedagogies of scholarly knowledge production and dissemination through qualitative and quantitative methodologies which include the use of bibliometrics, surveys, interviews, analysis of written academic genres, and data gathered in faculty development workshops and programs (Ammon, 2006; Ferguson et al, 2011; Flowerdew, 2000; Corcoran, 2017; Corcoran et al, 2019; Hamel, 2007; Hanauer & Englander, 2011; Hyland, 2015; Perez-Llantada et al, 2011; among others). Investigations in ERPP have especially focused on the practices and perceptions of plurilingual EAL scholars[5] and ways to support their EAP development to further immerse themselves in the global scholarly and research scenario (Burgess et al, 2014; Flowerdew, 2013; Corcoran, 2015; Corcoran et al, 2019; Martinez & Graf, 2016; Moreno et al 2011, 2012, 2013; Lopez-Navarro et al, 2015).

[5] The use of the term "plurilingual EAL scholars" instead of "non-native speakers scholars" aims to oppose deficit views about those whose first language is not English and emphasize the complexities related to languages used for knowledge production and dissemination by scholars globally (Corcoran et al, 2019).

When I began this investigation, the first hypothesis was that scholars from some fields of knowledge used certain written academic genres more frequently than others. For instance, it seemed that scholars in the exact and natural sciences published a higher number of articles than those from humanities, while in engineering, papers in conference proceedings were more commonly used than in other fields. The second hypothesis was that some fields of knowledge were more internationalized than others, and that this seemed to be associated with the extent that English and Portuguese were used to produce knowledge through the publication of different written academic genres and through different scholarly practices, such as presentations in academic events and international research collaborations. More specifically, it seemed that scholars from humanities used English much less frequently than those from natural sciences. In addition, the general impression was that scholars from natural sciences seemed to be more proficient in English, which could be related, for instance, to the extent they used this language in their academic and research activities.

The research questions that guided the present investigation were:

1. Are there any differences and similarities in the frequency of self-reported use of Portuguese and English amongst Brazilian scholars from different fields of knowledge for

1.1 publication in the last five years?

1.2 presentations in academic events in the last five years?

1.3 international collaborations?

2. Are there any differences and similarities in the self-rated proficiency in English amongst Brazilian scholars from different fields of knowledge?

3. Are there any differences and similarities in number and types of publications (articles in academic journals, books, book chapters, and papers in conference proceedings) amongst scholars from different fields of knowledge with a CNPq research productivity grant

3.1 in total numbers?

3.2 in Portuguese?

3.3 in English?

4. Are there any differences and similarities in the frequency of scholars with a CNPq research productivity grant who self-rated their proficiency in English as good in the four skills (comprehension/understanding, speaking, reading, and writing) amongst the different fields of knowledge?

In order to answer these research questions, the present investigation encompasses two bodies of quantitative data: (1) questionnaires administered to scholars affiliated to Brazilian HE institutions and (2) curriculum vitae (CVs) of scholars with a PhD affiliated to Brazilian HE institutions who hold a CNPq research productivity grant. Analyses from the questionnaires will be discussed in the *Questionnaire study*, and data from the Lattes CVs will be analyzed in the *CV Study*.[6] In both studies, for statistical analyzes purposes, the independent variable was field of knowledge, and it had eight levels as officially adopted by the National Council for Scientific and Technological Development (CNPq) and the Lattes Platform:

- *Agricultural Sciences*[7]*,*

[6] For the purposes of guiding the reader throughout this dissertation the two studies will be will be referred as "*Questionnaire study*" and "*CV study*".

[7] The eight fields of knowledge officially adopted by CNPq and the Lattes Platform will be capitalized and italicized throughout this dissertation.

- *Applied Social Sciences,*
- *Biological Sciences,*
- *Engineering,*
- *Exact and Earth Sciences,*
- *Health Sciences,*
- *Human Sciences, and*
- *Linguistics, Literature, and Arts.*

The present dissertation is comprised of six chapters, the first one being this introduction. In chapter 2, I will present the theoretical background on which this research is based on. This includes a historical background of HE, along with a brief overview of Brazilian HE and research systems. In addition, I will explore the bibliometric system and knowledge production and dissemination scenario globally, the expansion and consolidation of English as the global language of science, the emergence of the field of English for Research and Publication Purposes (ERPP), and the relationship between knowledge production in English and proficiency in this language. Chapter 3 will provide the methodological procedures adopted in the *Questionnaire Study*, i.e, the questionnaire administered to scholars with a PhD working in Brazilian HE institutions; a general examination of the data collected in study 1; detailed descriptive and inferential analyses regarding the use of English and Portuguese for publication, presentation, and international collaboration purposes by scholars from different fields of knowledge; analyses of scholars' self-perceived English language proficiency; and a discussion of study 1 results. In chapter 4, I will present the methodological procedures adopted in the *CV study*, i.e, the analysis of Lattes CVs of scholars with a PhD and a CNPq research productivity grant working in Brazilian HE institutions; a general examination of the data collected in study 2; an analyses of scholars' self-rated English proficiency in the four skills (comprehension/understanding,

speaking, reading, and writing); descriptive and inferential analyses about the use of four written academic genres (articles in academic journals, full books, book chapters, and papers in conference proceedings) and a comparison of Portuguese and English publications by scholars from the different fields of knowledge; and a discussion of study 2 results. In chapter 5, I will discuss the common trends between the results of both studies and their connection with previous investigations. Finally, concluding remarks will be made in chapter 6, including the implications of this investigation for the Brazilian scholarly and research scenario, its limitations, as well as an indication of necessary future research in the field.

Chapter 2: Literature Review

In this chapter, I will provide the reader with the theoretical background on which this study is based. To start with, I will introduce the historical background of universities in general and in Brazil, along with key aspects regarding the Brazilian HE and its research system. Next, some considerations regarding the bibliometric system and knowledge production and dissemination communication globally and in Brazil will be made. Then, I will present a historical overview of the spread of languages across time and the expansion and consolidation of English as the dominant language for communication around the world. After that, I will examine the predominance of English as the global language of science based on previous data-driven investigations, the development of the field of English for Research and Publication Purposes (ERPP), as well as studies that show how and why various disciplinary communities choose English to disseminate knowledge to different extents. Finally, I will explore the relationship between scholars' choices to share knowledge in English, especially through written discourse genres, and their English language proficiency.

2.1 Higher education and the Brazilian context

The institution "university" originated in the 13th century in Western Europe when independent groups of scholars moved out of the cathedral schools of the middle ages and started law, theology and medical schools. Among these early isolated schools, were the universities of Cambridge, Oxford, Paris, Bologna, and Salamanca (Lindberg, 1976), in which scholars focused on studying the books brought by Islamic Arabs, containing the knowledge of Chinese, Indian, Greek and other civilizations (Ridder-Symoens, 1996). These books were written in Greek, Hebrew or Arabic and, when brought to Europe, were translated into Latin. In fact, the movement of translating knowledge into Latin was the first organized and global action of the

recently born universities, which made clear the multinational character of the intellectual activity, as well as the need of a common language to allow for knowledge dissemination (Ridder-Symoens, 1996).

Over the centuries, until the present day, the various HE institutions underwent far-reaching changes related to their functions (Rüegg, 2004). For instance, academic disciplines and careers that were not considered to be subject of academic pursuit such as dentistry, pharmacy, and nursing have become part of the core of almost all universities programs. Another major transformation that has happened over the last 150 years relates to the coexistence of knowledge production and knowledge transmission (teaching) in universities (Rüegg, 2011). Today, universities are composed of a *corpus* of faculty members whose role includes teaching, doing service for the institutions through administrative positions, conducting research, planning innovation projects and initiatives, supervising students' academic work, among other things. Differently from the first universities created centuries ago in Europe, today a variety of undergraduate and graduate career preparation programs, along with continuing studies courses, are offered in order to prepare students to enter the job market.

A central activity for professors with PhD degrees working in graduate programs and research centers in universities around the world is conducting research and preparing new researchers by promoting their immersion in the scientific and academic environment. Also, one of the most significant differences from universities of centuries ago to modern universities is the major role played by researchers in the advancement of society by producing and disseminating knowledge. In a globalized world, national and transnational scientific and academic networks have helped foster these processes, through participation in academic events in which ground-breaking results are shared and discussed, as well as the process of faculty and student short-term or longer-term academic mobility (Lillis & Curris, 2010b).

Concerning the Brazilian context, the origin of HE in the country is recent in comparison to other countries. It only started in 1808, when the King of Portugal founded a medical-surgical college in Salvador, followed by the creation of medicine, law, and polytechnic isolated schools throughout the 19th century that aimed to prepare students for traditionally prestigious professions (Durham, 2005). As Rossato (2012) points out, there was almost no research conducted in these schools and Brazil was one of the last Latin American countries to implement the university system, due to resistance and lack of interest by Portuguese and Brazilian decision-makers. In the beginning, universities followed the European model, as did most of Latin American HE institutions. However, the expansion of HE in North America in the XIX century largely affected the scenario in the region, weakening the European influence due to the gradual lack of conciliation between professional training and scientific research activities (Rossato, 2012).

An important historical milestone was the establishment of the University of São Paulo (USP) in 1934, as a result of the unification of the schools of law, medicine, polytechnic, and the newly-born school of philosophy, sciences, and arts (Almeida Filho, 2016). This was the genesis of several public universities created from 1940 onwards, as well as private non-profit confessional universities, such as the catholic universities in Rio de Janeiro (PUC-RIO), São Paulo (PUC-SP), Paraná (PUC-PR), and Rio Grande do Sul (PUC-RS) (Rosso, 2018). Especially in the public institutions, research started to be stimulated and carried out in a more structured way for the very first time in the Brazilian context in the 1940s (Teixeira, 2005).

A decisive step towards the creation of the Brazilian public university system as we know today occurred in 1968, with the implementation of an academic and administrative reform following a model partially inspired by the system of American postgraduate programs (Durham, 2005). This reform also led to the emergence of private HE institutions that tended to be

qualitatively distinct in nature and purpose when compared to the preceding private non-profit institutions (mostly catholic) that emerged in the second half of the 19th century (Rosso, 2018; Tavares, 2009). According to Altbach (2005), private HE institutions that emerged after the 1968 reform represented a system structured in the molds of educational companies aimed at obtaining economic profit and the rapid fulfillment of educational market demands.

In the 1990s, the implementation of further reforms that legally recognized for-profit institutions in a radical process of deregulation opened the Brazilian HE system to local and international private investment (Martins, 1998, 2009). The opening to business-oriented HE institutions provided a major boost for the private sector, aiming to occupy a space that historically belonged to public and private non-profit HE institutions (Tavares, 2009). Over the last decades, the tendency of converting students into educational consumers has become a pattern and institutions with a "business-driven" profile have rapidly expanded in the country (Knobel & Verhine, 2017; Martins, 2009; Schwartzman, 2004), subverting the idea of a HE system based on the articulation between teaching and research, on the preservation of professors and researchers' academic autonomy, and on the commitment of education with the public interest (Altbach, 2005; Marginson, 2007).

Today, Brazil's public HE system is composed of federal, state, and municipal universities as well as federal technical institutes (which have all always been entirely free of charge), along with for-profit and non-profit private universities, university centers, and colleges. There are currently 2,407 HE institutions, of which 296 are public (12.3%) and 2,111 are private (87.7%) (Brasil, 2016). Among the public HE institutions of different types, 36.1% are federal institutions, 41.6% are state institutions, and 22.3% are municipal ones (Brasil, 2016).

An important aspect to be mentioned is that among the private institutions, only 4.2% are universities, while 7.4% are university centers, and 88.4% are colleges (Brasil, 2016). The great

majority of private for-profit HE institutions in Brazil offer majorly hourly work contracts to most professors and lecturers and may offer lower quality of education to students than do public universities[8] (Martins, 1998). The operational cost of for-profit colleges and university centers is rather lower in comparison to research-driven universities because the first ones only focus on teaching and, as a consequence, may have a large return for investment.

Today, there is a clear distinction in the distribution of students across public and private Brazilian HE institutions, with the latter accounting for 75.3% of undergraduate student enrollment in the country. A possible explanation for such disparity is that access to HE in Brazil is based entirely on national and institutional entrance exams. Elite students, mostly white and from privileged backgrounds who attend the best private primary and secondary schools, have historically ranked higher in these entrance exams and, thus, have greater access to the best public (and tuition-free) HE institutions. Significant changes in the access to public education were triggered by the implementation of Law 12,711 in 2012 (Brasil, 2012), which mandated Brazilian public HE institutions to gradually adopt affirmative action with "quota systems" aiming to reach the percentage of 50% (in 2016) of admission slots reserved for historically oppressed groups, such as African descendants, indigenous, and underprivileged groups of students coming from the poorly resourced public secondary schools (Brasil, 2018; Telles & Paixão, 2013).

In contrast, public universities account for 84% of the total of masters and doctoral students (Capes, 2018), and 87.3% of professors with a PhD degree are associated with public universities (60.8% in federal universities, 26% in state universities, and 0.5% in municipal

[8] Exceptions should be made to some traditional private non-profit catholic and community universities, for example the catholic institutions established during the second half of 9th century (Tavares, 2009).

ones), while only 12.8% work in private HE institutions. Undoubtedly, Brazilian public universities represent the main institutional support for research, training of future scholars and researchers, and knowledge production for the advancement of the country (Almeida Filho, 2016). Recent data indicates that out of the 20 institutions that produced the most papers with higher impact in citation indexes, 15 are public federal universities and five are public state universities (Cross et al, 2017).

Despite their significant role in research, professors and researchers working in Brazilian public universities experience an extremely low level of faculty mobility across different institutions in the country. Faculty members enter public universities through a specific exam prepared by each institution and, differently than what occurs in the North American and European systems, the great majority of them start and finish their careers in the same university, with fewer opportunities to grow from exchanges with peers from other regions and with different perspectives. Data from the 2018 Ranking Universitário Folha indicates a marked tendency of faculty members to stay in the same institution throughout their careers (RUF, 2018). In addition, academic inbreeding, the practice in academia that involves "the appointment of faculty members who graduated from the institution employing them" (Altbach et al, 2015), is extremely high in Brazil. For instance, approximately 75% of University of São Paulo (USP) professors also studied in the institution, and this number is also over 50% in other prestigious Brazilian universities (RUF, 2018). Authors such as Horta et al (2010) and Altbach et al (2015) have argued that, in general, inbred faculty are more locally-oriented and, as a consequence, less involved with the wider academic community, which affects their participation in broader national and transnational research collaborations and, consequently, in the country's research quality and development.

The largest amount of investments in research, science and technology in Brazil come from the state, through governmental funding agencies (ANDES-SN, 2018). A study conducted by Cross et al (2017) showed that the private industry participates in only 0.99% of Brazilian scientific research and co-authors only about 1% of Brazilian research papers. Private investments in research come almost exclusively from large pharmaceutical firms and the partially state-owned Petrobras SA.

Among the most important research funding agencies in the country, linked directly or indirectly to the Brazilian government, there are the National Council for Scientific and Technological Development (CNPq), the Coordination for the Improvement of Higher Education Personnel (CAPES), the Financing Agency for Studies and Projects (FINEP), and the many State Foundations for Research Support (FAPS). Created in the 1950s, CNPq focuses on the promotion of scientific and technological research and the development of human resources for research in the country, while CAPES is responsible for quality assurance in postgraduate programs and for substantial funding of all levels of research in Brazil. This latter agency also has an online platform, called "CAPES Portal", which provides free access to university students and professors to a great number of the most important journals in all fields of knowledge. At the federal level there is also the Financing Agency for Studies and Projects (FINEP), mainly devoted to funding of technological and industrial research, both in universities and industries. Finally, there are 20 State Foundations for Research Support (FAPS) in Brazil, the largest one being São Paulo Research Foundation (FAPESP).

The budgets of all these agencies are largely dependent on the priorities set by federal and state policies and, over the last few years, investments have been cut drastically (Escobar, 2018). Despite these recent difficulties, today Brazil is the 13th largest producer of research publications globally and its research output growth over the last decade can be observed in the

increasing number of papers published in the Web of Science (Cross et al, 2017). Researchers in Brazil have increasingly been working across borders within and beyond Latin America, conducting research that have higher impact than domestic research.

In order to further understand what is involved in the work of those who conduct research in HE institutions globally and in Brazil, in the next section some considerations regarding the measurement of the impact of knowledge production and dissemination, citation indexes and bibliometrics databases will be presented.

2.2 Knowledge production and dissemination and the bibliometric system

According to Hyland (2015) "academic publishing is the main driving force of scholarly endeavor: it is central to the construction of knowledge and the measurement of an academic's professional competence" (p.1). Publications are the tools for exchanging ideas and research findings to foster scientific development and, thus, are essential for enabling academics to contribute to the advancement of society. The most widely used and well-recognized type of publication are academic journals, which are a core part of the process of knowledge production and dissemination.

The rise of metrics to measure scientific production and impact has become increasingly important in the contemporary scholarly scenario, with the quantification through the "impact factor" of a publication (Englander, 2014). The creation of a system to determine a journal's impact dates to 1961 when Garfield founded the Institute for Scientific Information (ISI) (Garfield, 1977). Today, ISI has been incorporated into Thomson-Reuters' Web of Science (previously known as Web of Knowledge) which includes the Science Citation Index (SCI) and Social Sciences Citation Index (SSCI), along with the Arts & Humanities Citation Index, the Conference Proceedings Citation Index, the Book Citation Index, and the Emerging Sources

Citation Index. Currently, there are over 20,300 journals, books, and conference proceedings in the Web of Science core collection (Clarivate Analytics, 2018).

Essentially, the impact factor of a journal is higher if the articles published are more frequently cited in other articles and, consequently, the journal has a greater impact on a certain field of knowledge (Garfield, 2006). A myriad of criticisms argue that citations are a shallow method of measuring the quality and impact of research, impairing meaningful scholarship rather than fostering and rewarding it (Adler & Harzing 2009; Lillis & Curris, 2010a). However, today the impact factor is well-established and scientists need to publish in journals indexed in the Web of Science in order to obtain high impact in their fields of research according to the bibliometric system.

In short, bibliometrics consists of the use of mathematical and statistical methods for analysis of written publications, such as books or articles, and is closely related to the broader term "infometrics" and the narrower term "scientometrics" (Ellegaard & Wallin, 2015). Over the last decades, bibliometrics has gained importance as it has become central to the ranking of journals (Englander, 2014).

The metrics determined by the Web of Science have become the most authoritative indicator of knowledge production, being used in institutional, national, and international rankings of HE institutions and graduate programs and in the allocation of funding for research. The journal acceptance rate in the Web of Science is between 10 to 12% (Clarivate Analytics, 2018) and, as Curry and Lillis (2010a) point out, the inclusion in the indexes is heavily biased

toward English-medium journals from English-speaking countries[9]. Additionally, the Author Citation Index, measuring the number of citations per article of an author, is widely used to determine the quality of scholars' work, provide incentives, and further advancement in their careers.

In addition to the Web of Science, another major citation indexing service is Scopus, Elsevier's abstract and citation database launched in 2004, which today covers over 23,700 peer-reviews journals in different subject areas (Elsevier, 2018). Other indexation services have developed over the years, such as PubMEd, MedLine, and EBSCO Publishing's Electronic Databases.

An important bibliographic database in the context of emerging countries is the open access ScieLO database, originally established in Brazil in 1998, as a result of a cooperative convergence of publishers, and national research funding agencies, more specifically São Paulo Research Foundation (FAPESP) and the Brazilian National Council for Scientific and Technological Development (CNPq) (Packer et al, 2014; Santos, 2003). SciELO was created with the purpose of (1) indexing qualified national journals to complement international indexes and publishing full texts freely available online; and of (2) meeting the scientific communication needs of developing countries by increasing the quality, visibility, and access to scientific literature (Meneghini, 2013; Packer et al, 2014).

Today, ScieLO Network is comprised of 15 countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Mexico, Peru, Portugal, South Africa, Spain, Uruguay, Venezuela,

[9] Issues around the wide adoption of English for knowledge production and dissemination will be further explored in sections 2.3 and 2.4.

and Paraguay) and represents the largest provider of journals indexed by the Directory of Open Access Journals (DOAJ). Most Latin American journals indexed by the Web of Science and Scopus are open access, the greatest majority of them being journals from SciELO (Packer et al, 2014). According to Miguel et al (2011), no other region in the world has adopted internationally indexed open access journals to the same extent as Latin America. In 2013, the SciELO Citation Index was integrated into the Web of Science and today includes over 1,100 journals (Clarivate Analytics, n.d.). One of the ways that SciELO has contributed to the increase of the audience of Latin-American journals and the dissemination of knowledge produced in the region is by supporting multilingual publications with the simultaneous use of English and either Portuguese or Spanish (Packer et al, 2014).

Undoubtedly, the world of science and academia depends on the adoption of one (or more) common global language that allows for mutual intelligibility and for the participation of scholars from different parts of the world (Hanauer & Englander, 2011). The present research will explore issues around the use of languages in science and, as a starting point, the spread and dominance of English globally will be examined in the next section.

2.3 The spread and dominance of English as a global language

For Cooper (1982), language spread is a kind of social change defined as "an increase, over time, in the proportion of a communication network that adopts a given language or language variety for a given communication function" (p. 6). When using the word 'spread', Cooper (1982) is referring to the dissemination of behaviors that can be discussed from the points of view of form, function and pervasiveness. Form concerns the linguistic variety of the language being spread and its changes along time, while function refers to the reasons why the

language or language variety is spreading. Pervasiveness, in its turn, relates to the degree to which speakers adopt a language or language variety for a certain communication function.

A range of factors has influenced language spread, shift and change; the most important factor has been demographic shifts (Cooper, 1982; Graddol, 1997). Cooper (1982) argues that language spread should be understood as a geographical phenomenon that can be observed according to the areas over which a language is adopted over time. With regards to English, its relationship with migration movements goes back to the 5th century. As a world language, the global spread of English began with the establishment of the American colonies in the 17th century and was consolidated first through the actions of the British Empire in the 19th century and, later, by its adoption as an official or semi-official language by newly independent states in the mid-20th century (Crystal, 2003; Graddol, 1997; Lieberson, 1982)[10]. World War I was a turning point for the English language. Before that, English was only one among a group of leading languages internationally (Hamel, 2007; Kaplan, 2001). The status it has achieved is primarily the result of the expansion of British colonial power that reached its peak by the end of the 19th century, and the ensuing rise of the U.S. as a preeminent economic power in the twentieth century. The successful implementation of colonialism, and, subsequently, the long-lasting dominant economic strength of the U.S. and the U.K. over the 18th, 19th, and 20th centuries has consolidated the position occupied by English globally (Ammon, 2010; Crystal, 2003; Graddol 2006; Phillipson, 2003).

In fact, there has never been a language as dominant as English, which has become, progressively, the prevalent language of communication in the fields of trade, commerce,

[10] For a detailed historical examination on the expansion of the English language, see Crystal (2003).

tourism, technology, science, banking, business, popular culture, among others. As Graddol (2006) emphasizes, "for the first time in the history of human society, a single language has become so sufficiently universal that it can be used as a global lingua franca[11] for communication among speakers of many languages" (p. 243). English has taken the primary position in all descriptive parameters or plausible indicators regarding the international standing of a language (Ammon, 2010; de Swaan 2001a; Maurais, 2006).

Today, the most common terms used in the literature to refer to the preeminent position achieved by English are 'global language', 'global lingua franca', and 'international global language' (Crystal, 2003; Graddol, 1997; McCrum, 2010; Montgomery, 2013; Pennycook, 2003). English has been described as 'global' since the mid-1990s as a reflection of the growing interest in the impact of globalization generally and its impact on English language teaching in particular (Block & Cameron 2002; Crystal, 2003; Ferguson 2006; Gardner, 2012; Kirkpatrick 2007). For Crystal (2003), a language is considered global when it plays a special role, in which it has been adopted by countries other than the ones where the language is spoken as a mother tongue.

Over time, English has become attractive to the different stakeholders in education: governments, ministries, parents, employers, faculty and students. There is an increasing global demand for "more teaching of English, in English and through English" (Gardner, 2012, p. 259). English is used by more non-native speakers that native speakers and is by far the most studied additional language (AL) globally (Ammon, 2015; Crystal, 2003; Graddol, 2006; Seidlhofer,

[11] In this study, I will use the terms 'English as a global language' and 'English as a global lingua franca' interchangeably.

2004). In 2015, a 15-year longitudinal study carried out by Ulrich Ammon at the University of Dusseldorf (Population Reference Bureau as cited in The Washington Post, 2015) showed that English had, by far, the largest number of learners (1.5 billion), followed by French, (82 million), Chinese (30 million), and both Spanish and German (14.5 million).

These data confirm English as a global language today, as Graddol (2006) understands that the number of native speakers is less important than the number of people who use it for defining the global status of a language. However, today at least three quarters of the world population still do not speak English at a useful level[12] (British Council, 2013). In countries in Eastern Europe and South America, for instance, English continues to have a very limited presence, while some other countries like France have been investing in the maintenance of their home languages in their former colonies.

According to Crystal (2003, p. 7), "why a language becomes a global language has little to do with the number of people who speak it. It is much more to do with who those speakers are". For example, the emergence of Latin as an international language during the Roman Empire was related to Rome's military power and not to the number of speakers. In addition, language dominance is tied to historic, economic, and political factors, and changes in power asymmetries can affect the status of a global language. Despite the clear dominance of English, over the last decades there has been a significant rise of Chinese and Spanish globally (Ammon, 2010; Graddol, 2006).

[12] According to the information found on British Council's website (n.d), communicating in English at a useful level is equivalent to level B1 of the Common European Framework of Reference for Languages (CEFR).

Contrary to what some may think, the progression of a language in becoming global has no relation with intrinsic structural properties of the language itself, its 'simplicity' in grammar or even the size of its vocabulary (Crystal, 2003). As De Swaan (1993) argues, "different from what some people believe, all languages can equally be suitable for the functional requirements of communication in contemporary society" (p. 222). This is the case of English, which does not necessarily have innate qualities that make it superior to Latin, German or French, formerly widely used as languages of science (De Swaan, 2001b).[13]

Over the last three decades, fueled by the publication of Phillipson's *Linguistic Imperialism* (1992) and Pennycook's *Cultural Politics of English* (1994), extensive literature has offered a critical discussion on the hegemony of English as a global language (Phillipson, 1997, , 2003, 2008, 2013, 2015, 2018; Philipson and Skutnabb-Kangas, 1994; Skutnabb-Kangas, 1988). For Phillipson (1992), the linguistic imperialism of English is a result of the systematic attempt by the U.K. and the U.S., over centuries, to transform a multilingual reality into a monolingual state and establish English as the language of neoliberal empire.

In Europe, the use of English has increased immensely due to the Bologna Process, triggered by the Bologna Declaration signed in 1999, which is currently endorsed by 48 European countries (European Higher Education Area, n.d.). The Bologna Process is a collective effort of public authorities, universities, stakeholder associations, employers, and international agencies and organizations, including the European Commission, to strengthen the quality assurance of European education and to simplify the recognition of qualifications and periods of

[13] We cannot forget, however, that English is a Germanic language that has a considerable number of Latin cognates, as well as lack of verb tenses and noun declensions.

study among different countries (European Union, n.d). English has assumed a key role in the development of this process and, as Phillipson (2015) points out, "in the Bologna Process, internationalization means English-medium higher education" (p. 5).

In recent decades, there has been an expansion of English both as the medium of instruction and as a mandatory subject as an additional language in diverse school systems around the globe (Ammon, 2010). The British Council has made major investments to promote English through policy texts and global projects, tying countries' development to English language proficiency, which is seen as a 'basic skill' to fully participate in society (Dearden, 2014; Galloway et al, 2015; Howson, 2013).

The resistance to the hegemony of English has had multiple manifestations in different parts of the world. In Brazil, for example, the opposition to the growth of the use of the language in different spheres of society has led to the proposal of Bill 1676 in 1999 (Câmara dos Deputados, 1999) aiming to restrict the use of foreign expressions and vocabulary, in order to protect and preserve the Portuguese language. The Bill was never approved but led to a heated academic debate about ideological and political issues around language. Authors such as Faraco (2001), Fiorin (2000), Garcez and Zilles (2001), and Zilles (2001) have rejected the ideas conveyed by the Bill, arguing that language derives from social relations and, thus, is enriched through contact with other languages and cultures. They refuted the simplistic idea of a 'linguistic planification or unity', which ends up reinforcing old linguistic prejudice and impositions of one single language in Brazil (the Portuguese language), ignoring dialects, among other things.

Contrarily to Phillipson's linguistic imperialism, Davies (1996) and Ferguson (2006) claim that this perspective is an extremely simplistic and unsatisfactory explanation for the

spread of English as a global language. For these authors, by emphasizing top-down processes of imposition, the thesis of linguistic imperialism neglects the possibility of bottom-up planning by colonized countries, i.e. "the ways in which English has been appropriated and turned to varying political purposes, often deeply uncongenial to the original imperial powers" (Ferguson, 2006, p. 118).

To provide an alternative explanatory framework for the spread of English, Ferguson (2006) draws on De Swaan's model of the language system as a galaxy with constellations of languages (1993, 1998, 2001a). The first level of the galaxy is occupied by English, today's exclusive dominant language, considered a 'hyper-central' world language. The second level has less than a dozen of so-called 'super-central' languages, many of which represent languages of former colonial or regional empires, spoken in more than one country (French, Spanish, Chinese, Russian, German, Portuguese, Japanese, Arabic, Hindi, among others). On the third level, we find around a hundred 'central' languages, usually national or important regional languages without much international diffusion. Finally, the fourth level comprises 'peripheral' or vernacular languages, which are the vast majority of the world's languages, often mother tongues of small ethnic groups without an official status in the countries where they are spoken.

In De Swaan's framework, English is situated within the galaxy of language constellations, which is itself an integral component of an emergent global and transnational society. The array of individual choices that combined produce language spread or language shift at the macro-level are considered in this model. As Ferguson (2006) explains, drawing on

economic concepts embedded in a sociological framework, the model explains in detail the factors that influence individuals' decision to acquire one language rather than another.[14]

Although all four linguistic properties of a language (suitability, similarity, robustness, and ease of learning) influence people's decisions about what language they will learn, its higher communication potential is the most important defining factor (De Swaan, 1993, 2001a). In fact, since "one of the functions of linguistic exchange is to symbolize and enact the power relations in society"[15] (Bourdieu, 1982, p. 14), the widespread use of English demonstrates that the language carries essential linguistic capital (Bourdieu, 1984, 1991, Bourdieu et al, 2001).

Similar to Ferguson (2006), authors like Crystal (2003) and Graddol (1997, 2006) also recognize the historical legacy of colonialism in the spread and global standing of English but understand that "the emphasis is now on discontinuities, away from power and towards functional specialization" (Crystal, 2003, p. 24). English is seen in the globalized world as an instrument that enables people to achieve particular goals and global presence, while local languages still perform an important array of functions as expressions of local identity.

> It is a model which sees English playing a central role in empowering the subjugated and marginalized, and eroding the division between the 'haves' and the 'have nots'. Those who argue for this position have been dismissed as displaying 'naive liberal idealism' and adopting a 'liberal laissez-faire' attitude. Rather, it is the linguistic imperialism position

[14] De Swaan (1993) situates the study of the dynamic language system in a field called political sociology of language, which is not entirely a derivation from other social sciences disciplines, nor should be reduced only to linguistics or sociolinguistics.

[15] *L'une des fonctions des échanges linguistiques est de symboliser et mettre en acte les relations de pouvoir dans la société.*

> which is naive, disregarding the complex realities of a world in which a historical conception of power relations has to be seen alongside an emerging set of empowering relationships in which English has a new functional role, no longer associated with the political authority it once held. (Crystal, 2003, p. 24-25)

It is true that, in a globalized world, the existence of a global language allows for mutual intelligibility and brings many benefits in communication in different spheres. Phillipson (2003, 2015), nevertheless, emphasizes the possible risks of a dominant language, which include making other national languages less necessary or even dispensable, as well as causing minority languages to disappear. For instance, the population of countries with a minority or second official language (such as Swedish in Finland and Catalan in Spain) is more likely to focus on English as the additional language to be studied than other languages, because they feel that it is indispensable (Ammon, 2010). However, Phillipson himself admits that the impact on national languages needs further empirical investigation in each different context around the world, to find out "whether there is a healthy addition to people's linguistic repertoire, linguistic capital accumulation or, at the other end of a *continuum*, the gradual subtraction and elimination of national languages in research, teaching, and publication, linguistic capital dispossession" (2003, p. 4).

In contrast, in a historical analysis, Crystal (2000) and Graddol (2006) demonstrate that processes of language domination and loss have happened throughout history despite the development of a global language. Thus, the spread of global English is not the direct or main cause of language endangerment, since the decrease in language diversity started historically before the rise of English as a global lingua franca.

Adding to this discussion, Lysandrou & Lysandrou (2003) argue that the impact of the rise of English on the international standing of national languages will not be changed by efforts to stop or reverse the spread of English itself. The solution, according to them, is to endorse its dissemination while acknowledging its dark side: "If English can facilitate the process of universal dispossession and loss, so can it be turned around and made to facilitate the contrary process of universal empowerment and gain." (Lysandrou & Lysandrou, 2003, p. 230).

Countries should invest in preserving their linguistic and cultural national identity while giving access to English, which should play the role of an empowering international language and have its access fully guaranteed to everyone (Linn, 2016).

> This situation is the familiar one of bilingualism – but a bilingualism where one of the languages within a speaker is the global language, providing access to the world community, and the other is a well-resourced regional language, providing access to a local community. The two functions can be seen as complementary, responding to different needs. And it is because the functions are so different that a world of linguistic diversity can in principle continue to exist in a world united by a common language. (Crystal, 2003, p. 22).

In the same way, Wood (2001) advocates that since 'English knowing bilinguals' are increasingly the majority of English speakers, focusing merely on its hegemony due to its standing as the global language or global lingua franca does not address all nuances involved. In sum, at present, the knowledge of English is empowering rather than hegemonic, as it has become the language of global communication.

In the next section, I will explore aspects related to the use and predominance of English as the global scientific[16] language, the field of English for Research and Publication Purposes, the language chosen by various disciplinary communities to produce and disseminate knowledge, and the possible reasons for the extent of the English dominance in different communities.

2.4 English as the global language of science

Historically, there has been much debate about the dominance of one or several languages in science during different periods. In the West, Sumerian, Greek, Arabic and Latin were used as languages of science in the past (Hamel, 2007). In Europe, Latin was widely employed as a scientific lingua franca from the Middle Ages to the 17th century. However, during the 16th century some vernacular dialects started evolving as national languages and being used in scientific communication, among which French stood out (Linn, 2013). In modernity, Latin was gradually replaced by French, English, and German during a period in which "founded and vigorously developed modern sciences deployed a system of plurilingualism, albeit limited to a few languages, in the field of science" (Hamel, 2007, p. 55).

Globally, by the beginning of the 20th century, multilingual science conferences had become common, and a 'triumvirate' of languages (English, French, and German) played a balanced role in scientific communication, with some prevalence in different fields of knowledge (Ammon, 2015; Englander, 2014). German was crucial for research in medicine and biology; French was the most important language in law, sociology and political science; and English dominated in economy and geology (Ammon, 2006). Nevertheless, this balance between the

[16] When I use the term scientific, I mean 'scientific, academic, or scholarly', which includes the fields of science and humanities.

three languages started to change over time. With the First World War, German lost importance after being banished from international conferences (Ammon, 2001; Lieberson, 1982), and the rise of the U.S. as an economic, military, and political power led to the rise of English as the predominant language for scientific knowledge dissemination (Kaplan, 2001). Over time, French and German lost power especially in the natural sciences and to a lesser extent in sciences and humanities (Ammon, 1995, 2006). One of the most important factors that has facilitated the shift from German and French to English as the dominant academic and scientific lingua has been the substantial funding of the sciences from the U.S. and pressures of the scientific publishing market (Ammon, 2006; and Philipson, 2015).

Today, there is no doubt that English is, by far, the most frequently used language in international scientific communication in publications, information gathering (reading), academic events, informal written and oral correspondence for research collaborations, and communication in labs and networks (Ammon 2001, 2006, 2010; De Swaan, 2001b; Lillis & Curry, 2010b; Solovova, Santos & Verissimo, 2018; Montgomery, 2013). As Ammon (2006) points out, publications in English are "widely read and quoted while publications in other languages hardly reach the international sphere, let alone the global arena" (p. 18).[17]

In fact, one of the most important indicators used as a criterion to measure the degree of internationality of a language of science is the number of scientific publications in this language. Based on data from Scopus, Van Weijen (2012) analyzed the general use of English as the international scientific language over the last decade. The study presented the ratio of the number

[17] However, as Stolerman and Stenius (2015), Breeze (2015), and Di Bitetti and Ferrera (2017) highlight, we cannot assume that research published in languages other than English have a poorer quality than English-medium studies, with the only difference between them being that the latter have a larger audience.

of journal articles published by researchers in English to the numbers in the official language in six European countries from 1996 to 2007 and proved that, overall, the use of English has been increasing sharply over time. In comparison to a previous study by Research Trends (2008), Van Weijen (2012) indicated that English kept rising strongly in the Netherlands, Italy and Russia and increasing somewhat in Germany, but remained relatively stable in France, Spain, and China[18]. Recent studies have indicated that English is the language used in 95% of all publications in the Science Citation Index (Hyland, 2015). In addition, according to Ware and Mabe, 2015), 71.8% of fully open access journals on the Directory of Open Access Journals are in English and 81.3% of peer-reviewed journals recorded in Ulrich's Web Directory in 2014 were English-language journals.

In the next section, I will explore different aspects of the growing field of English for Research and Publication Purposes (ERPP).

2.4.1 The field of English for Research and Publication Purposes (ERPP)

Studies carried out in different countries have demonstrated an increase in the proportion of papers published in English by academics whose first language is not English (Wood 2001; Bordons and Gomez 2004; Benfield and Feak 2006; Flowerdew 2013). In recent years, we have seen the development of a branch from English for Academic Purposes (EAP)[19] known as English

[18] It is worth mentioning that Van Weijen's study (2012) showed a decrease in the ratio between the use of English and Portuguese in Brazil, although this is likely related to an expansion in the coverage of Brazilian journals published in Portuguese instead of English in Scopus. More recent data presented by Packer (2018) has indicated that the number of Brazilian publications exclusively in English increased between 2011 and 2015.

[19] According to Hyland and Hamp-Lyons (2002), EAP refers to "language research and instruction that focuses on the specific communicative needs and practices of particular groups in academic contexts" (p. 2).

for Research and Publication Purposes (ERPP). The term ERPP was coined by Cargill and Burgess (2008) in the editorial of a special issue of the *Journal of English for Academic Purposes* and refers to the perspectives, policies, and pedagogies for scholarly writing for publication (Corcoran et al, 2019).

Investigations in ERPP have focused on themes such as the languages used for academic and scientific publishing, the perceptions and struggles of plurilingual EAL scholars when publishing in English, ways to support EAP development in scholars from various academic disciplines, among other topics (Flowerdew, 2013; Corcoran, 2015; Corcoran et al, 2019; Hyland, 2015; Moreno et al 2011, 2012, 2013; Lopez-Navarro et al, 2015). Over the last years, there has been significant growth in the literature approaching the dominance of English for global knowledge production and disseminations (Ammon, 2006, 2010; Benfield & Feak, 2006; Curry & Lillis, 2004, 2010; Englander, 2014; Hamel, 2007; Flowerdew, 1999, 2001, 2007, 2008, 2015; Lillis & Curry, 2006a, 2006b, 2010a, 2010b, 2016; Uzuner, 2008; among others). Considerable work has been carried out in settings such as Spain (e.g. Fernandez-Polo & Cal-Valera, 2009; Ferguson et al, 2011; Perez-Llantada et al, 2011; Lopez-Navarro et al, 2015), Germany (e.g. Ammon, 1998, as cited in Hamel, 2007, 2003), Hong Kong (Li & Flowerdew, 1999, 2000), and Mexico (Corcoran, 2015, 2017; Hamel, 2007; Hanauer and Englander, 2011). Nevertheless, ERPP still remains an under-explored topic in Southern American contexts and, more specifically, in the Brazilian context.

Several qualitative studies have focused on the attitudes and motivations for publishing in English by plurilingual EAL scholars from different non-Anglophone contexts around the globe, for instance in China (Flowerdew & Li, 2009), Denmark (Petersen & Shaw, 2002), Italy (Giannoni, 2008), Portugal (Bennett, 2010, 2011), Spain (Ferguson et al, 2011; Perez-Llantada et

al, 2011; Moreno et al, 2011, 2012, 2013; Lopez-Navarro et al, 2015), and Sweden (Bolton & Kuteeva, 2012). In addition, several investigations (e.g. Ammon, 2007; Belcher, 2007; Canagarajah, 1996, 2002; Englander, 2014, Ferguson, 2007; Flowerdew, 2008, 2013; Hanauer &Englander, 2011, Lillis & Curry, 2010a; Uzuner, 2008; Jenkins, 2003; Jenkins et al, 2011) have given emphasis to the disparities and inequities in the distribution, audience, and publishing practices in scientific journals due to the dominance of English and the difficulties and disadvantages faced by non-native speakers to publish in English-medium international peer-reviewed journals due to language barriers. As in Bortolus' (2012) metaphor, scientists whose first language is not English feel like Alice being lectured by the Red Queen: "It takes all the running you can do, to keep in the same place" (in terms of academic publishing advances). "If you want to get somewhere else" (e.g., increase the publication rate over time), "you must run at least twice as fast as that" (p. 770).

On the other hand, Ferguson et al (2011) question the centrality of non-nativeness as a disadvantage factor in academic publication in English and propose a more nuanced and circumspect view of linguistic disadvantage, with language being one of its factors among others. The authors argue that both the non-native and native speaker categories are loose and comprise individuals with different levels of linguistic competence that can be more or less familiar with the academic discourse in their fields. Native speakers are not necessarily proficient in academic literacy since this is not part of a set of universal skills and, thus, the disadvantages of non-native speakers are not completely true, since all scholars have to learn to socialize in the academic discourses of their fields and learn the common practices of their disciplinary community (Hyland, 2015, 2016). According to Swales (2004), the distinction that seems most relevant in today's scholarly scenario is the one between experienced or 'senior'

researchers/scholars and less experienced or emerging ones.

Although the arguments of Ferguson et al (2011), Hyland (2015, 2016), and Swales (2004) presented above should be taken into consideration, I believe that English language proficiency is a key factor in the challenges faced by plurilingual EAL scholars. Proficiency in this language places them at a clear disadvantage when producing and disseminating knowledge, despite their disciplinary literacy and seniority. As Corcoran et al. (2019) emphasize, it seems that researchers in the field of applied linguistics and those who work with EAP have come to a consensus that the obstacles faced by plurilingual EAL scholars are distinct from those whose first language is English. In addition, authors from geolinguistic regions in the global periphery or semi-periphery, such as Brazil and other Latin American countries, have these challenges further aggravated with less access to financial resources, for instance (Corcoran, 2017; Corcoran et al, 2019, Perez-Llantada, 2012).

2.4.2 Disciplinary communities and language choice

Despite the sharp rise and general predominance of English for scientific knowledge production and dissemination around the globe, distinct fields of study employ the language to different extents due to several factors, among which are the target audience and characteristics of different academic disciplines and academic cultures. Each disciplinary community can be understood as a "socially embedded community" (Lopez-Navarro et al, 2015) with its own specificities and 'machinery' to produce and spread knowledge (Price, 1965).

A group of studies (Herculano & Norberto, 2012; Kuteeva & Airey, 2014, Mare & Wabe, 2015; Mabe & Mulligan, 2011; Motta-Roth, 1996; Motta-Roth et al, 2016; Petersen and Shaw, 2002, Skudlik, 1991; Waltham, 2010) argued that academic and scientific communities from different fields of knowledge or academic disciplines have their own academic culture regarding

written discourse genres, language of publication, knowledge production processes, collaborations and exchanges between local and international communities, among other activities.

It is important to highlight that, in order to explore the use of language in various disciplinary communities, as well as to present the analyses of the present investigation and discuss the results found, the distinction between 'harder' sciences and 'softer' sciences will be often employed to help the identification of similarities, differences, and trends.

The terms 'harder' sciences and 'softer' sciences are commonly used to characterize different scientific fields to compare them based on perceived scientific methodological rigor, exactitude, and objectivity (Storer, 1967; "In praise of soft science", 2005). Commonly, the fields in the natural and exact sciences (such as physics, chemistry, biology, mathematics, engineering, agricultural sciences, and even medicine) have been labelled 'harder', while fields in the humanities (such as psychology, linguistics, arts, sociology, anthropology, and languages) have been categorized as part of the 'softer' sciences. This differentiation is based on methodological aspects, exactitude and objectivity, as well as on reasons intrinsic to the nature of the object of study (Pigliucci, 2009; Storer, 1967). The 'harder' sciences usually involve experiments in which controlled variables and objective measurements are relatively easily set and results can be represented mathematically. In contrast, the 'softer' sciences deal with intangibles and commonly focus on study of human and animal behaviors and interactions, thoughts, and feelings. Although scientific methods can be applied to such intangibles, due to the nature of living beings, carrying out an experiment with exactitude is not achievable in many academic disciplines in the 'softer' sciences (Helmenstine, 2018). Thus, as Helmenstine (2018)

points out, "the distinction between the two types of science is a matter of the how strongly you can state, test and then accept or reject the hypothesis" (para. 8).

Wilson (2012) signals that this labeling could imply that the 'softer' sciences are less legitimate or even less scientific than the 'harder' sciences, with a risk of lesser or higher perceived values of different fields of knowledge and the amount of funding available for each of them based on these perceptions. Nevertheless, the distinction is widely adopted in the literature but, as Pigliucci (2009) proposes, should be understood as a *continuum*, with some academic disciplines and fields of knowledge being 'harder' or 'softer' than others. Assumptions related to intellectual hierarchy or greater importance of scholars from 'harder' sciences than those from the 'softer' sciences should be treated with caution or even refuted.

Regarding written academic genres in general, the International Association of Scientific, Technical and Medical Publishers (STM) 2015 Report on scientific and scholarly communication showed that academic disciplines have significant differences in their patterns of publishing, reading, and using scholarly materials (Mare & Wabe, 2015). These authors demonstrated that, according to data from the Thomson Reuters' Journal Citation Report, the average number of publications of a journal (more specifically "citable items", which are mostly articles, reviews, and proceeding papers) is 120 publications per year. In the fields of science and technology, the average is 140 publications per year, while in the fields of social sciences and humanities is only 45 publications per year (Mare & Wabe, 2015).

Mare and Wabe (2015) also demonstrated the decline in scholars' reading and writing of books in favor of articles in journals and a significant decrease in the citation of books in comparison to journals and proceeding papers. Based on Adams and Gurney (2014), Mare and Wabe (2015) argued that these patterns have a direct relation to the pressure created by the

assessment of scholars' productivity by institutions, research funding agencies, and rankings. However, the relation of the aforementioned patterns with factors such as cuts in resources to buy books in libraries, the greater availability of online journals, or simply the lack of time for reading longer bibliographies could not be verified. In addition, Mare and Wabe (2015) indicated that the importance of journal articles in distinct subject disciplines is related to differences in the reading behavior amongst scholars. For instance, scholars in medicine read almost three times more articles than those in the humanities and two times more than those in social sciences, while scholars in sciences in general read two times more articles than those in humanities and 1.5 times more than those in social sciences.

In another study, Mabe and Mulligan (2011) analyzed the results between 2002 and 2009 from the Elsevier's Author Feedback Program (Sparks, 2005), a large-scale program based on surveys administered to UK academics that allow for regular collection of data concerning what matters to authors in their journal publishing. Mare and Mulligan (2011) discovered that scholars from the 'harder' sciences (physical and biomedical sciences and engineering) published 7.5 articles in a three-year period, while those in social sciences published five articles, and scholars in arts and humanities published less than 3 articles. The results also showed that the importance of journal articles in scholarly communication was much greater than in the 'harder' sciences than in arts and humanities (in which books and monographs play a more significant role); however, the gap is closing due to the emphasis placed by research assessment on high impact journal publications in the fields of arts and humanities. Finally, Mare and Mulligan's study (2011) indicated that the great majority of academics in the field of biomedical sciences reported that the degree of co-authorship was 75% or more, followed by physical sciences and

engineering, then social sciences, and, finally, the majority of arts and humanities academics reported that they published 25% or less in joint authorship.

When analyzing the results of a pilot study for the National Humanities Alliance (NHA), Waltham (2010) showed that in experimental and empirical subject areas it is crucial to focus on the speed of publishing, while in the fields of arts and humanities this seems to be less important. The emphasis on speed given by scholars in experimental and empirical disciplines is closely connected to the ownership of an idea or discovery, as there is a presumption that discoveries are independent objective truths that can be found and reported by anyone who searches for them. Thus, quick publishing is key for these scholars and clearly reflects the differences in the philosophical nature of research undertaken in different disciplinary communities (Mabe & Mulligan, 2011).

Finally, it is worth mentioning the investigation conducted by Skudlik (1991) about the use of German, English, and other languages through a questionnaire applied to German-speaking scholars from two universities in Germany. One of the findings was that German-speaking scholars from the natural sciences hardly ever published books, using articles and short communications almost exclusively to produce and disseminate knowledge (Skudlik, 1991). In the Brazilian context, Motta-Roth et al (2016) mapped the written production of seven academic disciplines (education, linguistics, physics, zoology, computing sciences, electric engineering and mechatronic engineering) between 2012 and 2015 through the analyses of 466 CVs, proving that the highest number of articles published in scientific journals was from scholars in the natural and exact sciences fields, while those from human sciences predominated in number of book chapters published.

Considering the above, it is clear that providing an in-depth examination of the practices of scientific disciplinary communities is crucial in order to understand and define their cultural identities. One important element of such communities relates to the language used for knowledge production and dissemination. Language choice is largely dictated by the social norms and conventions of each disciplinary community. As Lopez-Navarro et al (2015) point out, each community is "more or less endo- or exocentric, more or less internationalized and anglicized, and more or less 'Anglophone' or 'local-language-oriented'" (p. 944). Therefore, the 'degree of internationalization' of different academic disciplines affects the publishing rates in English and in a country's home languages.

The amount of investment in research and development also plays an important role in fostering international scientific productivity. The number of research papers published is closely associated with public expenditure on science. Today, the U.S. has the largest amount of money and the highest percentage of Gross Domestic Product (GDP) invested in research and development (42%), followed by Japan (15%) and Germany (9%) (OECD, 2011). These countries are among the ones with the highest citation counts (along with the U.K, China, France, and Canada) and account for the overwhelming proportion of the world's citations (Englander, 2014).

A set of bibliometrics studies carried out in several countries has investigated the use of English as a global language of science in various fields of knowledge throughout different historical periods (Ammon 1998, as cited in Hamel, 2007, 2003; Frame & Carpenter 1979; Fergusson 2007; Kronegger et al. 2011; Motta-Roth, 1996; Motta-Roth et al, 2016; Rey-Rocha & Martin-Sempere 1999; Sanz et al, 1995; Solovova, Santos & Verissimo, 2018; Petersen and Shaw 2002; Swales, 2004; Tsunoda, 1983). Among the longitudinal quantitative studies on the

topic, Tsunoda (1983) is one of the most frequently cited. Based on the most important bibliographies and documentary libraries of England, France, Russia and the US, Tsunoda (1983) investigated the share of the most important scientific languages and demonstrated the sharp rise of English in the total mass of publications in five academic disciplines (biology, chemistry, physics, mathematics, and medicine) throughout a 100-year period (1880 to 1980).

A body of studies from Ammon (1998, as cited in Hamel, 2007, 2003, 2006, 2010) also presented a comprehensive *corpus* on the distribution of languages in scientific publications in a variety of academic disciplines across different periods of time, leading to today's huge gap between English and the other languages. Ammon (1998, as cited in Hamel, 2007, 2003, 2006, 2010) examined in detail the development of the use of languages in sciences in general between 1880 and 1980; in natural sciences between 1980 and 2005; and in social sciences between 1974 and the 1995. The *corpus* included the proportional use of English, German, French, Spanish, and Russian in scientific publications and showed a constant rise of English, which reached 64.1% in 1980, whereas all other languages declined and continued to decrease between 1980 and 1986. By the mid-1990s, 90% of publications in selected periodicals of international ranking in natural sciences were in English and 82.5% in Social Sciences and Humanities, with no other language reaching more than 10% (Ammon, 1998, as cited in Hamel, 2007, 2006). Studies by Ammon (2010; 2012) and Hamel (2007, 2013) indicate that over the last few decades more than 90% of the indexed scientific articles in the field of natural sciences have been published in English. In addition, Ammon (2010) and Hamel (2007) described that in the 'pure' or theoretical sciences (e.g. mathematics, physics, biology, chemistry), the concentration of English is higher than in applied sciences (e.g. agriculture, medicine).

Based on data collected in Scopus from 1996 to 2011, Van Weijen (2012) examined the percentage of articles published in different languages in the fields of life sciences, physical sciences, health sciences, social sciences, arts and humanities in relation to total publication output in these fields in each language over time. The results indicated that scholars publishing in English tend to publish most in fields related to the 'harder' sciences (e.g. physics, engineering, and materials science), while researchers who prefer publishing in languages other than English (e.g. Dutch, French, Italian, Portuguese or Spanish) tend to do so in the fields of the 'softer' sciences (e.g. social sciences, psychology and arts and humanities).

In a longitudinal study comparing articles written in Portuguese and English and within a 20-year period in two decades (1998–2007 and 2008–2017), Solovova, Santos and Verissimo (2018) collected data on two disciplinary areas from the 'softer sciences' (linguistics and information science/librarian science) and one from the 'harder sciences' (pharmacology and pharmacy). The data provided evidence of certain trends in scholars' choices within disciplinary communities in Portugal and in Portuguese. The results indicated that the shift towards English was much more evident in pharmacology and pharmacy, where English was clearly the preferred language of science. On the other hand, the disciplinary communities of linguistics and information science/librarian science appeared to be "more resilient towards preserving Portuguese as a scientific language" (Solovova, Santos and Verissimo, 2018, p. 9). The study also demonstrated that the volume of research articles in these two languages was different within different fields of knowledge depending on the number of publication forums available, as there are fewer indexed journals in Portuguese in the 'softer' sciences than in the 'harder' sciences.

Haarmann and Holman (2001) focused on data related to the languages of doctoral dissertations in juridical sciences in comparison to the fields of natural sciences in Finland between 1911 and 1997. In juridical sciences, dissertations in Finish increased ten times, and those written in English rose from zero to seven within the period examined. In contrast, in natural sciences, dissertations in Finish rose twelve times, and those in English increased from zero to 456 between 1990 and 1997.

Other studies have used surveys as a method to gather data on the use of English in different scientific communities (Burgess et al, 2014, Kaplan & Medgyes, 1992, Moreno et al, 2011, 2013, Medgyes & Lazlo, 2001, Truchot, 2001). One of the few large-scale studies found in the literature is the one by Burgess et al (2014), based on data from a larger investigation carried out by the ENEIDA (Spanish team for Intercultural Studies on Academic Discourse) research group (Moreno et al 2011, 2013) that gathered 1,454 responses to a web-based questionnaire applied in 2010 to Spanish scholars from different fields of knowledge working in five universities and research institutes in Spain. Burgess et al (2014) analysed the subset of responses from scholars in Psychology and History and contrasted with other academic disciplines, showing that the proportions of the average number of papers published differed across the disciplines. For instance, psychologists reported publishing 33% of their average total output in English, while historians reported publishing over 80% of their papers in Spanish. In contrast, scholars from medicine published 83% of their papers in English.

Sjudlik's (1991) investigated the German scholarly scenario through a questionnaire administered to German-speaking scholars. They were asked to give the approximate number of their publications in German, English, and in other additional languages, ordered by different written academic genres, including articles, short communications, books, and instructive

literature[20]. The findings indicated that English predominated over German in the fields of natural sciences and medicine and that this predominance was even stronger in short communications than in original articles. In fact, short communications in English were also frequent in social sciences and humanities. However, Skudlik (1991) discovered that the scenario was rather different for books and instructional literature, with German prevailing over English.

Truchot (2001) reported the results of a survey conducted among a large sample of full-time researchers in Strasbourg, which is considered an important research hub with international connections. The survey included questions about the researcher's language proficiency, language use for publications, participation in conferences, daily work in research centers, and attitudes towards the use of English. The results showed a clear dominance of English for scientific purposes. Scholars reported that 85% of the information they handled was in English, compared to 12.5% in French and 2% in German; while 95% of them presented papers in English in conferences abroad, and 76% delivered English-medium presentations in conferences in France. Overall, scientists reported that 70% of their academic production was written in English, with variations in different academic disciplines, but interestingly, "the higher they ranked in the scientific profession, the more English they used" (Truchot, 2001, p. 321). The results also indicated that 70% of scholars considered using English a necessity, but, at the same time, considered the maintenance of French important in some contexts, such as laboratories and research centres and at the postgraduate studies level, especially with French-written doctoral dissertations.

[20] Unfortunately, the analysis of other written academic genres could not be included here, since they can only be accessed in the German language in Skudlik (1990).

Another survey-based study by Medgyes and Lazlo (2001) replicated a previous investigation conducted by Kaplan and Medgyes (1992) and applied a questionnaire to top-ranking professors from natural sciences and human sciences in Hungary. The questions involved scholars' other additional languages competence, language learning attitudes and aspects of writing academic papers like language of publication and writing strategies, scholars' learning history of English, as well as their present use of English and English language proficiency in the four skills (reading, writing, speaking, and listening). The results concerning language of publications chosen by Hungarian scholars were compared to those from Kaplan and Medgyes' study (1992) and showed that, in general, the use of English increased more than the use of Hungarian over the 10-year period. The analyses also indicated that scholars from human and social sciences still published the majority of their works in Hungarian (68.9%), followed by English (20%) and other languages (12.2%); while those from natural sciences reported publishing 67% of their works in English, 27.1% in Hungarian, and 5.9% in other languages.

With regards to the use of languages other than English in different fields of knowledge, although in the social sciences and humanities the concentration of English has increased over time, Ammon (1998, as cited in Hamel, 2007) and Hamel (2007) indicated that especially French and German were used to a greater extent in comparison to the natural sciences. Therefore, despite the general preference for English as the language for scientific communication, there are still academic disciplines whose scholars continue to publish in their native languages as well. A compilation of studies showed the bibliometrics relevance that languages other than English assume in specific disciplinary communities of human and social sciences in countries such as China (Flowerdew & Li, 2009), Denmark (Petersen and Shaw 2002), Germany (Ammon, 1998, as cited in Hamel, 2007, 2001), Italy (Carli & Calaresu, 2003), and Spain (Burgess et al. 2014;

Lopez-Navarro et al., 2015). In general, they demonstrated that in these fields English is less used by scholars for both international and intra-national communication than in natural sciences and 'harder' sciences.

In the Brazilian context, Packer (2016) reported the growth in English usage in general in the country, as well as the distribution of articles in English and Portuguese in ScieLO Brazil in each of the eight fields of knowledge officially adopted by CNPq and the Lattes Platform. Based on data from the Web of Science, Packer (2016) showed that the total percentage of English-medium articles, reviews, and proceedings published by Brazilian scholars rose from 80% in 2011 to 87% in 2015, and that this increase was even sharper in human and social sciences, from 49% in 2011 to 77% in 2015.

Packer (2016) explains that these trends in the use of English are connected to the changes in the language used in articles published in Brazilian journals indexed in SciELO. These changes are due to the implementation of actions of Brazilian journals aiming to reinforce the insertion of Brazilian research output in the international flow of scientific communication and the internationalization of knowledge produced in Brazil. More specifically, ScieLO indexing criteria established different minimum and recommended percentages of articles in English for each of the eight fields of knowledge officially adopted by CNPq. When analyzing articles published in journals indexed in ScieLO Brazil, Packer (2016) showed that there was a consistent rise between 2011 to 2015 in English-medium publications and a continuous decrease in the number of Portuguese-medium publications. In 2014, a milestone was achieved when journals indexed in ScieLO Brazil started to publish more frequently in English than in Portuguese and, by 2015, 62% of the articles in these journals were in English and 54% were in Portuguese.

With regards to the eight fields of knowledge officially adopted by CNPq and the Lattes Platform, Packer (2016) demonstrated that, in 2015, 85% of the publications in SciELO Brazil were exclusively in English in the fields of *Biological Sciences* and *Health Sciences* and around 60% in the fields of *Engineering* and *Exact and Earth Sciences*. The percentage of English-only publications was considerably lower in *Human Sciences* (19%), *Applied Social Sciences* (20%), and *Linguistics, Literature, and Arts* (32%). When analyzing the changes between 2011 and 2015, although all fields of knowledge had an increase in English-medium articles, the only fields that had reached the ScieLO recommended criteria were *Biological Sciences*, *Health Sciences*, and *Linguistics, Literature, and Arts*.

Considering these data, to better understand the nuances of the adoption of English for knowledge production and dissemination by plurilingual EAL scholars from various fields of knowledge, especially by Brazilian scholars, it is imperative to investigate the multiple factors involved in the extent to which they use Portuguese and English.

2.4.3 Possible reasons for the greater or lower dominance of English in different disciplinary communities

Scientific research papers or articles are the most established way of capturing, creating, and spreading new knowledge, which contributes to world development and generates knowledge capital (Bourdieu, 1984, 1991) and, at the same time, creates social capital (Bourdieu, 1988) for scholars by the acquisition of more intellectual and professional prestige and more funding for research.

Authors such as Salager-Meyer (2014), Li (2014), and McGrath (2014) have questioned whether the choice of language in which to publish is really scholars' 'choice' or not, since they are highly limited, and their decisions are not independent but "constrained by larger

sociocultural contexts: multilayered sites of symbolic struggles that have emerged over history" (Solovova, Santos & Verissimo, 2018, p. 11).

According to the data presented in Ferguson (2007), one of the most important constraints is the economic strength of the English language community which leads to a larger number of research and publications in this language, as opposed to those from scientific communities with scarcity of investments in science. In addition, based on data related to the share of languages used by German authors to publish in two top international journals in Biology and Math, Ammon (2006) suggests that scholars' language choices are also related to what they perceive as beneficial for their careers (e.g. promotions, participation in international conferences and collaboration networks, research funds, and job positions) and for their institutions and countries. Some considerable benefits come from the size and quality of the Anglophone scientific market in comparison to other markets (Ammon, 2006). The size can be measured by the number of readers, researchers in the same field, funds, and potential jobs, while the quality relates to scientists' competence, the standards of research, and the value that comes with having contact with prestigious scientists. Educational and research institutions, as well as publishing companies, also commonly make their language choices heavily influenced by market conditions. The adoption of English as the language of publications and/or as the medium of instruction brings not only economic benefits but allows for these stakeholders' inclusion in the international educational and scientific scenario (Kirkpatric, 2012, Perez-Llantada et al, 2011).

Therefore, the dominance of English in scientific publication seems to be directly associated with the social capital it generates, which has a relation with the rewards given by different national academic systems to publications in English over national languages and to the

importance gained over time by publication metrics and ranking systems that have been privileging the exclusive use of English (Corcoran, 2015; Curry & Lillis, 2004; Englander, 2014; Hanauer & Englander, 2011). As Duszak and Lewkowicz (2008) emphasize, the choice of language is more than just ‘‘one aspect of the complex process of research communication and identity construction’’ (p. 115) since it also has consequences in broader issues such as national and institutional policies. Choosing to publish in English is strongly connected to nationally and institutionally-mandated measures of scientific productivity, visibility, impact and quality of research (Lopez-Navarro et al, 2015).

Around the globe, scholars have increasingly been pressured to publish in international high prestige journals because of the policies adopted by HE institutions for faculty promotion, research funding, and requirement for doctoral program completion, among other things. Both in Anglophone and non-Anglophone countries, scholars' research productivity and performance are measured by their institutions and evaluation agencies according to the frequency they are named in citation indexes (Corcoran & Englander, 2016; Lopez-Navaro et al, 2015; Salager-Meyer, 2014; Wood, 2001, among others). The conditions for scientific journals to be included in these indexes involve having English as their language of publication and contributions referenced (the so-called 'referenced journals'), which is practically always in English. The great majority of these journals accept publications only in English and, thus, scholars are left with almost no choice but to publish in this language (Curry & Lillis, 2010). A recent study by Bitetti and Ferreras (2017), based on the results of statistical analyses of 1,328 articles retrieved from Scopus in six Mexican and Argentinian natural sciences journals suggested that English-medium articles are more likely to be cited, and have a higher number of citations than those published in other languages.

The expression ‘publish or perish’, coined by Wilson (1942), has been used to describe the pressure endured by scientists to quickly and continuously publish their work in order to advance in their careers (Garfield, 1996). With the establishment of English as a global language of science, the expression has been adapted to ‘publish in English or perish’ and scholars in the field of ERPP have been discussing issues related to the demands faced by scholars, as well as the profound consequences of not choosing to publish in this language (Curry & Lillis, 2004; Flowerdew, 2008, 2013; Hanauer & Englander, 2011). It should be noted, however, that while scholars have to cope with the pressure to publish in English, the use of one global scientific language helps in the networking and the exchange of ideas among academics, allowing for transnational scientific exchanges and collaborations.

As previously stated, the prevalence of English is greater in fields from the ‘hard sciences’ in comparison to the fields from the ‘softer’ sciences. The possible reasons for such differences are related to a range of intertwining factors that together create a complex scenario, which involves networks of research collaborations (Curry & Lillis, 2010), access to literacy brokers (Lillis & Curris, 2006a), distinct internal disciplinary cultures (Burgess, 2017), the type of language most commonly used (De Swaan, 2001b), the audience of the knowledge produced (Ammon, 2006; Hammel, 2007), and the language skills of writers and potential readers (Ammon, 2006; Carli & Calaresu, 2003), among other factors.

Frame and Carpenter (1979) have long ago highlighted that the language chosen for scholarly communication is connected to the extent that different fields of knowledge establish international research collaboration networks. In a nine-year longitudinal study with 50 European scholars, Curry and Lillis (2010) demonstrated that gaining access and participating in local and transnational academic research networks provide access to social capital (Bourdieu, 1986) by

enabling the mobilization of key resources for publishing in English, particularly in English-medium journals highly ranked in the most prestigious indexes. According to Curry and Lillis (2010), these essential resources include "making connections with others; obtaining information and research/bibliographic materials; collaborating on research and writing; receiving rhetorical/linguistic support; getting help with responding to feedback from gatekeepers; and securing publishing opportunities" (p. 282). One of the important factors in widening scholars' participation in academic research networks is the availability of funds for conferences and research travel. In Brazil, for instance, Schwartzman (2002) demonstrated that, in general, fields that belong to the 'harder' sciences have evolved in such a way that they fomented a culture around securing financing of their various research endeavors, while in the social sciences and humanities they have not.

According to Curry and Lillis (2010), another factor, which is beyond material resources, should also be taken into consideration when analyzing language choices: the role played by PhD advisors and more experienced scholars as brokers who facilitate academic connections and access to research networks to emerging scholars. Based on data gathered from questionnaires and semi-structured interviews with Brazilian students and supervisors, Martinez and Graf (2016) identified that supervisors play a key role in fostering publications in English, acting as literacy brokers, but not necessarily in a systematic way.

The term "literacy brokers" was first used by Lillis and Curry (2006a) to refer to those who mediate English-medium text production in various ways, such as editors, reviewers, academic peers, English-speaking colleagues, and supervisors. For plurilingual EAL academics working on the periphery of the non-Anglophone center of knowledge production, such as Brazilian scholars, these brokers have a decisive influence on the success of their publishing in

English. In their longitudinal text-oriented ethnographic study of psychology scholars in Hungary, Slovakia, Spain, and Portugal, Lillis and Curry (2006a) identified key types of literacy brokers – academic, language, and nonprofessional – and showed that they are stratified according to the type of text and the target publication. For instance, the involvement of academic professional brokers is greater in journal article production than in other types of texts and greater in English-medium international journals than in national ones (Lillis & Curry, 2006a).

Another important factor to be considered regarding language choice used for a myriad of practices in the academic and scientific context are the distinct internal cultures of various academic disciplines. For instance, students from the fields that constitute the 'harder' sciences must access a more internationalized academic community since the beginning of their post-secondary studies, since the foundational articles and research results in fields from the 'harder' sciences, such as computer sciences, physics, and biology, are written exclusively in English. In addition, conferences in these fields tend to prefer papers in English even when they are hosted in non-English speaking countries, as happens in Brazil. Since English has been widely adopted for decades as the common language in the 'harder' sciences and the publication of English-medium articles in high impact journals has long ago become the established way to measure quality and allocate research funds in these fields, today plurilingual EAL scholars in the 'harder sciences' do not offer much resistance to the use of this common global language. In contrast, the internal culture that has been established over time in the fields that constitute the 'softer' sciences' is the publication of longer texts (mostly books and book chapters) usually in the original language of scholars' countries. However, due to the increasing pressure by evaluation agencies for publications in high impact journals, most of them English-medium journals (Curry

& Lillis, 2010), scholars in the 'softer' sciences have been changing their usual vehicles of publications and have been forced to change on two fronts: (1) publish shorter and more rhetorically constrained texts (research articles) and (2) write in English (Burgess, 2017).

The choice of which language to use for knowledge production and dissemination also involves the technical language of publications. For instance, in the 'pure' sciences the technical language is more formalized, with the presentation of results from empirical studies allowing for the use of linguistic standards that are more easily written in an additional language (Skudlik, 1991). De Swaan (2001b) emphasizes that the fields of natural and exact sciences are characterized by the predominance of exactitude with the use of quantitative and formal terms and accurate measurements, and "most of what can be said in English can also be phrased in mathematics and in formal schemes" (p. 76). In contrast, in fields that constitute the 'softer' sciences, language discourse tends to be more complex and plays a crucial role in interpreting results and building arguments, which requires a higher level of language proficiency from the writers.

The topics investigated by the various disciplinary communities may also have an influence in the language chosen to produce and disseminate knowledge. According to Ammon (2006), research in the 'softer' sciences tend to have greater intra-national interest and audience, while the vast majority of subjects from 'pure' sciences tend to have universal relevance and aim at an international readership, for which English is the best language choice. In fact, based on data from high ranking international periodical publications, Ammon (2006) and Hammel (2007) indicated that if scholars with relevant scientific findings want to be acknowledged by the top scientific and academic community in their discipline, they must publish in English, as "even

results of utmost relevance and originality, e.g. in natural sciences or medicine, may get lost or pass unnoticed if they are published in any other language." (Hamel, 2007, p. 60).

It seems that language choice has an influence and is influenced by the language skills of writers and potential readers, as publications in the 'softer' sciences often aim at readers within their own countries who accept and understand texts more easily in their own national language rather than in English. On the other hand, publications by 'pure' scientists are usually addressed to international readers and, thus, English is the more functional language choice (Ammon, 2006; Carli & Calaresu, 2003). In a self-perpetuating dynamic, it seems that in the 'softer' sciences, the less the audience reads knowledge published in English, the fewer English-medium written academic genres are produced; and if there is less knowledge available in English, the less the audience is demanded to read in this language or to improve their proficiency to do so.

It should be mentioned that in some fields of knowledge, the use of languages other than English is more frequent because of the seminal theoretical perspectives that scholars in these fields adopt. For instance, German and French philosophers have historically had a major influence in the fields of education and law in Latin American countries, especially in Brazilian academia. Thus, scholars in these academic disciplines consider that accessing knowledge in the original language in which it was produced allows for an in-depth understanding that contributes to their production of new knowledge. Along these lines, Ammon (2006) reported that even in the U.S. in some 'niche subjects' of the humanities and social sciences (e.g. philosophy, archeology, musicology, and theology) French, German, Spanish, and Italian continue to be used for accessing knowledge and for international academic communication, even though English is the preferred choice. The data collected by Medgyes and Lazlo (2001) also suggested that

English is less frequently used due to some specificities of certain subfields, such as Literature, History and Art.

Irrespective of the reasons for the less frequent use of English in social and human sciences, De Swaan (2001) argues that scholars and advanced students in these fields must learn to use English as the global medium of their academic discipline, as "all comparative social science presupposes the intelligibility of patterns from one culture to scholars living in another" (p. 76), and the use of English as a global language provides a single, universal forum for the social science community.

As Stolerman and Stenius (2008) point out, not only disciplinary communities, but entire regional scientific communities who publish exclusively or mainly in their local languages tend to be trapped in an 'institutional provincialism' having a more limited perspective of science. Stolerman and Stenius' (2008) investigations demonstrated that in France, for instance, a substantial part of ground-breaking pharmaceutical research takes years to reach the international scientific community and hinders the dissemination and progress of science because it is mostly published in local French-medium journals. The same situation happens with the scientific and academic knowledge produced in Brazil, where not publishing in English hinders the dissemination of scientific knowledge produced in the country and restricts international scientific collaboration (Meneghini & Packer, 2007).

Considering what has been explored, the present research addresses a gap in the field of ERPP related to the use of English for scientific knowledge dissemination in different fields of study in the Brazilian context. The focus of this investigation are the differences and similarities of various Brazilian scientific and academic disciplinary communities regarding the use of Portuguese and English in publications through four discourse genres from the academic domain,

as well as presentations given in academic and scientific events and international collaborations. The results of two large databases collected through a large-scale questionnaire and analyses of CVs of scholars working in the country's HE institutions will be used to map the Brazilian scholarly scenario.

In the next section, I will examine issues around plurilingual EAL scholars' English proficiency and its potential relation with the use of English to produce and disseminate knowledge.

2.5 Knowledge production and dissemination in English by plurilingual English as an Additional Language (EAL) scholars and English language proficiency

Cooper (1982) highlights that language spread, as any social change, happens over time, and that the spread of language proficiency requires more time than the majority of other diffusion of innovations, due to the level of knowledge required to learn, use and adopt a language. In addition, there is no doubt that linguistic competence serves as a class marker (Bourdieu, 1984), since fluency in one or more additional languages adds to individuals' linguistic and cultural capital and increases their prominence. In more developed countries, this can be achieved through universal schooling and opportunities, while in developing countries like Brazil this is only offered to a small educated elite, with the clear exclusion of the substantial majority of the population (Gardner, 2012, Paiva & Pagano, 2001).

Even though it is clear that the degree of additional language competence among plurilingual EAL scholars is a key aspect in their inclusion in the global scholarly scenario, very few in-depth data-driven investigations regarding their language proficiency were found in the literature (Man et al, 2004; Skudlik, 1991). In a survey-based investigation, Skudlik (1991) asked German-speaking scholars to estimate their knowledge of additional languages differentiating

between the four skills (reading, writing, listening, and speaking). The analysis included partial competence in one or more skills, as well as full competence in the four skills of knowledge in English and French. The results pointed to the overwhelming knowledge of English by German-speaking scientists, followed (far behind) by French. When comparing full competence in the four skills in English in different academic disciplines, Skudlik (1991) discovered that the disciplines with the highest percentages of self-rated full competence of English were physics and sports sciences (with 100%); mathematics, biology, and psychology (with 97%); and chemistry and sociology (with 93%). In contrast, the academic disciplines with the lowest percentages in self-estimated full competence of English were theology (53%), law (73%), history (76%), and literature (77%).

Although most scholars in Skudlik's study (1991) reported a rather high level in English competence in the four skills, the author argues that the findings also suggest a difference between understanding English and writing in English for publication purposes. For instance, overall, 78% of the scholars stated that they wrote the academic texts themselves; 54% reported asking for corrections for their texts either from native speakers, professional translators, or German colleagues in their disciplines who had good English-writing skills; and only 24% reported being so confident in their language competence that they did not need help with corrections.

There is no doubt that, with the standing achieved by English as a global language of science, written English proficiency has become crucial to plurilingual EAL scholars. Not only is it a form of cultural capital in the scientific community that leads to the power and prestige of its members (Bourdieu, 1986), but it also allows scholars from various geolinguistic regions in the global periphery or semi-periphery to disseminate their ideas and take an active role in academic

and scientific discussions. As Vasconcelos (2007) emphasizes

> For non-native English-speaking authors, good command of English does not appear to be a minor issue in their doing of science. Also, although they are expected to master the four skills, there is no dispute that the writing skill has a unique place in their academic life. (…) The accumulated capital associated with written English proficiency may contribute substantially to research visibility in this international scenario (p. 62).

According to Bortolus (2012), many plurilingual EAL scholars do not write exactly what they would have written in their mother tongue but the best they can write in English, in a commonly extensive and time-consuming process if their language proficiency is low. Also, there is no doubt that overcoming such difficulties faced by plurilingual EAL scientists has consequences for their institutions and countries, once there is a high cost involved in becoming academically proficient in English and producing texts autonomously.

Considering this, the present research addresses two gaps in the literature. The first one refers to a large-scale mapping of plurilingual EAL scholars' English language proficiency, in this case Brazilian scholars. The second gap is related to the association (or not) between these scholars' English proficiency and their use of English to produce and disseminate knowledge.

Among the studies that examine the connection between English proficiency and publication rates, Man et al (2004) investigated the potential relationship between national research funding and English proficiency on publication output among Organization for Economic Cooperation and Development (OECD) member countries. They analyzed all original publications in the five highest ranked general medical journals between 1997 and 2000 and identified a significant correlation between the corresponding author's country and the country's

TOEFL scores. According to their study, "in general, countries which did poorly on TOEFL exams had low publication output, independent of research funding. Conversely, countries with excellent English fluency had high publication output in the highest ranked medical journals" (p. 814).

A study conducted by Bauwens et al (2007), based on data sets of highly cited researchers in all fields of sciences and statistical analyses, identified that the differences in scientific productivity between Anglophone and non-Anglophone countries are highly influenced by English proficiency. They found that besides economic variables such as research and development expenditure and per capita Gross Domestic Product (GDP), "English proficiency explains, at least partially, the good performance of English-speaking countries as well as that of a few other countries in which the population has a very good knowledge of English." (p. 3).

Concerning the employment of self-rated language proficiency as the measure of scholars' knowledge of additional languages, as done in the study conducted by Skuglisk (1991) and in the present research, several authors (Ingram, 1985; LeBlanc & Painchaud, 1985; Oskarsson, 1980, 1989; Wilson & Lindsey, 1999) have stated that adult learners can give a fairly accurate assessment of their additional language ability when a measuring standard is provided. As Wilson and Lindsey (1999) point out

> Given descriptions of behavior that validly reflect different functional levels of proficiency in a second language as foci for organizing and expressing their intuitions, educated adult users/learners of that language are able to rate their own level of proficiency with a significant degree of validity. (p. 3)

Thus, the results found for scholars' self-rated English proficiency in study 1 and study 2 of the present research can be considered valid for the purposes of establishing potential relationships with other data gathered about these scholars.

Finally, with respect to the Brazilian scientific scenario, the investigation carried out by Vasconcelos et al (2008) also provides insights on the importance of English language proficiency on scientific dissemination and productivity. The authors analysed data from 2005 made available by the Brazilian National Council for Scientific and Technological Development (CNPq) regarding national and international publications and self-evaluation of additional language proficiency of 52,233 researchers. They combined this data with the Brazilian Science Indicators (BSI) database, where information on Brazilian authors' publications in the Web of Science available and identified that the number of publications in journals indexed in the Web of Science by BSI authors was associated with how they self-evaluate their writing skills in English.

The Brazilian academic and scientific tradition, as other Latin and Southern American countries, does not include country-wide institutional support for the development of language skills in scholars to write in English (such as English classes, specific training to write in English, and access to writing centers), which directly affects the visibility of science produced. For Meneghini and Packer (2007), there is no doubt that "the ability of scientists to communicate in the scientific lingua franca is part of a country's scientific capabilities" (p. 114). Therefore, as Vasconcelos et al's (2008) claim,

> improving the writing competence of Latin America's scientific community should not be a minor issue in policy-making. Increasing the number of researchers who are fully

> proficient in English might help to enhance international awareness of this region's scientific contributions (p. 702).

Although this is not the focus of the present research, it is important to highlight that among the literacy brokers mentioned by Lillis and Curry (2006a), translators play a significant role in the wide adoption of English-medium publication by plurilingual EAL scholars. The findings of Burgess at al (2014) in their large-scale investigation about Spanish scholars' publishing practices point in the same direction, with translation being an important publishing strategy for Spanish researchers.

Translation, however, does not exclude the need for improvement in scholars' English proficiency in writing. In the Brazilian context, Hanes (2013) proposes that the wider use of English in the scientific domain requires

> further intermediaries such as competent manuscript translators and revisers, the self-positioning of national institutions with regards to language policy as well as bilingualism on the part of Brazilian scientists. The degree of success in navigating this international language interface could well be determinant in the success of scientific practice in Brazil (p. 236).

In the next chapter, I will present the methodological procedures adopted in the first study that comprises this research (*Questionnaire study*), as well as an overview of the data collected. I will also analyze the use of Portuguese and English for publications, presentation, and international collaboration purposes by participants from different fields of knowledge and their self-perceived English language proficiency.

Chapter 3: Questionnaire study

The *Questionnaire study* encompassed data gathered through an online questionnaire administered to scholars who had a PhD and were affiliated with a Brazilian HE institution. The data analyses will focus on the following two objectives:

Objective 1: to examine differences and similarities in the frequency of self-reported use of Portuguese and English amongst Brazilian scholars from different fields of knowledge for publication purposes, for presentations in academic events, and for international collaborations; and

Objective 2: to examine differences and similarities in the self-rated proficiency in English amongst Brazilian scholars from different fields of knowledge.

In this chapter, I will first explain the methodological procedures adopted in the *Questionnaire study* (section 3.1). Secondly, the profile of the participants will be described (section 3.2). Then, I will provide descriptive and inferential analyses regarding the use of Portuguese and English for publications, presentation, and international collaboration purposes by participants from the different fields of knowledge, as well as a discussion of the results (section 3.3). Finally, the results related to participants' self-perceived English language proficiency will be analyzed (section 3.4).

3.1. Methodological Procedures

In this section, the methodological procedures adopted in the *Questionnaire study* will be presented, including the process of recruiting participants, the questionnaire used as the instrument for data collection, and the data trimming.

3.1.1 Recruitment of participants

The online questionnaire used in the *Questionnaire study* was sent to potential participants between May and October 2017 and allowed for the collection of a large amount of anonymous responses. The participants recruited were employed PhD HE professors and/or researchers (referred in this investigation as 'scholars') from different types of institutions, i.e., public (federal, state, and municipal) institutions, private institutions, public federal technical institutes, and colleges.

The identification of potential participants to whom the questionnaire would be sent was carried out based on the Lattes Platform, an initiative of the National Council for Scientific and Technological Development (CNPq) which aims to integrate academic curricula databases of scholars from public and private institutions into a single platform. The so-called "Lattes Curriculum" or "Lattes CV" is considered a national standard of assessment or evaluation, representing a history of scientific, academic, and professional activities of scholars registered on the platform (Mena-Chalco & Junior, 2009). Lattes curricula have been designed to show individual public information by each registered user, including their identification (full name and name used for bibliographic citation); professional address; self-rated proficiency in any additional language(s) (ALs); educational background; field(s) of knowledge; bibliographic; technical, and artistic productions; research projects; participation in academic events, supervisions; and participation in committees. According to official data from CNPq, in 2016 there were approximately 3,4 million Lattes CVs registered on the platform (CNPq, 2016).

At the time the research proposal was sent to the Ethics Committee of UFRGS in March 2017, there were 297,515 scholars (i.e. employed HE professors with a PhD degree) registered on the Lattes Platform. This number was identified through the search engine available on the platform, as shown in Figure 1:

Figure 1. Search engine of Lattes Platform. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

Participants were recruited so as to respect proportions related to three categories:

- field of knowledge,
- professional activity (institution), and
- CNPq research productivity grant[21].

This was conducted by choosing the option "Search Curriculum Lattes" (Figure 1). The screen then allowed for access to the different types of filters, among them “field of knowledge”, “professional activity (institution)”, and “CNPq research productivity grant”.

The filters "professional activity (institution)" and “Brazil” were also selected in order to include only CVs of scholars who worked in Brazilian HEIs (Figure 2):

[21] Researchers with a PhD degree affiliated with any Brazilian HE institution can belong to different categories and levels of CNPq research productivity grants. The category and level of the grant, as well as its duration vary according to specific criteria, which include scholars’ number of years of PhD completion and the quality of their research. (CNPq, n.d.)

Figure 2. Page showing the filter "professional activity (institution)" and "Brazil" selected as the country of the institution on Lattes Platform. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

As for "field of knowledge", Lattes Platform organizes eight major fields: *Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, *Health Sciences*, *Human Sciences*, *Linguistics, Literature, and Arts*, *Other*, and *Technologies*. It is possible to search CVs by each of these fields of knowledge (Figure 3).

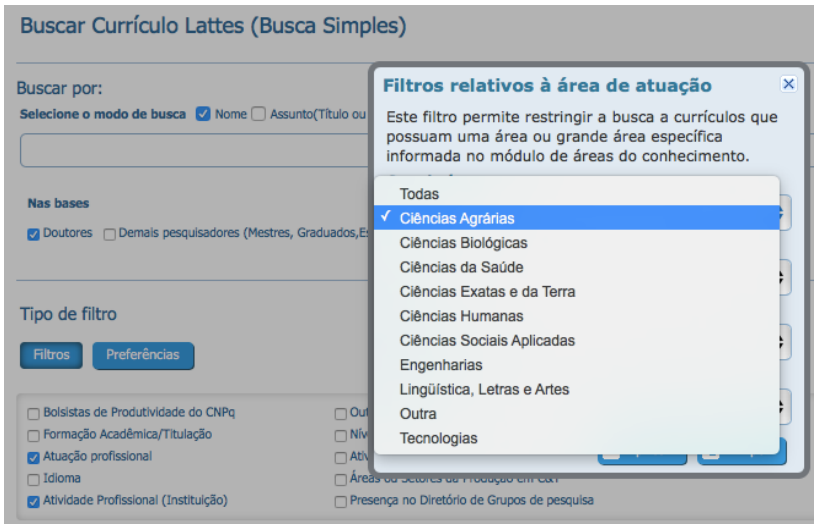

Figure 3. Page showing the filter "field of knowledge" on Lattes Platform and the 11 fields of knowledge provided. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

Table 1 shows the total number of scholars from each field of knowledge who hold a PhD and are affiliated with a Brazilian HE institution in March 2017. The third column presents the percentage of CVs in relation to the total.

Table 1
Number of Lattes CVs of scholars from each field of knowledge with a PhD and affiliated with a Brazilian HE institution

Field of knowledge	Number of Lattes CVs	Percentage of Lattes CVs (%)
Agricultural Sciences	29,351	9.9
Applied Social Sciences	34,740	11.7
Biological Sciences	42,120	14.2
Engineering	29,223	9.8
Exact and Earth Sciences	41,586	14.0
Health Sciences	48,722	16.4
Human Sciences	53,749	18.0
Linguistics, Literature, and Arts	18,024	6.0
Other	0	0
Technologies	0	0
Total number of Lattes CVs	297,515	100

Note. Based on data extracted from Lattes Platform in March 2017.

As there were no CVs registered under the fields of knowledge "Other" and "Technologies", only *Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, *Health Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts* were considered.

The Lattes Platform (CNPq, n.d.) classifies specific academic disciplines that constitute each of these eight fields of knowledge in a rather different way in comparison to the common classification adopted in Anglophone countries or even in international contexts. These are:

1) *Agricultural Sciences*: a) agricultural engineering; b) agronomy; c) food science and technology; d) forestry and forest engineering; e) fishing engineering and fishery resources; f) veterinary medicine; and g) zootechnical engineering.
2) *Applied Social Sciences*: a) architecture and urbanism; b) business; c) communication; d) demography; e) economics; f) home economics; g) industrial design; h) information sciences; i) law; j) museology; k) social service; l) tourism; and m) urban and regional planning.
3) *Biological Sciences*: a) biophysics; b) botany; c) ecology; d) general biology; e) genetics; f) immunology; g) microbiology; h) morphology; i) parasitology; j) pharmacology; k) physiology; and l) zoology.
4) *Engineering*: a) aerospace engineering; b) biomedical engineering; c) chemistry engineering; d) civil engineering; e) electric engineering; f) materials and metallurgical engineering; g) mechanical engineering; h) mining engineering; i) naval and ocean engineering; j) nuclear engineering; k) production engineering; l) sanitary engineering; and m) transportation engineering.
5) *Exact and Earth Sciences*: a) astronomy; b) chemistry; c) computer science; d) geoscience; e) mathematics; f) oceanography; g) physics; h) statistics and probability.
6) *Health Sciences*: a) medicine; b) nursing; c) nutrition; d) odontology; e) pharmaceutical sciences; f) physiotherapy and occupational therapy; g) physical education; h) public health; and i) speech therapy.

7) *Human Sciences*: a) anthropology; b) education; c) geography; d) history; e) sociology; f) political science; g) philosophy; h) psychology; and g) theology.
8) *Linguistics, Literature, and Arts*: a) linguistics; b) literature; and c) arts.

For the purposes of the analyses and discussion of the results of this investigation, these eight fields of knowledge will be classified as either integrating the 'harder' or the 'softer' sciences (see chapter 2, subsection 2.4.2). The 'harder' sciences will be comprised of five fields (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*), while the 'softer' sciences will include the three remaining fields (*Applied Social Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts*). However, it is important to acknowledge the fact that this classification is practical but not necessarily 'ideal' and should be understood in a *continuum*, as previously stated. For instance, the field of *Applied Social Sciences* includes academic disciplines that tend to produce knowledge that is 'softer', such as communication, law, tourism, and museology, and disciplines that can be considered 'harder', such as economics and information sciences.

Finally, I used the filter "CNPq research productivity grant" to select participants for the *Questionnaire study*[22]. Since CNPq research productivity grants are one of the possible standards

[22] The research productivity grants are intended for scholars who stand out among their peers to value their scientific production, according to regulatory criteria established by CNPq and specific criteria established by CNPq's advisory committees (CNPq, 2015). These grants are considered a measurement of the quality of a researcher, a graduate program and even a research institution. CNPq ranks recipients of research productivity grants hierarchically. The top category of research productivity grants, category 1 (called PQ 1), has four levels of scholars (the highest being PQ 1A, followed by PQ 1B, PQ 1C, and PQ 1D). Category 2 (called PQ 2) does not have any level. More recently, a fourth category (PQ Senior) has been created, to include PQ 1A and PQB who remained at least 15 years (consecutive or not) active in the development of scientific and/or technological research and supervising the work of new scholars

to measure the quality of researchers, this was an attempt to recruit the most qualified scholars according to this criteria. This filter included CVs that represent a subset of the CVs included in Table 1 and allowed for the selection of scholars by the category and levels of productivity grant. Figure 4 shows the two categories (PQ 1 and PQ2) and the four levels of CNPq research productivity grants. (PQ 1A, PQ 1B, PQ 1C, and PQ 1D).

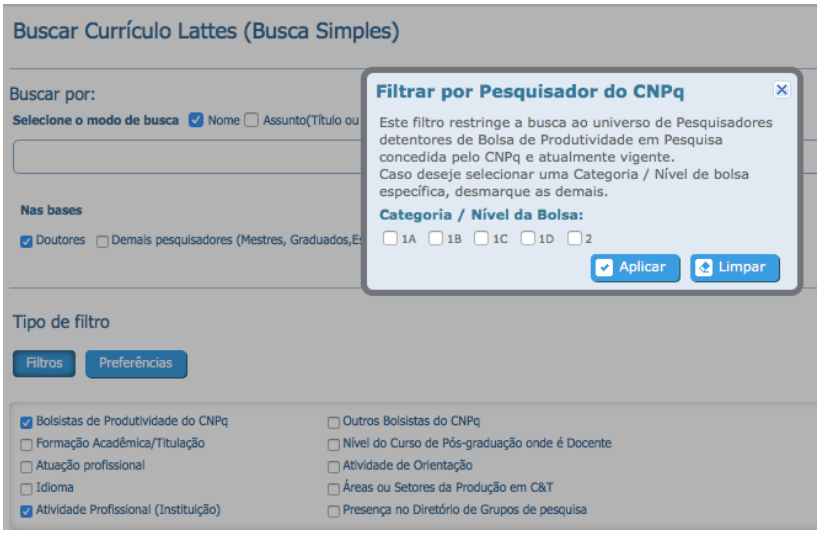

Figure 4. Page with the filter "CNPq research productivity grant" on Lattes Platform. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

Participants were recruited by crossing the filters "field knowledge" and "CNPq research productivity grant" (table 2):

Table 2.
Number of Lattes CVs of scholars from each field of knowledge with a PhD and affiliated with a Brazilian HE institution with different categories and levels of CNPq research productivity grant

(CNPq, 2015). However, the search system of Lattes Platform does not allow the collection of data for this category. Therefore, only PQ 1 and PQ 2 scholars were included in this study. This does not affect the design of the study, since there are currently only 75 scholars with Senior CNPq research productivity grants in all fields of knowledge together (CNPq, 2018a), which represents only 0.4%. out of the total of 18,875 scholars who have PQ 1 and PQ 2 research grants.

Field of knowledge	Lattes CVs of PQ 1A scholars	Lattes CVs of PQ 1B scholars	Lattes CVs of PQ 1C scholars	Lattes CVs of PQ 1D scholars	Lattes CVs of PQ 2 scholars	Total
Agricultural Sciences	164	143	221	399	1194	2121
Applied Social Sciences	83	88	91	189	808	1259
Biological Sciences	341	337	405	621	1879	3583
Engineering	200	223	213	443	1403	2482
Exact and Earth Sciences	313	361	402	670	2306	4052
Health Sciences	211	199	211	382	1292	2295
Human Sciences	188	218	206	354	1353	2319
Linguistics, Literature, and Arts	60	59	73	113	369	674
Total number of Lattes CV						18,785

Note. Based on data extracted from Lattes Platform in March 2017.

The questionnaire was sent to 10% of these 18,785 scholars, following the proportion by field of knowledge and category/level of CNPq research productivity grant. If the same CV appeared more than once as a result of different crossings, it was ignored, and the subsequent CV was used.

Table 3 shows the total number of Lattes CVs of scholars with a CNPq research productivity grant who were randomly selected to receive the survey, distributed among the two categories (PQ1 and PQ2) and four levels (PQ 1A, PQ 1B, PQ 1C, and PQ 1D).

Table 3.
Number of scholars from different fields of knowledge and different categories and levels of CNPq research productivity grant recruited to receive the survey

Field of knowledge	PQ 1A scholars	PQ 1B scholars	PQ 1C scholars	PQ 1D scholars	PQ 2 scholars	Total number of scholars
Agricultural Sciences	16	14	22	40	119	211

Applied Social Sciences	8	9	9	19	81	126
Biological Sciences	34	34	40	62	188	358
Engineering	20	22	21	44	140	247
Exact and Earth Sciences	31	36	40	67	230	404
Health Sciences	21	20	21	38	129	229
Human Sciences	19	22	21	35	135	232
Linguistics, Literature, and Arts	6	6	7	11	37	67
Total number of scholars recruited	155	163	181	316	1059	1,874

Note. Based on data extracted from Lattes Platform in March 2017.

Therefore, 1,874 e-mails were sent to CNPq research productivity grant holders, keeping a proportional distribution among the categories and levels, as seen on table 3. For example, 211 e-mails were sent to scholars from *Agricultural Sciences*, of which: 16 were PQ 1A scholars; 14 questionnaires were PQ 1B scholars; 22 were PQ 1C scholars; 40 were PQ 1D scholars; and 119 were PQ 2 scholars.

Scholars who did not hold a CNPq productivity grant were also recruited to participate in the *Questionnaire study*. To do so, from the total number of Lattes CVs registered in each field of knowledge (297,515) (table 1), the total number of CVs of scholars with a CNPq research productivity grant (table 2) was subtracted, as shown in table 4.

Table 4.
Number of Lattes CVs from scholars with different categories and levels of CNPq research productivity grant recruited to receive the survey

Field of knowledge	Total number of Lattes CVs	Number of Lattes CVs of scholars with a CNPq research productivity grant	Number of Lattes CVs of scholars without a CNPq research productivity grant	Number of online questionnaires sent (10% of the total number of CVs of scholars without a CNPq research productivity grant)
Agricultural Sciences	29,351	2,121	27,230	2,723
Applied Social Sciences	34,740	1,259	33,481	3,348
Biological Sciences	42,120	3,583	38,537	3,854
Engineering	29,223	2,482	26,741	2,674
Exact and Earth Sciences	41,586	4,052	37,534	3,753
Health Sciences	48,722	2,295	46,427	4,643
Human Sciences	53,749	2,319	51,430	5,143
Linguistics, Literature, and Arts	18,024	674	17,350	1,735
Total number of scholars recruited	297,515	18,785	278,730	27,873

Note. Based on data extracted from Lattes Platform in March 2017.

Thus 27,873 questionnaires were sent by e-mail to scholars without a CNPq research productivity grant. Adding grant and non-grant holders, a total of 29,747 online questionnaires were sent by e-mail, out of a total of 297,515 Lattes CVs of scholars with a PhD and affiliated with a Brazilian HE institution.

It is known that the rate of return tends to be low in questionnaires sent electronically (Leedy & Ormord, 2013), varying between 10 and 35%. In this study, a return rate of at least 10% was expected. This would correspond to 187 responses from productivity grant scholars, and to 2,787 responses from scholars without a CNPq research productivity grant, adding to 2,974 responses. In addition to that, it is impossible to know whether the questionnaire was also distributed by colleagues within institutions.

Scholars were contacted crossing the filters “field of knowledge: Agricultural Sciences”

and “CNPq research productivity: PQ 1A”. The system displayed the image below (Figure 5), with the names of 163 scholars and the link to their Lattes CVs.

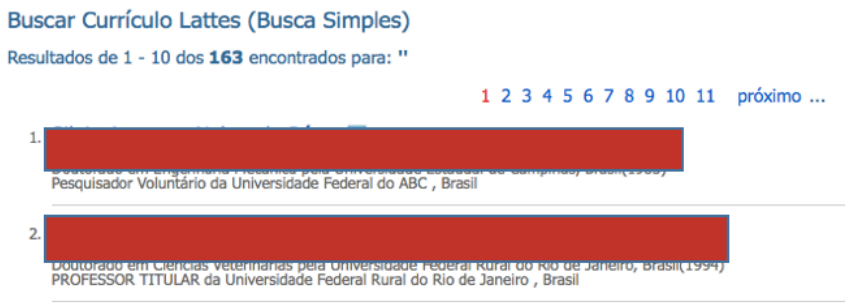

Figure 5. Page of Lattes Platform resulting from the crossing of filters field of knowledge” and “CNPq research productivity PQ 1A”. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

When clicking on the link to a specific scholar, the first page of his/her Lattes CV was opened (figure 6), displaying an icon called “Contact”.

Figure 6. First page of a Lattes CV registered on Lattes Platform. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

By clicking on the "Contact" icon, a new window was opened, in which the sender of the e-mail (in this case, me) inserts his/her name, e-mail account, subject of the message, and the message itself (Figure 7).

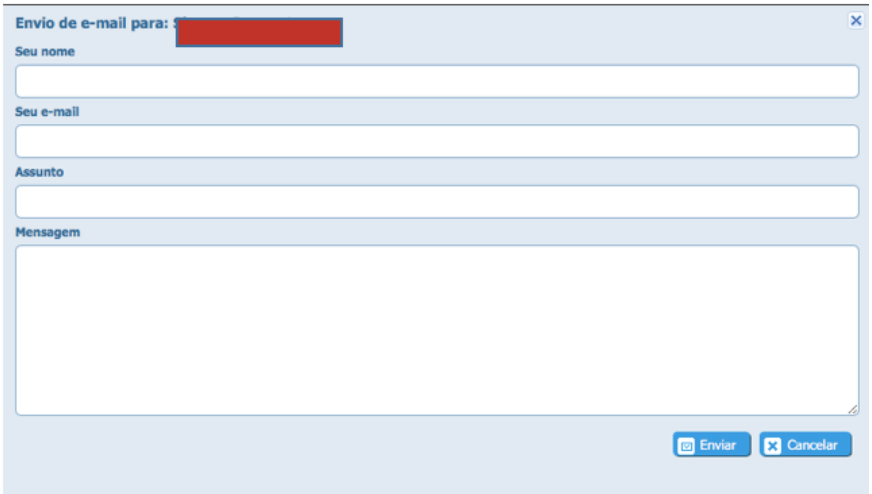

Figure 7. Page of the Lattes CV which enables sending an e-mail directly to a scholar. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

The message sent in Portuguese briefly explained the research and provided the link to the online questionnaire to be completed. In figure 8, a version of the message in English is presented.

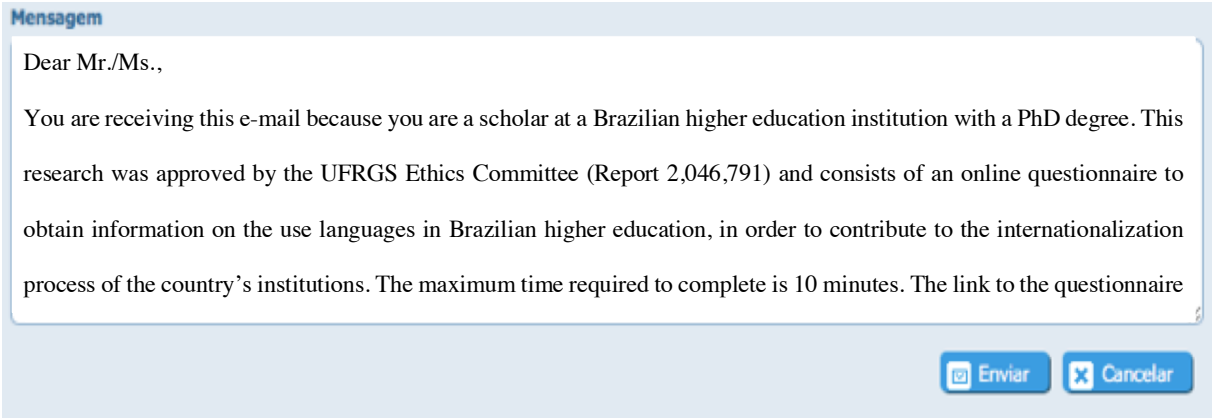

Figure 8. Message sent to scholars with the link to the online questionnaire[23]. Retrieved May 19, 2017 from

[23] In Portuguese, the message stated: "Prezado(a), Você está recebendo este e-mail por ser professor(a) em instituição de ensino superior brasileira com título de doutor(a). Esta pesquisa foi aprovada pelo Comitê de Ética da UFRGS (Parecer 2.046.791) e consiste em um questionário eletrônico que visa a obter informações sobre o uso de línguas no ensino superior brasileiro, a fim de contribuir para o processo de internacionalização das instituições do país. O tempo necessário para completá-lo é de no máximo 10 minutos. O link para o questionário

http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

By October 2017, a total of 5,119 valid responses had been collected, representing a return rate of 17.2%.

3.1.2 The questionnaire

Questionnaires are understood here as any type of written instruments that "present respondents with a series of questions or statements to which they are to react either by writing out their answers or selecting from among existing answers" (Brown, 2001, p. 6). Different types of questions were included in the questionnaire: close-ended questions, which provided only one option, or those which provided a set of options that respondents could choose from; and open-ended questions (optional), which allowed respondents to write their answers.

The design of the survey was based on an extensive literature review about internationalization of HE globally and in the Brazilian context, as well as the role played by additional languages in internationalization processes. Moreover, between April and August 2016, I conducted five informal semi-structured interviews with scholars from different fields of knowledge, affiliated with public federal universities and one from a private HE institution. The focus of these interviews was a preliminary exploration of scholars' use of English as a Medium of Instruction (EMI) and other uses of any AL for research and publication purposes. The analyses of the interviews showed that these issues were emergent and relevant to scholars, but also indicated that interviews were not an efficient method to quantitatively map the use of ALs in the Brazilian HE context. These actions taken during the planning phase enabled me to make

é https://goo.gl/forms/PBLY6pH0xfhDyjwv1. Muito obrigada. Atenciosamente, Laura Knijnik Baumvol - Doutoranda PPG Letras/UFRGS e Simone Sarmento – Professora PPG Letras/UFRGS.

an informed decision about the use of questionnaires as a methodological research tool and about which items to include in the questionnaire to be administered to Brazilian scholars.

In May 2017, after the project had already been approved by the Ethics Committee of Universidade Federal do Rio Grande do Sul (UFRGS), I conducted a pilot test (Mitchell, 2007; Mackey & Gass, 2005) with 10 respondents. Some slight revisions in the questions were made based on the feedback received from these respondents, such as the phrasing of a few questions that were unclear.

The e-mails with the link to the questionnaire were sent between May and October 2017. The full questionnaire is available in Appendix A (Portuguese original version) and Appendix B (English version) of this dissertation. The online questionnaire was designed on the free application "Google Forms" and consisted of 66 questions scattered through 12 theme sections:

1) participants' profile (nationality, gender, age, mother tongue, year of PhD conclusion, affiliation, location and type of HE institution, type of work contract, field of knowledge, and whether the scholars taught at the undergraduate or graduate level);

2) type of CNPq research productivity grants if participants had received one;

3) self-rated general English proficiency and English reading proficiency;

4) the way participants learned English, which language proficiency exam(s) they had taken, reasons for doing so, and the marks they got;

5) participants' self-reported knowledge of other additional language(s) (ALs) other than English and how they learned them;

6) additional language courses offered by participants' HE institutions;

7) participants' academic experiences abroad (country(ies), type of experience, and language(s) used);

8) language(s) used in participants' teaching practices at the undergraduate and graduate levels (language of references, language spoken by instructor and by students, and language of assignments and exams);

9) participants' international collaborations experiences (countries, language(s) used, and challenges faced);

10) participants' publications and presentations in academic events in the last five years (language(s) used for publication purposes in the last five years, language(s) mostly accepted by Brazilian and international journals in their fields, language(s) accepted in presentations in academic events in Brazil and abroad, and language(s) used for presentation purposes);

11) the use of English as a Medium of Instruction (EMI) in Brazil (participants' perceptions on EMI, HE institutions' incentives, reasons for having taught in English, courses taught in English, and challenges faced by participants); and

12) general comments on the use of English in Brazilian post-secondary education.

A few strategies had to be used in order to reduce the time required to complete the questionnaire. First, only closed-ended questions were mandatory. Second, "shortcuts" were created so that a negative answer would allow the participant to "skip" a question, or even an entire section of the questionnaire. For example, in the question "Have you had any academic experience abroad?", if the answer was "no", the participant could skip from question 27 to question 33, since questions 28 to 32 were related to academic experiences abroad.

Even though the questionnaire was sent to 29,747 scholars, as described in subsection 3.1.1, many scholars who received the questionnaire spread it to colleagues[24]. Thus, it is impossible to measure the exact number of scholars who had access to the survey.

[24] I received several e-mails from scholars reporting this.

At the end of October 2017, 5,516 responses had been collected. Twenty-seven participants reported they did not want to participate in the study and 370 participants reported they did not hold a PhD degree and, thus, were excluded from the *Questionnaire study*. Therefore, the total number of valid responses gathered was 5,119.

3.1.3 Data trimming

Google Forms automatically uploads the responses to Google Sheets. However, for the data trimming process, all responses were carefully 'checked' and reorganized when necessary. For example, in multiple-choice questions which accepted many answers, Google forms puts all the responses in only one column of the spreadsheet. In these occasions, the responses were manually separated in different columns. Out of the 66 questions, the responses to 15 questions were not used in the data trimming process for different reasons. There were 12 open-ended questions which were not used due to the small number of responses received. Analyzing these answers would also require extra time and effort not compatible with the timeframe of a PhD degree completion. This will be done in future research papers. In addition, the initial questions that requested participants' consent to take part in the research and asked whether they had a PhD degree; as well as the question regarding the type of international academic mobility participants had experience were also not used. The responses to this last question were not considered because the large variety of responses given by participants would also require extra time to be analyzed. The 51 remaining questions were organized to enable descriptive and inferential analyses.

In order to carry out the descriptive and inferential analyses, some important decisions had to be made. For instance, question 1.10 in the survey asked participants to choose their field of knowledge from the eight fields officially adopted by CNPq and the Lattes Platform (*Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences*, *Engineering*, *Exact and*

Earth Sciences, *Health Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts*). The option "Other" was also provided, in which participants could mention any other field of study that was not listed in the previous options. Also, when answering question 1.10, participants could click on more than one field of knowledge. This option was offered based on the fact that, in Brazil, scholars can work in more than one area. Therefore, in order to include these scholars in the analyses, during the data trimming process it would have been necessary to create new categories for them. However, as only 403 out of the 5,119 participants (7.9% of the total of participants) had chosen more than one field of knowledge, they were excluded from the analyses so as to match the objectives of this study, which considers the eight fields of knowledge officially adopted by CNPq and the Lattes Platform the main independent variable. Therefore, the analyses and discussions presented throughout this dissertation will only take into consideration the eight fields of knowledge officially adopted by CNPq and the Lattes Platform.

Finally, it is worth mentioning that trimming also encompassed the coding of a considerable number of questions, either in numbers or in new categories that were created to gather the data and allow for descriptive and inferential analyses. For example, in question 1.3 regarding participants' age, those between 20 and 30 years old were coded #1, those between 31 and 40 were coded #2, and so forth. The same procedure was adopted for responses to the questions about the year of participants' completion of PhD degree (question 1.5) and field of knowledge (question 1.10). In addition, a great number of questions had their responses gathered in fewer and/or newer categories due to the variety of answers given by participants, which would not allow for statistical analyses. For instance, in question 1.11 of the survey, about scholars' teaching level (undergraduate or graduate level), participants should choose at least one option, but they could choose more than one if appropriate: public federal university, public state university, and public municipal university, private institution, federal technical institute, state

technical university, private college, and "other" for any other type of HE institution. Considering the interests of this study, five main categories were used: public universities (included federal, state, municipal, and state technical universities), private HE institutions (included private universities and colleges), federal technical institute, public and private HE institution (when participants worked for both types of institutions), and other (when participants worked in more than one of the categories created).

In the next section, responses which helped understand the general profile of the participants will be presented.

3.2 General profile of participants

In this section, I will provide a general outline of the results obtained through the questionnaire administered to scholars with a PhD degree affiliated to Brazilian HE institutions. This overview aims to map the profile of the 5,119 participants of the *Questionnaire study*, including the following aspects: (1) gender, age, nationality, and mother tongue; (2) fields of knowledge; (3) location and type of Brazilian HE institution(s) participants were affiliated with; (4) type of work contract they had; (5) categories and levels of CNPq research productivity grant they had; 6) English language proficiency exams; and 7) knowledge of other AL(s).

3.2.1 Gender, age, nationality, and mother tongue

In the *Questionnaire study*, 56.2% of the participants (N = 2,876) were male and 43.8% percent (N = 2,243) were female. This distribution is rather similar to the official data found in Lattes Platform (CNPq, 2016), according to which 52.5% of scholars with a PhD teaching or researching in Brazilian HE institutions are male and 47.5% are female. In relation to participants' nationality, 96.1% (N = 4,918) reported being Brazilian, 3.4% (N = 174) reported having a nationality other than Brazilian, and 0.5% (N = 27), reported having at least one more nationality besides Brazilian.

Participants' ages were distributed as follows: 1.8% were between 20 to 30 years old (N = 90); 28.5% were between 31 to 40 years old (N = 1,462); 31.8% were between 41 and 50 years old (N = 1,626); 27% were between 51 and 60 years old (N = 1,383); 9.7% were between 61 and 70 years old (N = 498); and 1.2% were over 70 years old (N = 60). Figure 9 below illustrates the distribution of participants' age:

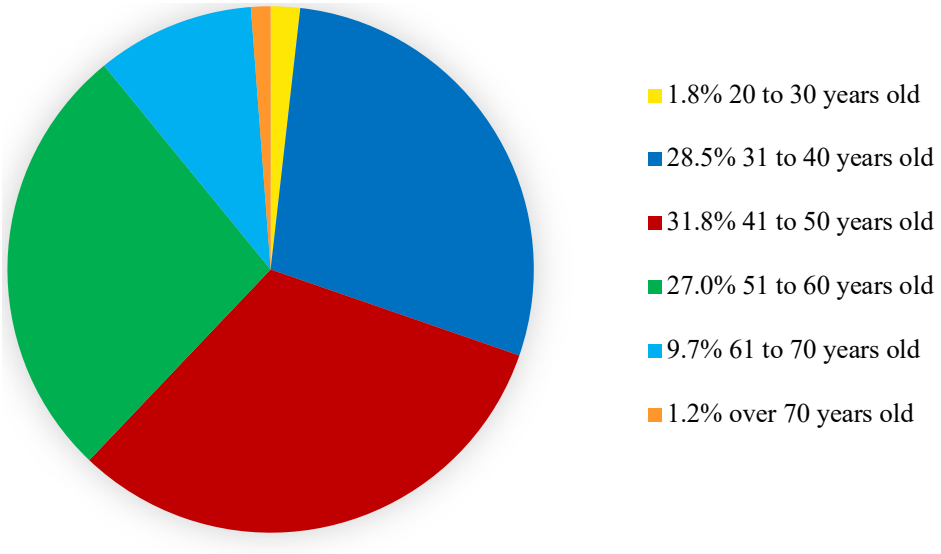

Figure 9. Questionnaire study - Distribution of participants' age.

With regards to participants' mother tongue(s), 93.3% (N = 4,774) had Portuguese as mother tongue, which represents the great majority. Concerning the rest of the participants, 2.3% (N = 117) had both Portuguese and either one of the other languages offered as options in question 1.4 of the questionnaire (English, French, Italian, German, or Spanish) or any other language(s) as mother tongues; 2% (N = 102) had Spanish as their mother tongue; 0.5% (N = 27) had German; 0.5% (N = 24) had French; 0.4% (N = 23) had English; 0.2% (N = 15) had Italian; and 0.6% (N = 29) had any other language as their mother tongue. Finally, 0.2% (N = 8) of participants had two or more languages other than Portuguese as their mother tongues.

3.2.2 Locations and types of Brazilian HE institution(s), type of work contract, and distribution among the different fields of knowledge and categories and levels of CNPq research productivity grant

With regards to the location of participants' HE institution(s), the right column of table 5 shows their distribution across the 26 Brazilian states. It should be noted that 0.7% of participants (N = 34) reported working in post-secondary institutions located in more than one Brazilian state.

The left column of table 5 shows the distribution of scholars with a PhD teaching or researching in a Brazilian HE institution according to the official data found in Lattes Platform (CNPq, 2016). In both columns, the number in parentheses after each percentage indicates the number of participants who worked in HE institution(s) located in each of the 26 Brazilian states. When comparing the two columns, we can identify that both distributions are rather similar.

Table 5.
Parallel between the location of registered participants in Lattes platform and location of respondents

State	Percentage of scholars in HE institution(s) located in the 26 Brazilian states according to CNPq official data	Percentage of scholars in HE institution(s) located in the 26 Brazilian states according to the Questionnaire study data
Acre	0.25% (N = 334)	0.50% (N = 28)
Alagoas	0.86% (N = 1,141)	0.90% (N = 48)
Amapá	0.18% (N = 239)	0.50% (N = 24)
Amazonas	1.07% (N = 1,420)	1.1% (N = 54)
Bahia	4.04% (N = 5,361)	4.5% (N = 229)
Ceará	2.53% (N = 3,360)	2.7% (N = 136)
Distrito Federal	3.76% (N = 4,990)	3.5% (N = 177)
Espírito Santo	1.52% (N = 2,018)	1.4% (N = 71)
Goiás	2.92% (N = 3,041)	2.3% (N = 118)
Maranhão	1.07% (N = 1,417)	1.1% (N = 58)

Mato Grosso	1.36% (N = 1,805)	1.4% (N = 70)
Mato Grosso do Sul	1.46% (N = 1,943)	1.4% (N = 71)
Minas Gerais	10.6% (N = 14,110)	10.2% (N = 520)
Pará	2.05% (N = 2,722)	2.6% (N = 134)
Paraíba	2.65% (N = 3,515)	2.8% (N = 141)
Paraná	7.67% (N = 10,173)	8.6% (N = 440)
Pernambuco	3.35% (N = 4,448)	3.6% (N = 184)
Piauí	0.88% (N = 1,162)	1.1% (N = 55)
Rio de Janeiro	12.6% (N =16,686)	11.9% (N = 611)
Rio Grande do Norte	2.08% (N = 2,765)	2.0% (N = 104)
Rio Grande do Sul	8.80% (N = 11,678)	9.0% (N = 463)
Rondônia	0.33% (N = 439)	0.50% (N = 26)
Roraima	0.22% (N = 286)	0.40% (N = 22)
Santa Catarina	4.12% (N = 5,464)	5.3% (N = 273)
São Paulo	22.76% (N = 30,193)	19.8% (N = 1,012)
Sergipe	0.95% (N = 1,263)	1.3% (N = 64)
Tocantis	0.50% (N = 658)	0.60% (N = 31)

Note. CNPq, 2016 and the Author.

In relation to the type of HE institution participants were affiliated with, 81% (N = 4,134) worked either in a public federal university, a public state university, a public municipal university, or a state technical university. Thirteen percent of participants (N = 663) worked in private institutions, 3.3% (N = 171) worked in public federal technical institutes and 3% (N = 151) worked in more than one type of institution. Figure 10 shows participants' distribution according to the type of HE institution.

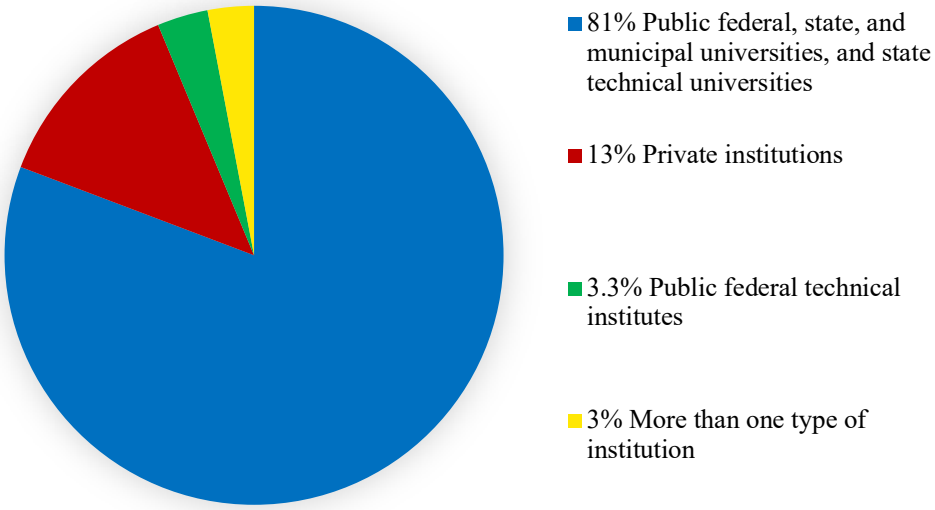

Figure 10. Questionnaire study - Distribution of participants in different types of Brazilian HE institutions.

Considering that all participants had a PhD degree, their distribution is very similar to recent official data (Capes, 2018), which indicates that 87.3% of PhD holders work in public universities (60.8% in federal universities, 26% in state universities, and 0.5% in municipal ones), and only 12.8% of them are associated with private HE institutions.

With regards to participants' type of working contract, 93.5% (N = 4,788) worked on a full-time contract; 2.9% (N = 150) worked on an hourly contract; 0.8% had a 20 or 30-hour contract (N = 43); and 2.7% (N = 138) had more than one type of contract in different HE institutions. Figure 11 shows the distribution of participants across the different types of work contracts.

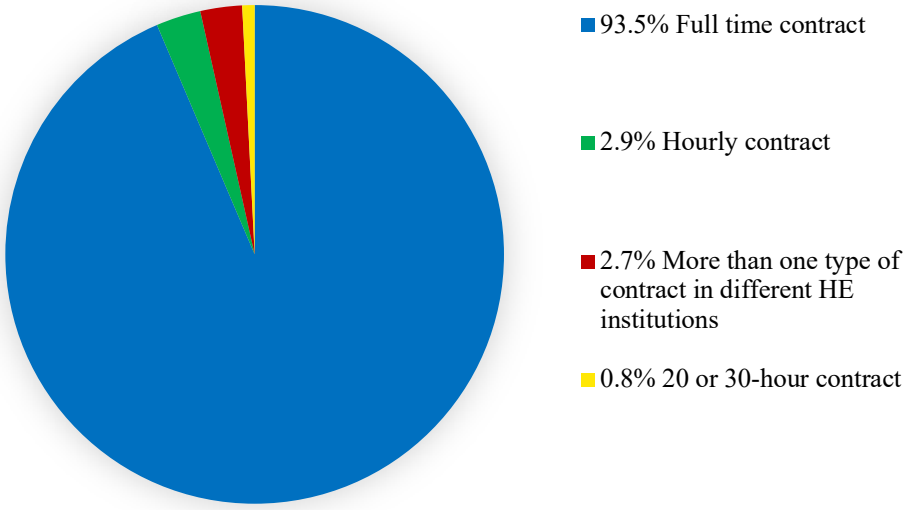

Figure 11. Questionnaire study - Distribution of participants across the different types of work contract.

The distribution of participants according to their work contract is also in accordance with recent official data (Brasil, 2016) that indicates that over 70% of faculty members of Brazilian universities work on a full-time contract.

Participants were distributed across the eight field of knowledge officially adopted by CNPq and the Lattes Platform as follows in figure 12 below:

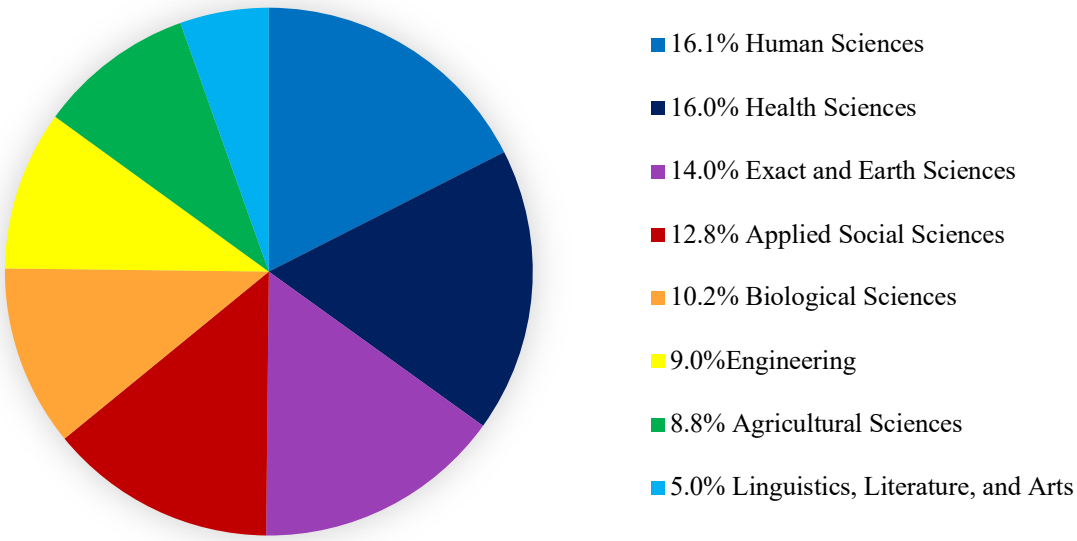

Figure 12. Questionnaire study - Distribution of participants across the eight fields of knowledge officially adopted by CNPq and the Lattes Platform.

It should be noted that this distribution was very similar to the data found in the Lattes platform regarding scholars with a PhD working or researching in Brazilian HE institutions in March 2017, the same period when the *Questionnaire study* was designed (table 1, subsection 3.1.2).

In relation to CNPq research productivity grants, 20.2% (N = 1,035) of participants in study-1 had a grant and 79.8% (N = 4,084) did not. Among the CNPq grantees, the distribution was: 57.2% (N = 592) had PQ 2 grants; 18.3% (N = 189) had PQ 1D grants; 8.1% (N = 84) had PQ 1C grants; 8.9% (N = 92) had PQ 1B grants, 7.1% (N = 74) had PQ1A grants; and 0.4% (N = 4) had PQ Senior grants, as shown in Figure 13.

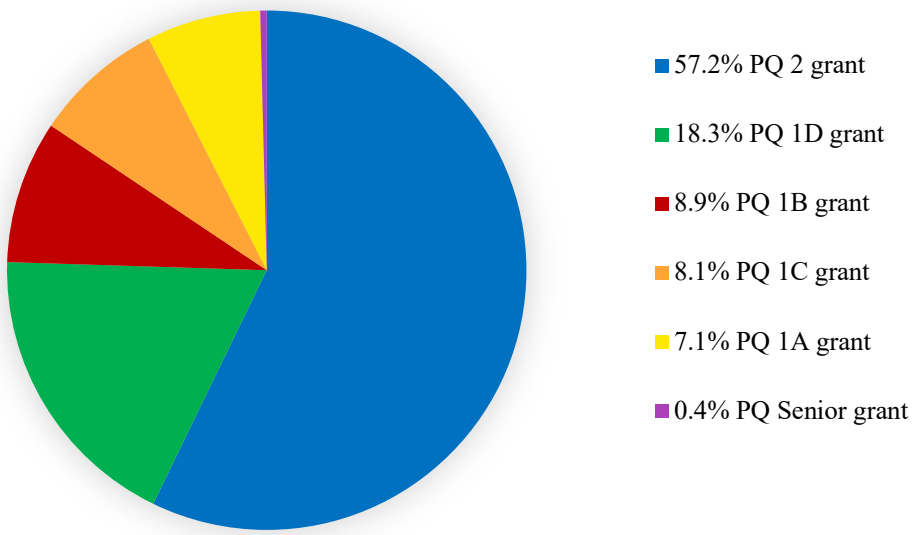

Figure 13. Questionnaire study – Distribution of participants among different categories and levels of CNPq research productivity grant.

3.3 The use of Portuguese and English for publication, presentation, and international collaboration purposes by Brazilian scholars

In this section, the analyses of self-reported use of Portuguese and English for publication, presentation, and international collaboration purposes by Brazilian scholars will be presented. The contexts of use are: (1) publication of articles in academic journals, book chapters, books, and full papers in conference proceedings (subsection 3.3.1); (2) presentation in conferences (subsection 3.3.2); and (3) international research collaboration (subsection 3.3.3)[25]. In each of these subsections, I will present a table with the original data collected, as well as a

[25] Although the questionnaire offered participants the option of reporting not having published in the last five years or having used any other language(s) apart from Portuguese and English for publication, these results will not be analyzed in this study.

figure focusing exclusively on the data regarding the use of Portuguese and English in each context and a descriptive analysis comparing the most relevant results.

The levels of the independent variable were the eight fields of knowledge aforementioned. A one-way analysis of variance (ANOVA[26]) test was conducted, as well as the calculations of means, standard deviations, and frequencies (percentages) of all variables of interest. These variables were (1) self-reported language used for publication, presentation, and international collaboration purposes; and 2) self-rated English proficiency. The software SPSS (IBM Corp, 2016) was used to run the analyses.

3.3.1. The use of Portuguese and English for publication purposes

In this subsection, I will report, describe, and compare the results regarding the *Questionnaire study* participants' use of Portuguese and English for publication of articles in academic journals, book chapters, books, and papers in conference proceedings. Question 8.1 of the questionnaire stated "In the last five years, you have published articles, book chapters, books, or papers in conference proceedings," and asked participants to choose one of the seven responses offered, which were: 1) exclusively in Portuguese; 2) mostly in Portuguese; 3) both in Portuguese and English; 4) mostly in English; 5) exclusively in English; 6) I did not publish in the last five years; or 7) other.

Table 6 shows the percentage of participants who declared (not) having published articles in academic journals, book chapters, books, or papers in conference proceedings in the last five years.

[26] Analyses of Variance (ANOVA) is a statistical method used to test differences between two or more means. The term "one-way" refers to the number of independent variables in the test. In this case, there is one independent variable, with eight levels.

Table 6.
Questionnaire study - Percentage of participants from the eight fields of knowledge who self-reported having published exclusively in Portuguese, mostly in Portuguese, both in Portuguese and English, mostly in English, exclusively in English, in any other language(s) other than Portuguese and English, or reported not having published in the last five years

Field of knowledge	Exclusively in Portguese	Mostly in Portuguese	In Portuguese and English	Mostly in English	Exclusively in English	Any other language (s)	Did not publish in the last five years
Agricultural Sciences (446)	3.4% (15)	9.4% (42)	33.4% (149)	42.4% (189)	10.1% (45)	0.0% (0)	1.1% (5)
Applied Social Sciences (656)	23.2% (152)	27.3% (179)	35.2% (231)	7.0% (46)	2.4% (16)	4.4% (29)	0.5% (3)
Biological Sciences (520)	1.7% (9)	3.3% (17)	11.7% (61)	40.0% (208)	42.7% (222)	0.0% (0)	0.0% (0)
Engineering (457)	4.4% (20)	6.1% (28)	33.9% (155)	37.9% (173)	16.4% (75)	0.4% (2)	0.9% (4)
Exact and Earth Sciences (735)	5.2% (38)	5.7% (42)	21.4% (157)	35.4% (260)	30.9% (227)	0.4% (3)	1.1% (8)
Health Sciences (814)	4.4% (36)	10.9% (89)	33.8% (275)	37.3% (304)	12.8% (104)	0.5% (4)	0.2% (2)
Human Sciences (822	33.3% (274)	29.8% (245)	23.4% (192)	4.7% (39)	0.7% (6)	7.4% (61)	0.6% (5)
Linguistics, Literature, and Arts (257)	33.5% (86)	32.3% (83)	22.6% (58)	2.3% (6)	0.8% (2)	7.0% (18)	1.2% (3)

The field of knowledge who published both exclusively and mostly in Portuguese more frequently was *Linguistics, Literature, and Arts* (33.5% and 32.3%, respectively). The field that published exclusively in English more frequently was *Biological Sciences* (42.7%) and the one that published mostly in English more frequently was *Agricultural Sciences* (42.4%).

Conversely, the data showed a trend in which *Biological Sciences*, *Engineering*, *Agricultural Sciences*, and *Exact and Earth Sciences* occupied the lowest positions in percentage of participants who published only in Portuguese and mostly in Portuguese, while *Linguistics, Literature, and Arts*, *Human Sciences*, and *Applied Social Sciences* occupied the lowest positions in English-only publications and publications mostly in English.

Figure 14 below helps visualize the percentages of participants who published exclusively in Portuguese, mostly in Portuguese, mostly in English, and exclusively in English. For the purposes of this research, these four categories are the most relevant for mapping participants' tendency to use more or less Portuguese or English in publications.

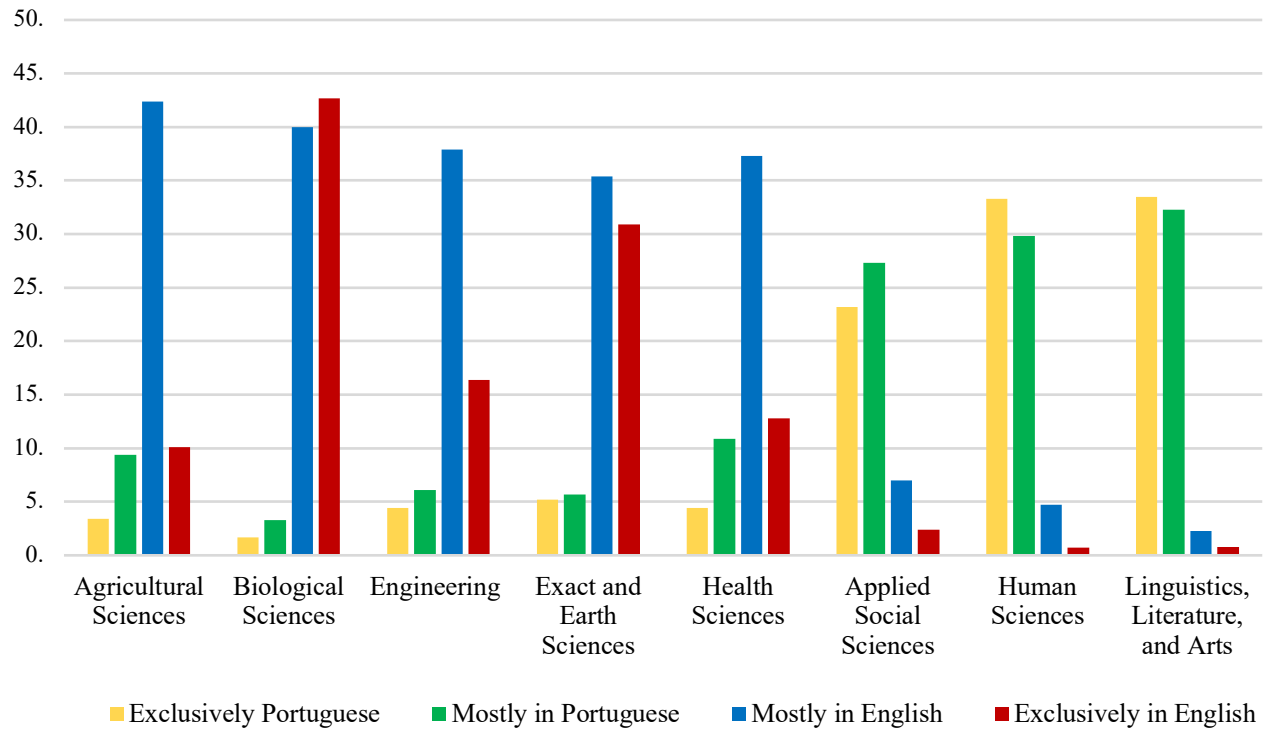

Figure 14. Questionnaire study - Percentages of participants from the eight fields of knowledge who published exclusively in Portuguese, mostly in Portuguese, mostly in English, and exclusively in English.

Overall, scholars in all five fields in the 'harder sciences' (*Agricultural Sciences, Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*) used English

to a greater extent than Portuguese in the context of publications (while academics in the three fields that integrate the 'softer' sciences (*Linguistics, Literature, and Arts*, *Human Sciences*, and *Applied Social Sciences*) tended to use Portuguese more frequently than English.

3.3.2 The use of Portuguese and English for presentation purposes

In this subsection, I will report, describe, and compare the results regarding the use of Portuguese and English for presentation in academic events by the *Questionnaire study* participants. Question 8.6 of the questionnaire stated "In the last five years, you have presented in academic events," and asked participants to choose one of the seven responses offered: (1) exclusively in Portuguese; (2) mostly in Portuguese; (3) both in Portuguese and English; (4) mostly in English; (5) exclusively in English; (6) I did not present in academic events the last five years; or (7) other as seen in table 7.

Table 7.

Questionnaire study - Percentage of participants from the eight fields of knowledge who self-reported having presented exclusively in Portuguese, mostly in Portuguese, both in Portuguese and English, mostly in English, exclusively in English, in any other language(s) other than Portuguese and English or did not present in academic events in the last five years

Field of knowledge	Exclusively in Portuguese	Mostly in Portuguese	In Portuguese and English	Mostly in English	Exclusively in English	Any other language (s)	Did not present in the last five years
Agricultural Sciences (446)	26.0% (116)	18.8% (84)	27.1% (121)	14.8% (66)	6.5% (29)	2.5% (11)	4.3% (19)
Applied Social Sciences (656)	32.2% (211)	22.0% (144)	28.4% (186)	6.9% (45)	2.7% (18)	5.9% (39)	2.0% (13)
Biological Sciences (520)	18.5% (96)	15.8% (82)	29.0% (151)	19.2% (100)	14.0% (73)	1.3% (7)	2.1% (11)
Engineering (457)	19.0% (87)	11.8% (54)	33.9% (155)	16.2% (74)	13.6% (62)	1.3% (6)	4.2% (19)
Exact and Earth Sciences (735)	16.2% (119)	10.9% (80)	31.3% (230)	22.9% (168)	14.3% (105)	1.2% (9)	3.3% (24)
Health Sciences (814)	23.3% (190)	19.9% (162)	33.5% (273)	12.9% (105)	6.9% (56)	2.0% (16)	1.5% (12)

Human Sciences (822)	36.5% (300)	26.4% (217)	21.8% (179)	4.9% (40)	1.0% (8)	8.9% (73)	0.6% (5)
Linguistics, Literature, and Arts (257)	29.2% (75)	24.5% (63)	26.5% (68)	3.5% (9)	2.7% (7)	11.3% (29)	2.3% (6)

The data showed that the field of knowledge who presented both exclusively and mostly in Portuguese more frequently was Human Sciences (36.5% and 26.4%, respectively). The field that presented both exclusively and mostly in English more frequently was *Exact and Earth Sciences* (14.3% and 22.9%, respectively).

Figure 15 below helps visualize the percentages of participants who presented exclusively in Portuguese, mostly in Portuguese, mostly in English, and exclusively in English. For the purposes of this research, these four categories are the most relevant for mapping participants' tendency to use more or less Portuguese or English in presentations.

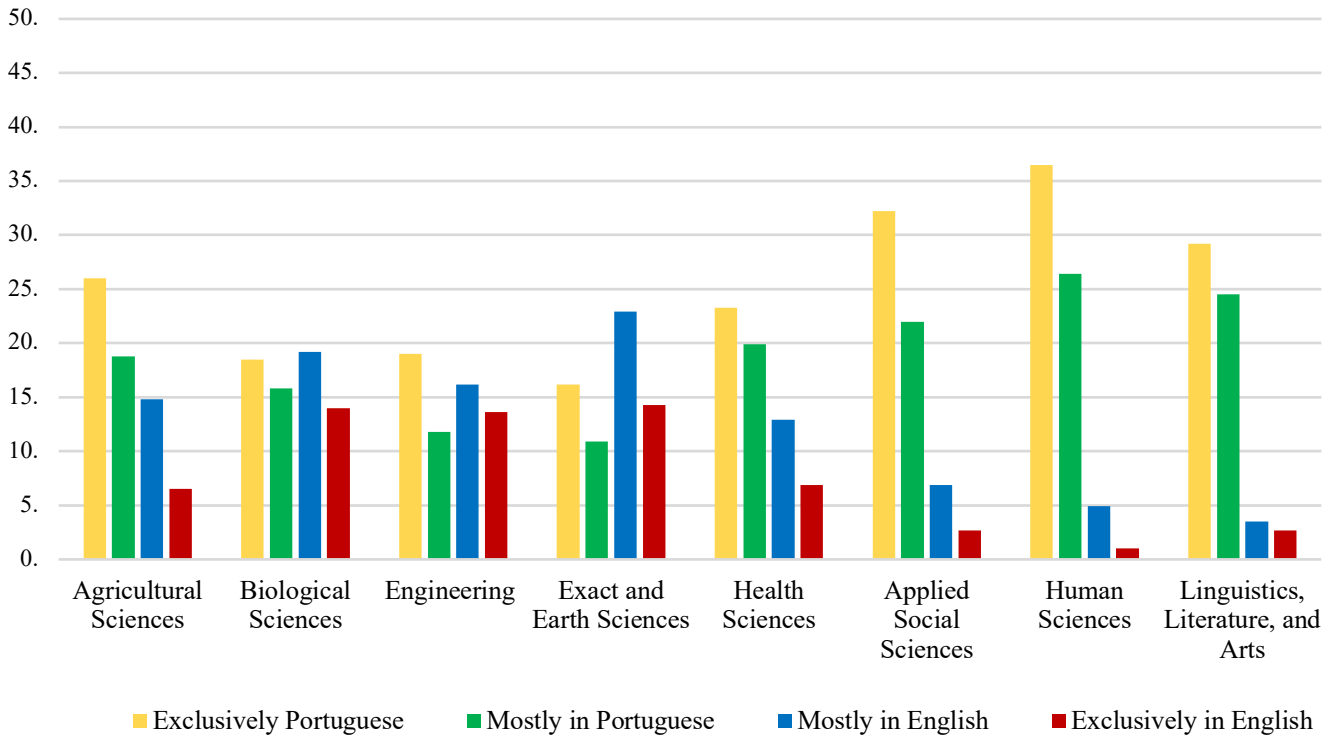

Figure 15. Questionnaire study - Percentages of participants from the eight fields of knowledge who presented in academic events exclusively in Portuguese, mostly in Portuguese, mostly in English, and exclusively in English.

The data showed a trend in which *Biological Sciences* and *Exact and Earth Sciences* occupied top positions in presentations given mostly in English and only in English and the lowest positions in percentages of participants who presented only in Portuguese and mostly in Portuguese. Conversely, *Applied Social Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts* occupied the top positions in percentages of participants who presented only in Portuguese and mostly in Portuguese, and the lowest positions in presentations delivered mostly in English and only in English.

3.3.3 The use of Portuguese and English for international collaboration purposes

In this subsection, I will report, describe, and compare the results regarding the *Questionnaire study* participants' use of Portuguese and English for international collaborations. Question 7 of the survey asked whether participants had ever collaborated internationally with foreign HE institutions. Overall, 49.7% of the participants stated they had already established international collaborations. Table 8 shows the percentage of participants who had collaborated with foreign HE institutions in each of the eight fields of knowledge.

Table 8.
Questionnaire study - Percentage of participants from the eight fields of knowledge who reported having collaborated with foreign HE institutions

Field of knowledge	Percentage of participants who reported having collaborated with foreign HE institutions
Agricultural Sciences (446)	52.2% (233)
Applied Social Sciences (656)	56.9% (373)
Biological Sciences (520)	45.4% (236)
Engineering (457)	42.0% (192)
Exact and Earth Sciences (735)	43.9% (323)
Health Sciences (814)	52.2% (425)
Human Sciences (822)	51.1% (420)
Linguistics, Literature, and Arts (257)	56.0% (144)

The field of knowledge with the highest percentage of participants who have collaborated with foreign HE institutions was *Applied Social Sciences* (56.9%), followed by *Linguistics, Literature, and Arts* (56.0%). The fields with the lowest percentages of participants who have collaborated with foreign HE institutions were *Engineering* (42%) and *Exact and Earth Sciences* (43.9%). There was not a considerable difference between the highest and the lowest percentages. For instance, the percentage of participants who collaborated internationally in *Applied Social Sciences* and in *Linguistics, Literature, and Arts* was 1.3 times higher than the percentage in *Engineering*.

Question 7.2 of the questionnaire stated "During your international collaborations, the communication happened," and asked participants to choose one of the six responses offered, which were: 1) exclusively in Portuguese; 2) preferably in Portuguese; 3) both in Portuguese and English; 4) preferably in English; 5) exclusively in English; or 6) other. Table 9 shows the data based on responses to this question.

Table 9.

Questionnaire study - Percentage of participants from the eight fields of knowledge who self-reported having collaborated internationally using exclusively Portuguese, mostly Portuguese, both Portuguese and English, mostly English, exclusively English, or any other language(s) other than Portuguese and English

Field of knowledge	Exclusively in Portuguese	Mostly in Portuguese	In Portuguese and English	Mostly in English	Exclusively in English	Any other language (s)
Agricultural Sciences (223)	0.9% (4)	1.8% (8)	5.6% (25)	8.7% (39)	20.0% (89)	10.8% (48)
Applied Social Sciences (373)	2.4% (16)	3.2% (21)	5.2% (34)	5.5% (36)	13.3% (87)	13.4% (88)
Biological Sciences (236)	0.4% (2)	1.5% (8)	4.8% (25)	9.8% (51)	30.4% (158)	7.7% (40)
Engineering (192)	1.1% (5)	2.8% (13)	4.8% (22)	11.2% (51)	26.9% (123)	11.2% (51)

Exact and Earth Sciences (323)	1.6% (12)	0.8% (6)	4.8% (35)	10.7% (79)	27.8% (204)	10.3% (76)
Health Sciences (425)	2.2% (18)	2.6% (21)	4.2% (34)	7.1% (58)	24.3% (198)	7.4% (60)
Human Sciences (420)	1.5% (12)	2.9% (24)	5.7% (47)	6.0% (49)	10.3% (85)	22.5% (185)
Linguistics, Literature, and Arts (144)	1.6% (4)	4.7% (12)	4.3% (11)	5.1% (13)	12.1% (31)	16.3% (42)

The field of knowledge who collaborated both exclusively in Portuguese more frequently was *Applied Social Sciences* (2.4%) and the field who collaborated mostly in Portuguese was *Linguistics, Literature, and Arts* (4.7%). The field that established collaborations exclusively in English more frequently was *Biological Sciences* (30.4%) and the one that collaborated mostly in English more frequently was *Engineering* (11.2%).

The data showed a trend in which the five fields of knowledge that integrate the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*) occupied the top positions in percentage of participants who collaborated only in English and mostly in English; while the three fields in the 'softer' sciences (*Applied Social Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts*) and *Health Sciences* occupied the top positions in percentages of participants who established collaborations only in Portuguese and mostly in Portuguese.

It should be pointed out that *Human Sciences* occupied the top position among all fields in collaborations established using any other language(s) besides Portuguese and English (22.5%). The other two fields in the 'softer' (*Applied Social Sciences* and *Linguistics, Literature, and Arts*) also had higher percentages of participants who used any other language(s) besides Portuguese and English to collaborate in comparison to the five fields in the 'harder sciences.

Figure 16 below helps visualize the results in order to compare the percentages of participants who collaborated exclusively in Portuguese, mostly in Portuguese, mostly in English, and exclusively in English in the eight fields of knowledge. For the purposes of this research, these four categories are the most relevant for mapping participants' tendency to use more or less Portuguese or English in collaborations.

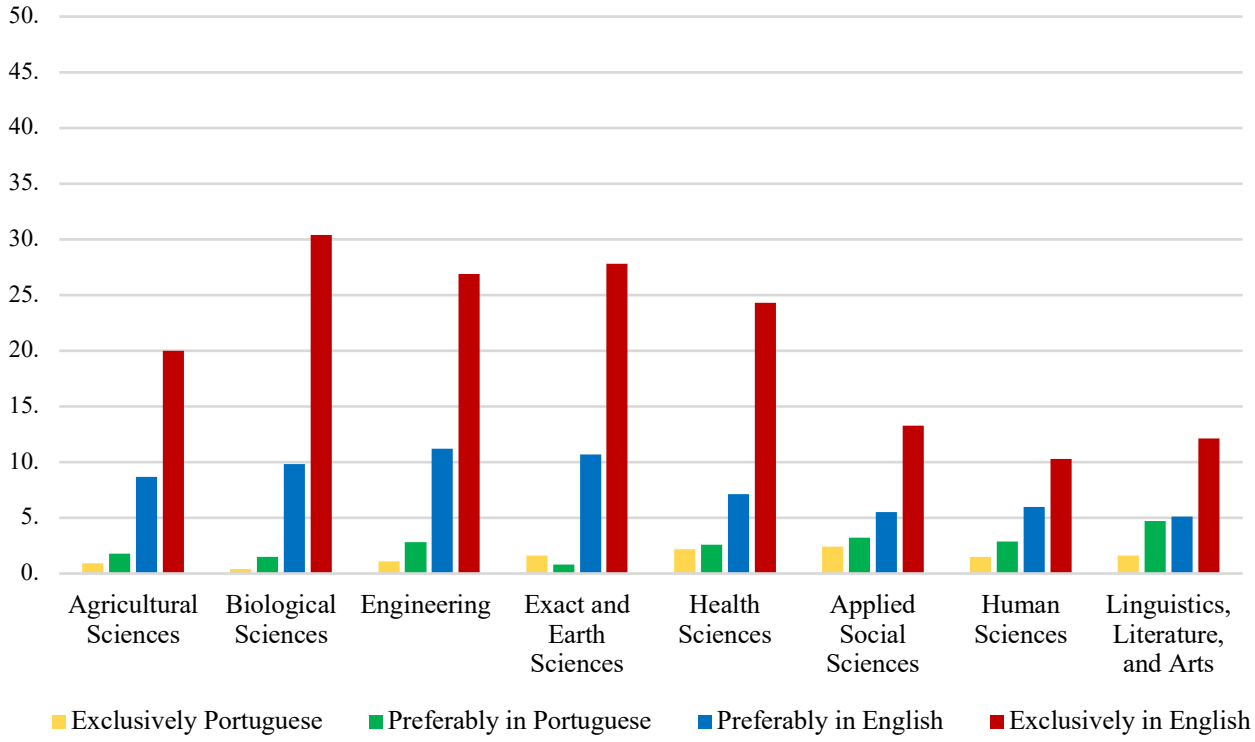

Figure 16. Questionnaire study - Percentages of participants from the eight fields of knowledge who collaborated exclusively in Portuguese, mostly in Portuguese, mostly in English, and exclusively in English.

The results displayed in figure 16 indicate that English-only collaborations occupied the top positions in all fields of knowledge, while collaborations established preferably in English occupied the second highest positions. Therefore, overall, all fields used English to a greater extent than Portuguese to collaborate internationally. Nevertheless, the differences in the use of the two languages were much greater in the fields that integrate the 'harder' sciences than the differences found in the 'softer' sciences. For instance, scholars in *Biological Sciences* used

English 21 times more than Portuguese to collaborate and those in *Exact and Earth Sciences* used it 16 times more than Portuguese. Conversely, academics in *Applied Social Sciences*, *Linguistics, Literature, and Arts*, and *Human Sciences* used Portuguese only three times more than English for establishing collaborations.

3.4 Self-rated English proficiency

In this section, the self-rated English proficiency of scholars from the eight fields of knowledge officially adopted by CNPq and the Lattes Platform will be examined. I will present a table with the results of the data collected, along with a descriptive and inferential analysis comparing these results. The independent variable used was the eight fields of knowledge aforementioned. A one-way analysis of variance (ANOVA) was conducted, as well as the calculations of means and standard deviations of the variable self-rated "English proficiency". The software SPSS (IBM Corp, 2016) was used to run the analyses.

Question 17 of the questionnaire asked, "How do you classify your general proficiency in English?" and gave participants choices from a four-point scale that included 0 (no proficiency), 1, 2, 3, and 4 (advanced proficiency). Table 10 shows how scholars from the eight fields of knowledge self-rated their English language proficiency. The number in parentheses after each field of knowledge indicates the sample size, and the number in parentheses after each mean refers to the standard deviation[27].

Table 10.
Questionnaire study - Self-rated English proficiency in a four-point scale by scholars from the eight fields of knowledge

[27] In statistics, the standard deviation (SD) is a measure used to quantify the amount of variation or dispersion of a set of data values. A low standard deviation indicates that the data points tend to be close to the mean of the set, while a high standard deviation indicates that the data points are spread out over a wider range of values.

Field of Knowledge	English self-rated proficiency
Agricultural Sciences (446)	3.07 (0.76)
Applied Social Sciences (656)	3.20 (0.76)
Biological Sciences (520)	3.29 (0.7)
Engineering (457)	3.30 (0.66)
Exact and Earth Sciences (735)	3.28 (0.72)
Health Sciences (814)	3.10 (0.73)
Human Sciences (822)	2.91 (0.86)
Linguistics. Literature. and Arts (257)	3.20 (0.83)

The highest score in English self-rated proficiency was found in *Engineering* (M = 3.30, SD = 0.66), followed by *Biological Sciences* (M = 3.29, SD = 0.7), and *Exact and Earth Sciences* (M = 3.28, SD = 0.72). The field of knowledge with the lowest score in self-rated proficiency in English was *Human Sciences* (M = 2.91, SD = 0.86), followed by *Agricultural Sciences* (M = 3.07, SD = 0.76), and *Health Sciences* (M = 3.10, SD = 0.73).

An ANOVA was conducted to investigate whether any of these self-ratings in English were different amongst the eight fields. The ANOVA showed that there was an effect of field of knowledge in self-rated proficiency in English [$F(14,5118) = 11.81$, $MSE = 6.69$, $p < 0.01$)]. The score in *Biological Sciences* ($M = 3.29$, $SD = 0.7$), $p = 0.001$; *Engineering* ($M = 3.30$, $SD = 0.66$), $p = 0.001$; *Exact and Earth Sciences* ($M = 3.28$, $SD = 0.72$), p = 0.0001 were statistically higher than the scores in *Agricultural Sciences* ($M = 3.07$, $SD = 0.76$). The scores in *Exact and Earth Sciences* ($M = 3.28$, $SD = 0.72$), p = 0.0001 and *Biological Sciences* ($M = 3.29$, $SD = 0.7$), $p = 0.001$ were statistically higher than those in Human Sciences ($M = 2.91$, $SD = 0.86$), $p = 0.029$ and in *Health Sciences* ($M = 3.10$, $SD = 0.73$), p = 0.001. The score in *Engineering* ($M =$

3.30, *SD* = 0.66), *p* = 0.001 was statistically higher than in *Health Sciences* (*M* = 3.10, *SD* = 0.73), p = 0.001. The scores in *Agricultural Sciences* (*M* = 3.07, *SD* = 0.76); *Applied Social Sciences* (*M* = 3.20, *SD* = 0.76), *p* < 0.001; *Engineering* (*M* = 3.30, *SD* = 0.66), *p* = 0.001; *Health Sciences* (*M* = 3.10, *SD* = 0.73), p = 0.001; *Linguistics, Literature, and Arts* (*M* = 3.20, *SD* = 0.83), *p* < 0.001.

In summary, the analyses showed that the scores for self-rated English proficiency in four fields of knowledge (*Exact and Earth Sciences*, *Biological Sciences*, and *Engineering*) were statistically higher than the score in three other fields of knowledge (*Agricultural Sciences*, *Health Sciences* and *Human Sciences*). The analyses also showed that the score for self-rated English proficiency in *Human Sciences* was statistically lower than the score in the other seven fields of knowledge (*Agricultural Sciences*, *Biological Sciences*, *Health Sciences*, *Exact and Earth Sciences*, *Applied Social Sciences*, *Engineering*, and *Linguistics, Literature, and Arts*). In addition, the score for self-rated English proficiency in *Health Sciences* was statistically lower than the score in three other fields of knowledge (*Biological Sciences*, *Exact and Earth Sciences*, and *Engineering*).

In conclusion, all the analyses presented in chapter 3 allowed for the achievement of objectives 1 and 2 of the present investigation. Regarding objective 1, the detailed examination of the differences and similarities in the use of Portuguese and English in three distinct contexts (publications, presentations in academic events, and international collaborations) amongst Brazilian scholars from different fields of knowledge indicated that scholars from three of the five fields that constitute the 'harder' sciences (*Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*) preferred English to Portuguese in all three contexts. Scholars from *Health Sciences* also tended to prefer English to Portuguese for publication purposes. In contrast, academics from the three of the fields that constitute the 'softer' sciences (*Applied Social*

Sciences, *Human Sciences* and *Linguistics, Literature, and Arts*) preferred Portuguese to English for publication and presentation purposes. Although scholars from *Applied Social Sciences* and *Linguistics, Literature, and Arts* also preferred English to Portuguese for collaborations, the differences found in *Human Sciences* were significantly smaller than those in the 'harder' sciences. It should also be mentioned that academics from two fields that integrate the 'harder' sciences (*Health Sciences* and *Agricultural Sciences*) tended to prefer Portuguese to English for presentations. It is important to remember that the analyses aforementioned did not take into consideration the use of languages other than Portuguese and English or the data regarding scholars who did not publish, did not present in academic events, and did not collaborate internationally.

In relation to objective 2, the analyses of the differences and similarities in self-rated proficiency in English amongst Brazilian scholars from different fields of knowledge also demonstrated a trend. In general, scholars from three of the fields of knowledge of the 'harder' sciences (*Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*) had statistically higher self-rated English proficiencies, while those from *Human Sciences* and *Health Sciences* had statistically lower self-rated English proficiencies. It is worth highlighting hat academics in *Human Sciences* had a statistically lower self-rated proficiency than those from all other fields of knowledge.

In the next chapter, the second study that constitutes this research will be presented (study 2), including the methodological procedures adopted, an overview of the data collected, as well as descriptive and inferential analyses of the data.

Chapter 4: CV study

The *CV study* consisted of the analysis of information recorded in the Lattes CVs by scholars from different fields of knowledge affiliated with a Brazilian HE institution and holders of CNPq research productivity grants. The data analyses will focus on the two following objectives:

> Objective 3: to examine the differences and similarities in the number and types of publications (articles in academic journals, books, book chapters, and papers in conference proceedings) amongst scholars from different fields of knowledge with a CNPq research productivity grant in total number, in Portuguese, and in English; and
>
> Objective 4: to examine the differences and similarities in the frequency of scholars with a CNPq research productivity grant who self-rated their proficiency in English as good in the four skills (comprehension/understanding, speaking, reading, and writing) amongst the different fields of knowledge?

In this chapter, I will first explain the methodological procedures adopted in the *CV study* (section 4.1). Secondly, an overview of the data collected (section 4.2) will be offered. Next, I will provide an analysis of the data collected regarding number and types of publications in both languages, in Portuguese, and in English by participants from the eight different fields of knowledge in a three-year period (2014 to 2016), along with a discussion including comparisons of the publication practices within and between different fields of knowledge (section 4.3). Finally, I will present an analysis of the data collected about participants' self-perceived English language proficiency in the four skills (comprehension/understanding, speaking, reading, and writing) (section 4.4).

4.1 Methodological Procedures

In this section, I will present the methodological procedures adopted in the *CV study*, including the design of the study and the participants' recruitment, as well as the processes of data collection and data trimming.

4.1.1 Design of the study and recruitment of participants

As previously explained, the Lattes Platform integrates academic curricula of academics working in Brazilian HE institutions into a single platform. All Brazilian professors, graduate students, and researchers must register in the platform. They enter their scientific, academic, and professional activities in the platform, which is used by funding agencies and other stakeholders for a number of reasons, including the distribution of funds. The Lattes Platform requires scholars to insert their identification (full name and name used for bibliographic citation); professional address; self-rated proficiency in any additional language(s) (ALs); educational background; field of knowledge; detailed bibliographic, technical, and artistic productions; research projects; participation in academic events; supervisions; and participation in committees.

In order to recruit participants, categories were established *a priori*, based on existing filters in the platform. To include only participants working in Brazilian HE institutions, the search engine of Lattes Platform was used (figure 1), with the filter "professional activity (institution)" and Brazil as the country (figure 2). To select only CVs of academics with a CNPq research productivity grant, the filter "CNPq research productivity grant" was also used, with the selection of either one of the two categories (PQ 1 and PQ 2) or one of the four levels of grants (PQ 1A, PQ 1B, PQ 1C, and PQ 1D) (figure 4).

The decision to include only scholars who had CNPq research productivity grants was based on the fact that such grants aim to "value researchers with outstanding scientific,

technological and innovation production in their fields of knowledge and to encourage the qualified scientific, technological and innovation production"[28] (CNPq, 2017). The grants are awarded to prominent academics in each field of knowledge and have been used as a quality criterion (CNPq, 2015). Therefore, examining information of a sample of this population allowed for the mapping of aspects of publication and language proficiency by some of the most knowledgeable Brazilian scholars.

In order to obtain a proportional representation of academics from each of the eight fields of knowledge officially adopted by CNPq and the Lattes Platform (*Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences*, *Engineering, Exact and Earth Sciences*, *Health Sciences*, *Human Sciences*, *Linguistics, Literature and Arts*), the filter "field of knowledge" (figure 3) was crossed with the filter "CNPq research productivity grant" (figure 4). This crossing resulted in a total of 18,785 Lattes CVs, as previously detailed in table 2. Data was collected from 1,874 CVs, which represents 10% of the total number of CVs (18,785), according to the proportion of scholars from the eight fields of knowledge who had different categories and levels of CNPq research grants, as previously detailed in table 3.

For example, the crossing of the filters for the field of Human Sciences and CNPq research productivity grant PQ 1A resulted in 188 Lattes CVs. Figure 17 shows the first page of the Lattes Platform with the crossings of such filters.

[28] "Valorizar pesquisadores que possuam produção científica, tecnológica e de inovação de destaque em suas respectivas áreas do conhecimento e incentivar o aumento da produção científica, tecnológica e de inovação de qualidade".

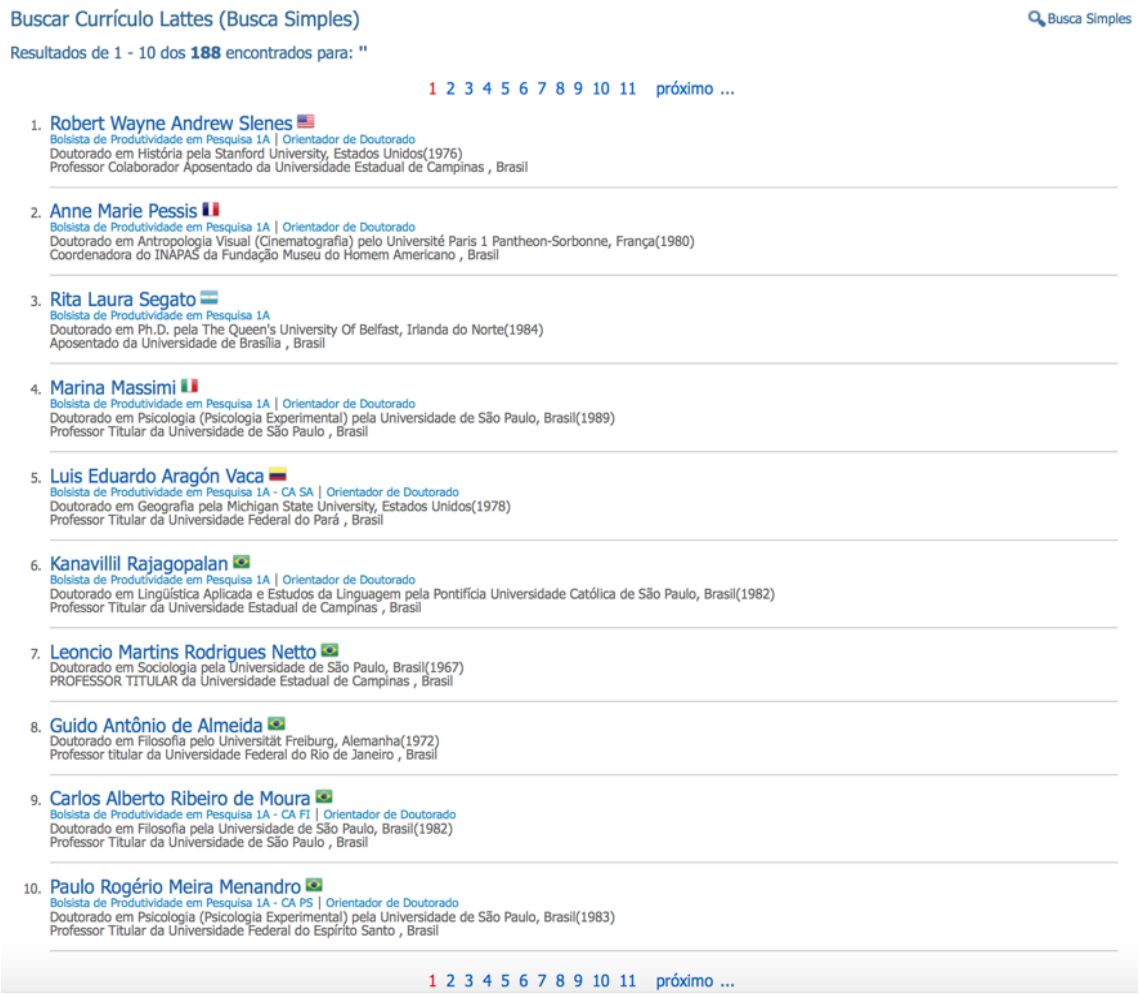

Figure 17. First page showing the crossing of the filters "CNPq research productivity grant: PQ 1A" and "field of knowledge: Human Sciences" on Lattes Platform. Retrieved May 19, 2017 from http://buscatextual.cnpq.br/buscatextual/busca.do?metodo=apresentar

When clicking on a scholar's name (figure 9), his/her full Lattes CV opened and all information recorded by the scholar could be accessed. The CVs used to collect information were selected in a randomized way with one in every five CVs chosen. For instance, from the 188 scholars with a PQ 1A research productivity grants in the field of Human Sciences (figure 9), the CV of the first scholar listed was chosen, followed by the CV of the sixth scholar, the CV of the eleventh scholar, and so forth. It should be noted that these CVs were not the same as those used in study 1. While in study 1 the Lattes Platform was used to identify academics who

would receive an email with the link to the questionnaire, in the *CV study* the data was collected directly through scholars' Lattes CVs.

4.1.2. Data collection

Between September and November 2017, information about 21 different items was collected from each of the 1,874 Lattes CVs. The items were:

1) nationality;

2) gender;

3) year of PhD completion;

4) affiliation;

5) location of HE institution;

6) type of HE institution;

7) total number of articles published in academic journals between 2014 and 2016;

8) number of articles published in academic journals in Portuguese between 2014 and 2016;

9) number of articles published in academic journals in English between 2014 and 2016;

10) total number of books published between 2014 and 2016;

11) number of books published in Portuguese between 2014 and 2016;

12) number of books published in English between 2014 and 2016;

13) total number of book chapters published between 2014 and 2016;

14) number of book chapters published in Portuguese between 2014 and 2016;

15) number of book chapters published in English between 2014 and 2016;

16) total number of papers published in conference proceedings between 2014 and 2016;

17) number of papers published in conference proceedings in Portuguese between 2014 and 2016;

18) number of papers published in conference proceedings in English between 2014 and

2016;

19) self-rated English language proficiency in the four skills (comprehension/understanding, speaking, reading, and writing);

20) self-rated Spanish language proficiency in the four skills (comprehension/understanding, speaking, reading, and writing); and

21) self-rated proficiency in ALs other than English and Spanish in the four skills (comprehension/understanding, speaking, reading, and writing).

Regarding the information on language proficiency in scholars' Lattes CV, academics can rate their proficiency in the four skills of each different language (comprehension/understanding, speaking, reading, and writing) in three levels: good, satisfactory or poor. Due to the high number of Lattes CVs that were examined, data was collected exclusively on whether scholars performed each of the four skills "well" or "not well". The "not well" category included academics who reported their proficiency as being satisfactory or poor in each of the four skills. The "well" category included academics who rated their proficiency as good in each of the four skills.

All the information collected in the 1,874 CVs regarding the 21 items previously mentioned was gathered in Excel spreadsheets organized by scholars' fields of knowledge (*Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, *Health Sciences*, *Human Sciences*, *Linguistics, Literature and Arts*), as well as category and level of CNPq research productivity grant received (PQ 1A PQ 1B, PQ 1C, PQ 1D, and PQ2). Each of the 21 items analyzed were organized in a separate column of the spreadsheets and each of the 1,874 participants were assigned an identification number and a row in the spreadsheet.

4.1.3 Data trimming

The data trimming process comprised the codification of some of the 21 different items collected from the 1,874 Lattes CVs into categories and numbers, in order to enable descriptive and inferential analyses.

In order to conduct these analyses, the codification included, for instance, the organization of the information about the type of HE institution that scholars were affiliated with into 5 categories: public federal university (category #1), public state university (category #2), private HE institution (category #3), public federal technical institute (category #4), and any other type of HE institution (category #5). Information on scholars' self-rated language proficiency in the four skills (comprehension/understanding, speaking, reading, and writing) in English, Spanish, and any other AL other than English and Spanish were also codified. Performing a certain skill well was codified as #1, and not performing a certain skill well was codified as #0.

4.2 General profile of participants

In this section, I will present an overview of the data by examining the topics considered more relevant to the present investigation. The overview aims to give a general outline of the results obtained through the analyses of Lattes CVs of scholars with a PhD and a CNPq research productivity grant. The mapping of the profiles of the 1,874 participants of the *CV study* will include the following items of participants' profile: (1) nationality, gender, age; (2) location and type of Brazilian HE institution(s) participants are affiliated with; (3) fields of knowledge; and (4) their categories and levels of CNPq research productivity grant.

In the *CV study*, 91.9% (N = 1,732) of participants were Brazilian and 8.1% (N = 151) had a different nationality. About 65% of the participants (N =1,211) were male and 35.4% (N = 663) were female. This distribution is rather similar to the most recent official data from CNPq (CNPq,

2014), according to which 64% of academics with a CNPq research productivity grant are male and 36% are female.

With regards to the location of participants' HE institution(s), table 11 shows their distribution across the 26 Brazilian states. In table 11, the number in parentheses after each percentage indicates the number of participants who worked in HE institution(s) located in each of the 26 Brazilian states. It should be noted that 0.7% of participants (N = 34) reported working in post-secondary institutions located in more than one Brazilian state.

Table 11.
CV study - Location of participants in HE institution(s) across the 26 Brazilian states

State	Percentage of CV study participants working in HE institution(s) located in each of the 26 Brazilian states
Acre	0.2% (N = 3)
Alagoas	0.4% (N = 7)
Amapá	0.1% (N = 2)
Amazonas	0.9% (N = 16)
Bahia	2.5% (N = 47)
Ceará	2.4% (N = 44)
Distrito Federal	3.0% (N = 54)
Espírito Santo	0.9% (N = 16)
Goiás	1.1% (N = 20)
Maranhão	0.3% (N = 6)
Mato Grosso	0.2% (N = 3)
Mato Grosso do Sul	0.6% (N =11)
Minas Gerais	12.0% (N = 218)
Pará	1.7% (N = 29)
Paraíba	2.0% (N = 36)
Paraná	5.1% (N = 95)
Pernambuco	4.2% (N = 78)
Piauí	0.5% (N = 9)
Rio de Janeiro	15.0% (N = 287)
Rio Grande do Norte	1.5% (N = 29)
Rio Grande do Sul	9.3% (N = 175)
Rondônia	0.1% (N = 1)

Roraima	0.1% (N = 2)
Santa Catarina	3.8% (N = 70)
São Paulo	32.0% (N = 603)
Sergipe	0.5% (N = 9)
Tocantis	0.1% (N = 2)

In relation to the type of HE institution participants were affiliated with, 92 % of them (N = 1,724) worked in a public federal university or in a public state university, 6.9% (N = 130) worked in private institutions, 0.6% (N = 11) worked in public federal technical institutes, and 0.5% (N = 151) worked in more than one type of institution. Figure 18 below illustrates the distribution of participants according to type of HE institutions.

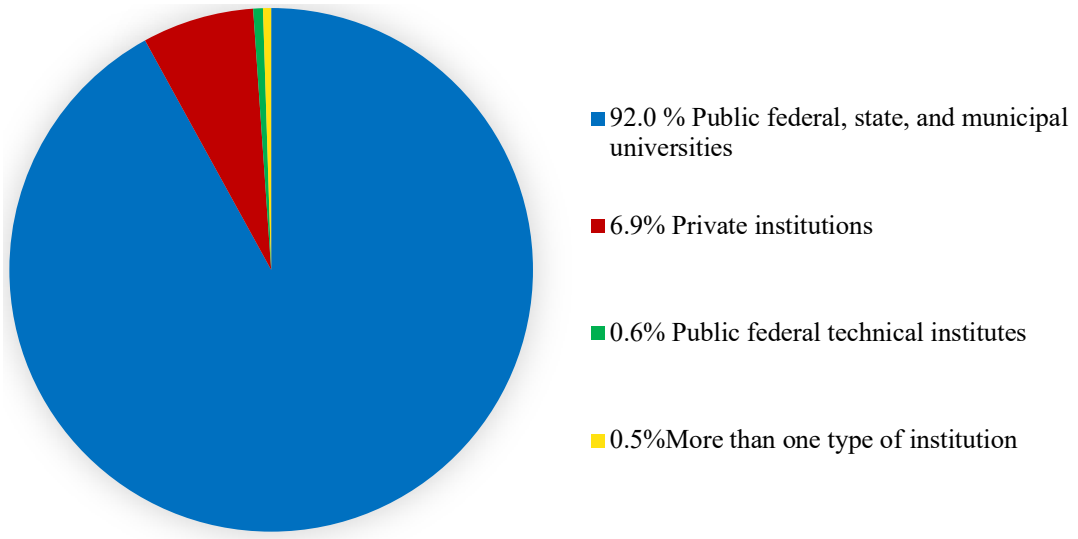

Figure 18. CV study - Distribution of participants in different types of HE institutions.

Participants were distributed across the eight fields of knowledge officially adopted by CNPq and the Lattes Platform as follows: 404 participants from *Exact and Earth Sciences*; 358 participants from *Biological Sciences;* 247 participants from *Engineering*; 232 participants from *Human Sciences*; 229 participants from *Health Sciences*; 211participants from *Agricultural*

Sciences; 126 participants from *Applied Social Science*; and 67 participants from *Linguistics, Literature, and Arts*. Figure 19 shows the percentage of participants in each of the eight fields of knowledge.

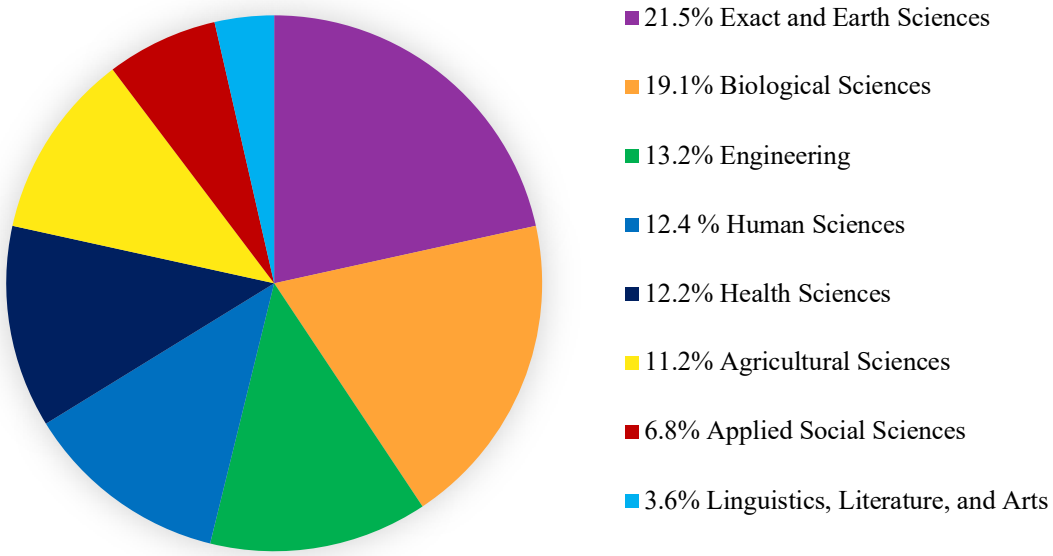

Figure 19. CV study - Distribution of participants across the eight fields of knowledge officially adopted by CNPq and the Lattes Platform.

With regards to the two categories and levels of CNPq research productivity grants, 43.5% had PQ 1 grants (N = 815) and 56.5% had PQ 2 grants (N = 1,059). Participants with PQ 1 grants were distributed among the four levels as follows: 8.3% had PQ 1A grants (N = 155), 8.7% had PQ1B grants (N = 163), 9.7% had PQ 1C grants (N = 181), and 16.9% had PQ 1D grants (N = 316). Figure 20 below illustrates participants' distribution among the categories and levels of CNPq research productivity grants.

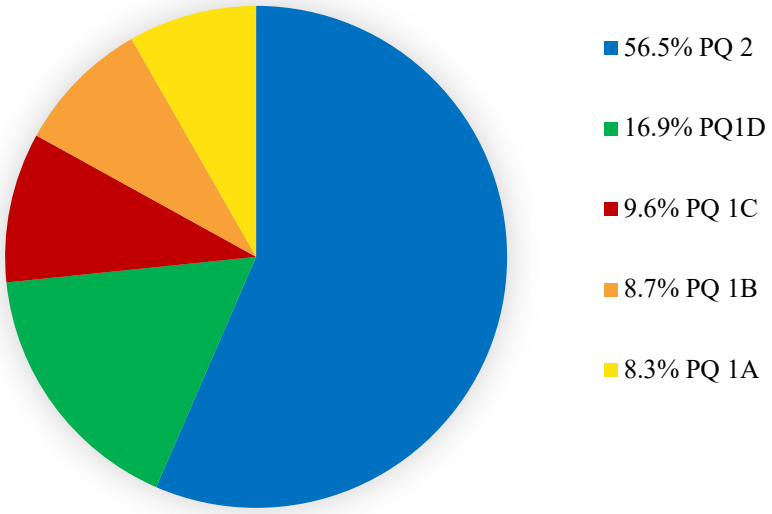

Figure 20. CV study - Distribution of participants among different categories and levels of CNPq research productivity grant.

4.3 Self-rated English proficiency of Brazilian scholars with CNPq research productivity grants: a comparison between the eight fields of knowledge

In this section, the self-rated English proficiency of the *CV study* scholars from the eight fields of knowledge officially adopted by CNPq and the Lattes Platform will be examined. The results will be systematized in table 16 and figure 32 containing the results of the data collected, along with a descriptive analysis comparing these results.

When completing their CV on Lattes Platform, under the tab "General data", scholars are supposed to self-rate their proficiency level in any additional language(s) (ALs). They have to rate their language proficiency level in the four skills of each language (comprehension/understanding, speaking, reading, writing), and have to decide whether they perform each skill well, satisfactorily or poorly.

Data were collected on self-rated proficiency in the four skills in English of 1,874 scholars. In table 12, the number in parentheses after each field of knowledge indicates the sample size, and

the number in parentheses after each percentage refers to the number of participants who ranked their language proficiency in English and in Spanish as good in each of the four skills. It presents results from scholars who rated themselves as performing each of the four skills in English well.

Table 12.

CV study - Percentages of participants with CNPq research productivity grant who self-rated their proficiency in the fours skills in English as good

Field of knowledge	Understands English well	Speaks English well	Reads English well	Writes English well	Performs well in the four skills
Agricultural Sciences (211)	56.9% (120)	40.8% (86)	82.5% (174)	43.1% (91)	55.8%
Applied Social Sciences (126)	73.8% (93)	60.3% (76)	84.1% (106)	58.7% (74)	69.2%
Biological Sciences (358)	80.4% (288)	67.9% (243)	96.4% (345)	74.0% (265)	79.7%
Engineering (247)	79.8% (197)	65.6% (162)	94.3% (233)	74.5% (184)	78.6%
Exact and Earth Sciences (404)	84.2% (340)	73% (295)	94.6% (382)	77.5% (313)	82.3%
Health Sciences (229)	78.2% (179)	56.3% (129)	91.3% (209)	65.1% (149)	72.7%
Human Sciences (232)	70.7% (164)	47.4% (110)	83.2% (193)	38.8% (90)	60.0%
Linguistics, Literature, and Arts (67)	71.6% (48)	52.2% (35)	80.6% (54)	47.8% (32)	63.1%

The results presented in table 12 show that, when all four skills are considered, *Exact and Earth Sciences* had the highest percentage of scholars who self-rated their general English proficiency as good (82.3%) in comparison to those from other fields of knowledge, followed by *Biological Sciences* (79.7%) and *Engineering* (78.6%). Conversely, the lowest percentages of participants who self-rated their general English proficiency as good were found in *Agricultural Sciences* (55.8%) and *Human Sciences* (60.0%). Some differences between self-rated general English proficiency amongst the fields of knowledge were important. For instance, the differences between *Exact and Earth Sciences*, *Biological Sciences* and *Engineering* and the field with the

lowest figure (*Agricultural Sciences*) varied between 26% and 22%, while in comparison to *Human Sciences* (60.0%) such differences varied between 22% and 18%.

In relation to specific skills, in all fields of knowledge, reading ranked the top skill in number of academics who have good English proficiency, while the comprehension/understanding skill ranked second. In five fields of knowledge (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*) writing ranked in the third position, and speaking ranked in the fourth position; whereas in the other three knowledge fields (*Human Sciences*, *Applied Social Sciences*, and *Linguistics, Literature, and Arts*) the opposite was found, with speaking ranking third and writing fourth. Figure 21 illustrates the percentage of scholars from the eight fields of knowledge who self-rated their English proficiency as good in the four skills.

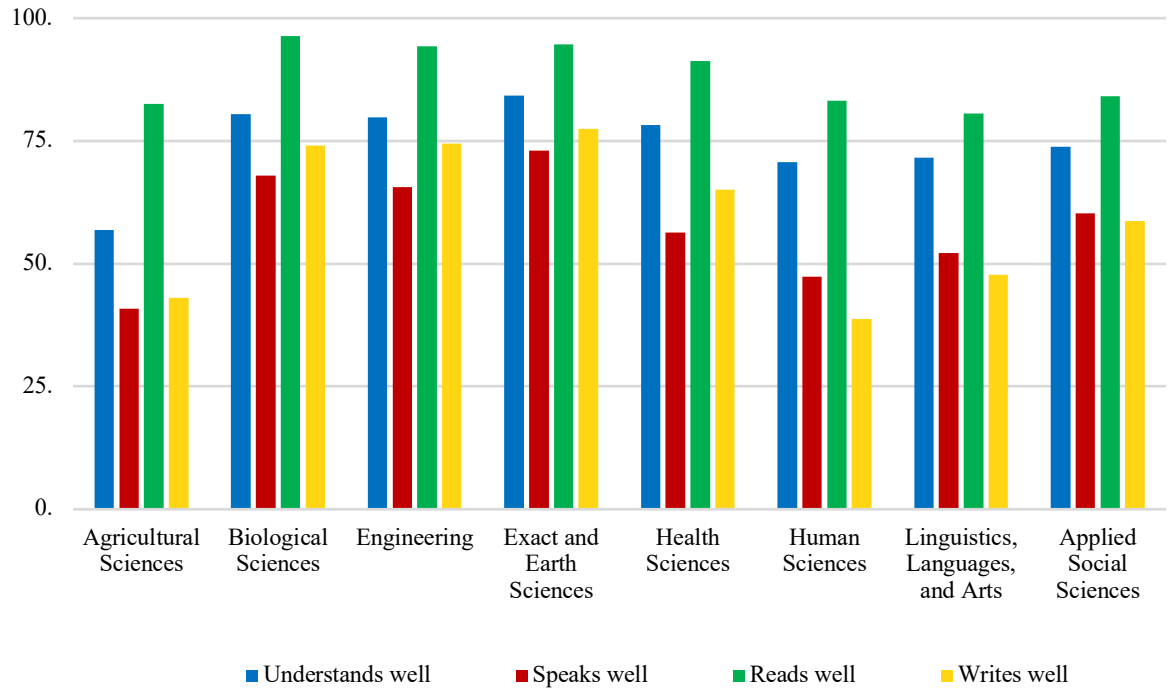

Figure 21. CV study – Participants' self-rated English proficiency in the four skills

The greatest difference between the highest and lowest self-perception in English language proficiency was found in the writing skill, in which the percentage of *Exact and Earth Sciences* scholars who have good writing skills (77.5%) was the double in comparison to *Human Sciences*' scholars (38.8%). Conversely, the skill with the lowest difference in self-rated proficiency was reading, with the highest being 96.4% in *Biological Sciences* and the lowest being 80.6% in *Linguistics, Literature, and Arts*.

In conclusion, all the analyses presented in chapter 4 allowed for the achievement of objectives 3 and 4 of the present investigation. With regards to objective 3, the detailed examination of the differences and similarities in the total number and types of publications (articles in academic journals, books, book chapters, and papers in conference proceedings) amongst academics from different fields of knowledge with a CNPq research productivity grant indicated an overall predominance of: (1) the fields that constitute the 'harder' sciences in publication of articles in journals; (2) the fields from the 'softer' sciences in publication of books and books chapters; and (3) *Engineering* over all other fields of knowledge in publication of papers in conference proceedings, followed by *Applied Social Sciences*. It is worth mentioning that in book chapter publication, the fields of *Health Sciences* and *Agricultural Sciences* prevailed over the other three fields in the 'harder' sciences.

With regards to the number and types of publications in Portuguese, the analyses indicated that, in general, (1) *Applied Social Sciences* was predominant in all four types of publication; (2) *Agricultural Sciences* prevailed in articles, book chapters, and papers in conference proceedings; (3) *Human Sciences* was predominant in articles, books, and papers in conference proceedings; (4) *Health Sciences* prevailed in articles and book chapters; and *Linguistics, Literature, and Arts* dominated in books and book chapters. In English-medium

publications, all five fields of knowledge that constitute the 'harder' sciences were predominant in articles; *Engineering*, *Exact and Earth Sciences*, and *Applied Social Sciences* were dominant in papers in conference proceedings; and *Linguistics, Literature, and Arts* was predominant in English-medium books. It is worth noting that in English-medium articles, *Applied Social Sciences* prevailed over the other two fields from the 'softer' sciences.

In relation to objective 4, the analyses of the differences and similarities in the frequency of scholars with a CNPq research productivity grant who self-rated their proficiency in English as good in the four skills (comprehension/understanding, speaking, reading, and writing) amongst the different fields of knowledge demonstrated that: (1) scholars from *Biological Sciences*, *Engineering*, and *Exact and Earth Sciences* had a higher self-rated English proficiency in comparison to the other fields of knowledge; and (2) scholars from *Human Sciences* and *Linguistics, Literature, and Arts* had a lower self-rated English proficiency than the other fields of knowledge.

4.4 The use of Portuguese and English for publication of articles in academic journals, books, book chapters, and papers in conference proceedings by Brazilian scholars with CNPq research productivity grants

In this section, I will analyze a selection of the data gathered from the 1,874 CVs of scholars with CNPq research productivity grants registered on the Lattes Platform in order to describe and compare the numbers of each type of publication (articles in academic journals, books, book chapters, and full papers in conference proceedings).

First, I will systematize all the results of the data collected (table 15), along with an overall analysis of participants' publications. Secondly, I will analyze each type of publication individually, first considering the total sum of publications (Portuguese and English together)

and then each language separately (first in Portuguese and then in English). The systematization will be as follows: academic journals (subsection 4.4.1), books (subsection 4.4.2), book chapters (subsection 4.4.3), and full papers in conference proceedings (subsection 4.4.4). Finally, I will discuss the results aiming to establish comparisons within and between the eight fields of knowledge (subsection 4.4.5).

The independent variable were the eight fields of knowledge officially adopted by CNPq and the Lattes Platform. A one-way analysis of variance (ANOVA) was conducted. The means (*M*), standard deviations (*SD*), medians, and frequencies (percentages) of all variables of interest were also calculated. These variables were: (1) number of publications of articles in academic journals, books, book chapters, and papers in conference proceedings in Portuguese and in English; and (2) self-perceived English proficiency. The software SPSS (IBM Corp, 2016) was used to run the analyses.

Table 13 shows the average (means) for each type and for each language of publication (articles in academic journals, books, book chapters, and papers in conference proceedings) across the eight fields of knowledge from 2014 to 2016[29]. The number in parentheses after each field of knowledge indicates the sample size.

Table 13.

CV study- Average (mean) publication of articles in academic journals, books, book chapters, and papers in conference proceedings by participants from 2014 to 2016

	Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)

[29]"Book publication" includes both the publication and editing of books, and "paper in conference proceedings" includes only full papers and not abstracts. Lattes Platform has a specific section for scholars to include abstracts from conference proceedings, but this is not included in this study.

Average of articles in academic journals	22.6	9.0	16.3	12.3	12.8	25.9	7.2	3.8
Average of articles in Portuguese academic journals	7.3	5.8	1.0	1.8	0.5	4.4	5.4	3.0
Average of articles in English in academic journals	15.2	3.1	15.3	10.5	12.2	21.4	1.3	0.5
Average of books	0.5	1.1	0.2	0.3	0.2	0.3	1.7	1.2
Average of books in Portuguese	0.5	1.0	0.2	0.2	0.1	0.3	1.5	1.1
Average of books in English	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.3
Average of book chapters	2.0	3.2	1.1	0.8	0.7	2.1	4.9	4.4
Average of book chapters in Portuguese	1.7	2.6	0.6	0.2	0.2	1.8	4.1	3.4
Average of book chapters in English	0.3	0.5	0.5	0.5	0.5	0.3	0.5	0.6
Average of papers in conference proceedings	2.9	8.2	1.3	13.7	2.6	0.7	2.1	1.1
Average of papers in Portuguese in conference proceedings	2.4	5.9	0.6	7.7	0.7	0.3	1.9	1.0
Average of papers in English in conference proceedings	0.6	2.2	0.7	6.0	1.9	0.4	0.2	0.1
Average total publication	28.0	21.5	18.9	27.1	16.3	29.0	15.9	10.5

Overall, the data presented in table 13 shows that some fields have a significantly higher average publication rate over the three-year period analyzed. Scholars from *Health Sciences* published an average of 29 texts, followed closely by *Agricultural Sciences* (28 publications), and *Engineering* (27 publications). In contrast, the average number of publication per scholar was 10.5 in *Linguistics, Literature*, and *Arts* and 15.9 in *Human Sciences*. These figures take into

consideration publications in Portuguese, in English, and in any other language(s). The five fields that integrate the 'hard' sciences (*Agricultural Sciences, Biological Sciences, Engineering, Exact and Earth Sciences, Health Sciences*) did not have any publication in other languages. In contrast, the fields that constitute the 'soft' sciences had the following average of publications in languages other than Portuguese and English: 0.3 texts in *Applied Social Sciences*, 0.9 texts in *Human Sciences*, and 0.5 texts in *Linguistics, Languages, and Arts*.

Most areas have articles as the main genre for disseminating knowledge, such as *Agricultural Sciences* (*M* = 22.6), *Applied Social Sciences* (*M* = 9), *Biological Sciences* (*M* = 16.3), *Exact and Earth Sciences* (*M* = 12.8), *Health Sciences* (*M* =25.9), and *Human Sciences* (*M* =7.2). The two exceptions are *Engineering*, in which papers in conference proceedings predominate (*M* =13.7), and *Linguistics, Literature,* and *Arts*, in which scholars publish more books chapters (*M* =4.4) than articles (*M* =3.8). The lower number of books and book chapters published might be related to the fact that these types of publications are usually not peer-reviewed and they are less prestigious and valued in academic contexts in comparison to articles published in academic journal and, in some fields such as *Engineering*, less than papers in conference proceedings (which also tend to be peer reviewed).

Furthermore, academics of some fields published substantially more in one of the two languages which are the focus of this research. For instance, scholars from the fields of *Applied Social Sciences*, *Human Science*s, and *Linguistics, Literature, and Arts* published more in Portuguese than in English in all four types of publications (articles in academic journals, book, book chapters, and papers in conference proceedings). The largest differences were found in *Linguistics, Literature, and Arts*, in which academics published 15 times more Portuguese-medium books (*M* = 1.5) than English-medium ones (*M* =0.1), and 10 times more Portuguese-medium papers in conference proceedings (*M* =1.0) than English-medium ones (*M* =0.1). It

should be pointed out that in all three fields (*Applied Social Sciences*, *Human Science*s, and *Linguistics, Literature, and Arts*), the figures for books, book chapters, and papers in conference proceedings published in English were very low, varying between 0.6 and 0.1 for the three-year period. There were a few slightly higher figures: in *Applied Social Sciences*, the average publication rate for English-medium articles in academic journals was 3.1, and for papers in conference proceedings was 2.2, and in *Human Sciences* the average of English-medium articles per scholar was 1.3. However, these numbers were still rather lower than the average of publications in Portuguese.

In *Agricultural Sciences*, the average of publications in Portuguese was higher than in English for books, book chapters, and papers in conference proceedings, but it was substantially lower for articles published in academic journals. Academics in this field published an average of 15.2 English-medium articles, which is more than two times their average of publication of Portuguese-medium articles ($M = 7.3$).

In contrast, in *Exact and Earth Sciences*, scholars published more articles in academic journals, book chapters, and papers in conference proceedings in English than in Portuguese, but the average of book publication was the same in both languages, with a rather low figure of only 0.1 of books per scholar over the 3-year period examined. In *Biological Sciences* and *Health Sciences*, articles in academic journals and papers in conference proceedings had a higher average for publications in English in comparison to Portuguese, while Portuguese-medium books and book chapters had a higher average than English-medium ones. Here again, the figures were very low when books were concerned: scholars in *Health Sciences* published an average of 0.3 Portuguese-medium books and 0.1 English-medium books, and academics in *Biological Sciences* had an average quantity of publication per scholar of 0.2 Portuguese-medium books and no books published in English at all during the three years.

Finally, in *Engineering*, articles in academic journals and book chapters had a higher average of English-medium publications compared to Portuguese, while the opposite patterns were found for books and papers in conference proceedings. The differences were striking between English-medium articles in academic journals (M = 10.5) and Portuguese-medium ones (M = 1.8), but were much smaller between book chapters published in English (M =0.5) and in Portuguese (M = 0.2). With respect to papers in conference proceedings and books, the difference between Portuguese-medium and English-medium publications were also smaller in comparison to articles, with an average of 7.7 papers in conference proceedings per scholar in Portuguese and 6.0 in English, and an average of 0.2 books in Portuguese and 0.1 books in English per scholar over the three-year period. In the field of *Engineering*, the figures were rather low for publication of books and book chapters.

4.4.1 Publication of articles in academic journals

In this subsection, I will describe and compare the numbers of articles published in academic journals in both languages, followed by an analysis of publications only in Portuguese, and only in English across the eight fields of knowledge. Descriptive and inferential analyses of the results will be provided.

As previously mentioned, in all fields of knowledge, with the exception of *Engineering* and *Linguistics, Literature, and Arts*, articles were the preferred genre for disseminating knowledge. Table 14 below shows the average publication rate of articles in academic journals,

with the mean (*M*), standard deviation (*SD*), median[30], and range[31] across the different fields. The results found for medians are especially relevant since they show, along with the mean (average), a measure of central tendency of the distribution of number of articles in academic journals.

Table 14.

CV study- Means, Standard Deviations, Medians, and Ranges of Publication of Articles in Academic Journals

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Articles in academic journals	Mean (*M*)	22.6	9.0	16.3	12.3	12.8	25.9	7.2	3.8
	Standard Deviation (*SD*)	(15.9)	(7.1)	(11.1)	(10.9)	(16.1)	(21.8)	(6.9)	(2.3)
	Median	19.0	7.0	14.0	9.0	9.0	21.0	5.0	4.0
	Range	(0-136)	(0-35)	(0-84)	(0-74)	(0-215)	(0-177)	(0-40)	(0-10)

The field with the highest average publication rate (mean) of articles was *Health Sciences* (*M* = 25.9). Scholars in this field published almost seven times more than those in *Linguistics, Literature, and Arts (M= 3.8),* approximately three times more than those in *Human Sciences* (M = 7.2) and *Applied Social Sciences* (M = 9.0), and two times more than those in *Engineering* (M = 12.3) and in *Exact and Earth Sciences* (M = 12.8).

[30] The median is a commonly used measure of the properties of a data set in statistics and probability theory. It is the value separating the higher half from the lower half of a data sample. For a data set, it may be thought of as the "middle" value.

[31] In general, the range of a set of data is the difference between the largest and smallest values. In descriptive statistics, range is considered the size of the smallest interval which contains all the data and provides an indication of statistical dispersion, being measured in the same units as the data.

Figure 22 below illustrates the average publication rate of articles in academic journals across the eight fields of knowledge.

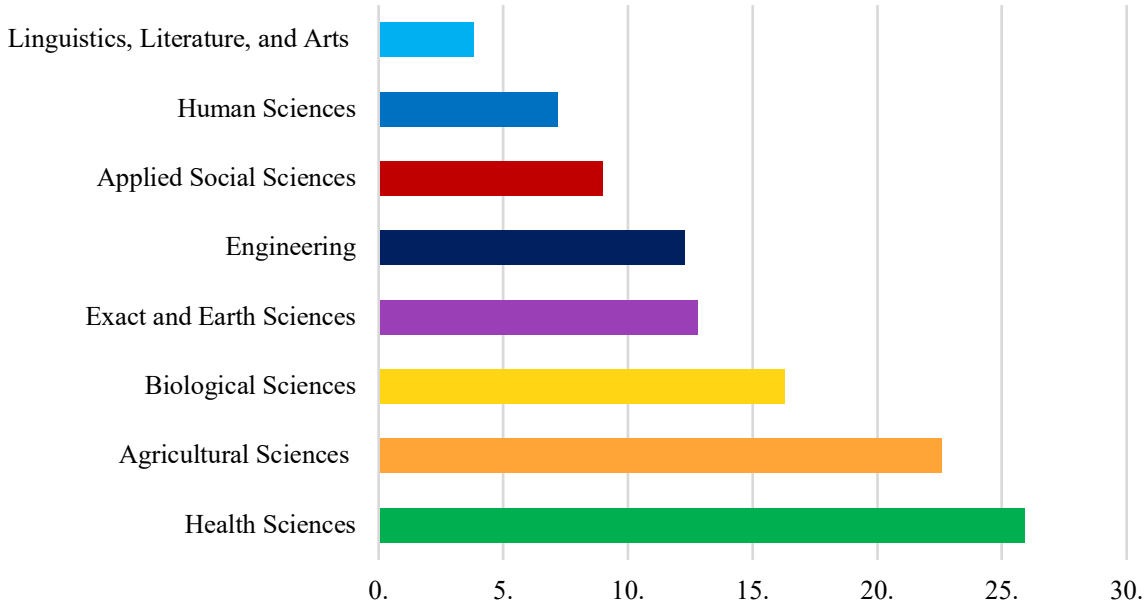

Figure 22. CV study - Average of publication of articles in academic journals by scholars from different fields of knowledge from 2014 to 2016.

When the standard deviations (*SD*), median, and range data are taken into consideration, the results demonstrated that, in *Health Sciences* ($M = 25.9$, $SD = 21.8$), the number of articles published in academic journals were extremely spread out around the mean. The range was between 2 and 177 articles, which showed that, in this field, there were scholars who published two articles in the three-year period examined, while there was one scholar who published 177. This scholar who published the highest number of articles brought the average publication rate considerably up, along with four other academics who published over 100 articles in the period. In addition, the median was 21.0, which indicated that 50% of the total of 229 scholars in *Health Sciences* published between 2 and 21 articles, while the other 50% published between 21 and 177 articles.

The analyses also showed that, in the fields of *Agricultural Sciences* ($M = 22.6$, $SD =$

15.9) and *Exact and Earth Sciences* (*M* = 12.8, *SD* = 16.1), the number of articles published in academic journals were considerably spread out around the mean. In *Agricultural Sciences*, the range was from 0 to 136 articles and the median was 19.0, which indicated that among the 211 academics in the fields, 50% of them published between 0 and 19 articles, while the other 50% of them published between 19 and 136 articles. In *Exact and Earth Sciences*, the range of articles was the greatest amongst all fields of knowledge (0 to 215) and the median was 9.0. This means that 50% of the 247 scholars in *Exact and Earth Sciences* published between 0 and 9 articles, while the other 50% of them published between 9 and 215 articles, indicating a very wide distribution in the number of articles published in this field.

Engineering (*M* = 12.3, *SD* = 10.9) had a narrower distribution in the number of articles than *Health Sciences*, *Agricultural Sciences*, and *Exact and Earth Sciences.* The range in *Engineering* was between 0 and 74 articles and a median of 9.0, indicating that half of the 247 of academics in the field published between 0 and 9 articles, and the other half published between 9 and 74 articles.

In *Biological Sciences* (*M* = 16.3, *SD* = 11.1), however, the dispersion in the number of articles published per scholar was much lower than in *Health Sciences*, *Agricultural Sciences*, and *Exact and Earth Sciences*. *Biological Sciences* had a range of articles between 0 and 84 and a median of 14.0. These results demonstrated that among the 358 scholars in Biological Sciences, half of them published between 0 and 14 articles, and the other half published between 14 and 84 articles. Thus, there was less variability than in the other areas.

When comparing the results found in the fields of the 'harder' sciences examined above, especially in *Health Sciences*, *Agricultural Sciences*, and *Exact and Earth Sciences*, and the results found in the fields that constitute the 'softer' sciences, the differences were striking. The average publication rate of articles was considerably lower in these latter fields (*M* = 9.1, *SD* =

7.1 in *Applied Social Sciences*; *M* = 7.2, *SD* = 6.9 in *Human Sciences*; and *M* = 3.9, *SD* = 2.3 in *Linguistics, Literature, and Arts)*, especially in *Linguistics, Literature, and Arts*. Consequently, the standard deviation was smaller as well as the ranges and the medians (median of 7.0 in *Applied Social Sciences;* median of 5.0 in *Human Sciences*, and median of 4.0 in *Linguistics, Literature, and Arts*).

An ANOVA was carried out to investigate whether the average of published articles were different amongst the eight fields. The ANOVA showed that there was an effect of field of knowledge in the total number of articles published [$F(7,1873) = 52.7$, $MSE = 10095.84$, $p < 0.01$]. The average of articles published in both *Health Sciences* (*M* = 25.9, *SD* = 21.8) and *Agricultural Sciences* (*M* = 22.6, *SD* = 15.9) were statistically higher than the average in *Biological Sciences* (*M* = 16.3, *SD* = 11.1), $p < 0.001$; *Engineering* (*M* = 12.3 , *SD* = 10.9), $p < 0.001$; *Exact and Earth Sciences* (*M* = 12.8, *SD* = 16.1), $p < 0.001$; *Human Sciences* (*M* = 7.2, *SD* = 5.9), $p < 0.001$; *Linguistics, Literature, and Arts* (*M* = 3.8, *SD* = 2.3), $p < 0.001$; and *Applied Social Sciences* (*M* = 9.0, *SD* = 7.1), $p < 0.001$. The average in *Biological Sciences* (*M* = 16.3, *SD* = 11.1) superseded that in *Engineering* (*M* = 12.3, *SD* = 10.9), $p = 0.014$; *Exact and Earth Sciences* (*M* = 12.8, *SD* = 16.1), $p = 0.010$; *Human Sciences* (*M* = 7.2, *SD* = 5.9), $p < 0.001$; *Linguistics, Literature, and Arts* (*M* = 3.8, *SD* = 2.3), $p < 0.001$; and *Applied Social Sciences* (*M* = 9.0, *SD* = 7.1), $p < 0.001$. The average publication rate in *Engineering* (*M* = 12.3, *SD* = 10.9), in turn, was statistically higher than that *Human Sciences* (*M* = 7.2, *SD* = 6.9), $p = 0.001$ and *Linguistics, Literature, and Arts* (*M* = 3.8, *SD* = 2.3), $p < 0.001$. The average in *Exact and Earth Sciences* (*M* = 12.8, *SD* = 16.1) superseded that in *Human Sciences* (M= 7.2, SD= 5.9), $p < 0.001$ and *Linguistics, Literature, and Arts* (M = 3.8, SD= 2.3), $p < 0.001$. Finally, the average of articles published in *Applied Social Sciences* (*M* = 9.0, *SD* = 7.1) was only statistically higher in comparison to *Linguistics, Literature, and Arts* (*M* = 3.8, *SD* = 2.3), $p <$

0.001.

In summary, both *Health Sciences* and *Agricultural Sciences* published statistically more articles than six other fields (*Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, *Human Sciences*, *Linguistics, Literature, and Arts*, and *Applied Social Sciences*); *Biological Sciences* published more articles than five other fields (*Engineering*, *Exact and Earth Sciences*, *Human Sciences*, *Linguistics, Literature, and Arts*, and *Applied Social Sciences*); and *Exact and Earth Sciences* and *Engineering* published a statistically higher number of articles than two other fields (*Human Sciences* and *Linguistics, Literature, and Arts*).

With regards to publication of Portuguese-medium articles in academic journals, Table 15 below shows the average publication rate of this genre in Portuguese, with the mean (*M*), standard deviation (*SD*), median, and range across the different fields of knowledge.

Table 15.

CV study- Means, Standard Deviations, Medians, and Ranges of Articles in Academic Journals published in Portuguese

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Articles in Portuguese in academic journals	Mean (*M*)	7.3	5.8	1.0	1.8	0.5	4,4	5.4	3.0
	Standard Deviation (*SD*)	8.7	5.7	3.1	3.6	1.5	7.4	5.7	2.1
	Median	4.0	5.0	0.0	0.0	0.0	1.0	4.0	3.0
	Range	0-55	0-31	0-28	0-28	0-15	0-62	0-34	0-10

With respect to the publication of Portuguese-medium articles in academic journals, overall, table 15 showed that the highest average quantity of publication per scholar was found in *Agricultural Sciences* (7.3 publications), followed by *Applied Social Sciences* (5.8 publications)

and *Human Sciences* (5.4 publications). In contrast, the average publication rate of Portuguese-medium articles was 0.5 in *Exact and Earth Sciences* and 1.0 in *Biological Sciences.*

When examining the standard deviations (*SD*), median, and range data regarding article publication in Portuguese, some differences among the different fields of knowledge should be mentioned. *Health Sciences* ($M = 4.4$, $SD = 7.4$) was the field in which the number of articles were the most spread out around the mean. The range was between 0 and 62 articles, showing that the scholar with the largest number of articles published in Portuguese (62 articles) brought the average publication rate considerably up. The median of 1.00 indicated that 50% of the 229 scholars in *Health Sciences* published from 0 to 1 article in Portuguese during the three years examined, while the remaining 50% published between 1 and 62 articles, indicating a wide distribution in the number publications. In *Agricultural Sciences* ($M = 7.3$, $SD = 8.7$), the number of Portuguese-medium articles was also spread out around the mean and with a wide distribution, as the range was from 0 to 55 articles and the median 4.0. In contrast, in *Linguistics, Literature, and Arts* ($M = 3.0$, $SD = 2.1$), the range was 0 to 10 articles and the median was 3.0 (exactly the same value as the mean), showing that the distribution in the number of articles was homogeneous and not as much spread out around the mean.

An ANOVA was conducted to investigate whether the average of articles published in Portuguese were different amongst the eight fields. The ANOVA showed an effect of field of knowledge in the average of articles published in Portuguese [$F(7,1873) = 61.8$, $MSE = 1586.14$, $p < 0.01$]. The average of Portuguese-medium articles published in *Agricultural Sciences* ($M = 7.3$, $SD = 8.7$) superseded that in *Biological Sciences* ($M = 1.0$, $SD = 3.1$), $p < 0.001$; *Engineering* ($M = 1.8$, $SD = 3.6$), $p < 0.001$; *Exact and Earth Sciences* ($M = 0.5$, $SD = 1.5$), $p < 0.001$; *Human Sciences* ($M = 5.4$, $SD = 5.7$), $p = 0.002$; *Linguistics, Literature, and Arts* ($M = 3.0$, $SD = 2.1$), $p < 0.001$; and *Health Sciences* ($M = 4.4$, $SD = 7.4$), $p < 0.001$. The average

publication rate in *Applied Social Sciences* (M = 5.8, SD = 5.7) was statistically higher than that in *Biological Sciences* (M = 1.0, SD = 3.1), $p < 0.001$; *Engineering* (M = 1.8, SD = 3.6), $p < 0.001$; *Exact and Earth Sciences* (M = 0.5, SD = 1.5) , $p < 0.001$; and *Linguistics, Literature, and Arts* (M = 3.0, SD = 2.1), $p < 0.001$. The average in *Human Sciences* (M = 5.4, SD = 5.7) superseded that in *Biological Sciences* (M = 1.0, SD = 3.1), $p < 0.001$; *Engineering* (M = 1.8, SD = 3.6), $p < 0.001$; *Exact and Earth Sciences* (M = 0.5, SD = 1.5) , $p < 0.001$; and in *Linguistics, Literature, and Arts* (M = 3.0, SD = 2.1), $p = 0.019$. The average of Portuguese-medium articles published in *Health Sciences* (M = 4.4, SD = 7.4) was statistically higher than that in *Biological Sciences* (M = 1.0, SD = 3.1), $p < 0.001$; *Engineering* (M = 1.8, SD = 3.6), $p < 0.001$; and *Exact and Earth Sciences* (M = 0.5, SD = 1.5) , $p < 0.001$. Finally, *Linguistics, Literature, and Arts* (M = 3.0, SD = 2.1) had statistically higher average than that of *Exact and Earth Sciences* (M = 0.5, SD = 1.5), $p = 0.005$ similarly to Engineering (M = 1.8, SD = 3.6), which was also statistically higher than *Exact and Earth Sciences* (M = 0.5, SD = 1.5), $p = 0.043$.

In summary, *Agricultural Sciences* published a statistically higher number of articles in Portuguese than six other fields of knowledge (*Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, *Human Sciences*, *Linguistics, Literature, and Arts*, and *Health Sciences*); the average publication rate in both *Applied Social Sciences* and *Human Sciences* superseded those in four other fields in Portuguese-medium texts (*Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Linguistics, Literature, and Arts*); *Health Sciences* had a statistically higher average of Portuguese-medium articles than three other fields (*Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*); and the average publication rate articles in Portuguese in *Exact and Earth Sciences* was superseded by those in both *Linguistics, Literature, and Arts*.

In table 16 below, the mean (M) standard deviation (*SD*), median, and range regarding the publication of articles in English across the different fields of knowledge are displayed.

Table 16.

CV study- Means, Standard Deviations, Medians, and Ranges of Articles in Academic Journals published in English

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Articles in English in academic journals	Mean (*M*)	15.2	3.1	15.3	10.5	12.2	21.4	1.3	0.5
	Standard Deviation (*SD*)	12.6	3.6	10.7	9.5	16.0	21.1	2.9	1.0
	Median	12.0	2.0	13.0	8.0	9.0	17.0	0.0	0.0
	Range	0-108	0-15	0-84	0-66	0-215	0-174	0-15	0-4

With regards to the publication of English-medium articles in academic journals over the three-year period examined, table 15 showed that the highest average of publication per scholar was found in *Health Sciences* (21.4 publications), followed by *Biological Sciences* (15.3 publications) and *Agricultural Sciences* (15.2 publications). In contrast, the average publication rate of English-medium texts was much lower in *Applied Social Sciences* (3.1 publications), *Human Sciences* (1.3 publications), and in *Linguistics, Literature, and Arts* (0.5 publications).

When taking into account the standard deviations (*SD*), medians, and range of English-medium articles, *Exact and Earth Sciences* (*M* =12.2, *SD* = 16.0) was the field in which the number of English-medium articles was the most spread around the mean, as the range was between 0 and 125 articles and the median was 9.0, meaning that half of the 404 scholars in the *Exact and Earth Sciences* published between 0 and 9 articles, while the other half published between 9 and 215 articles. The scholar who published 215 texts, along with two other academics that published over 100 texts, brought the average up. Also, the standard deviation corroborates that there was a wide distribution in the number or English-medium articles. In contrast, in the fields that constitute the 'soft' sciences, the range in number of articles was

smaller and the medians were lower (range of 0 to 4 articles and median of 0.0 in *Linguistics, Literature, and Arts*; range of 0 to 15 articles and median of 2.0 in *Applied Social Sciences*; and range of 0 to 15 articles and median of 0.0 in *Human Sciences*), indicating that the distribution in the number of articles was homogeneous and not spread out around the mean due to the low number of articles published in English by academics from these fields.

An ANOVA was ran to investigate whether the average of articles published in English were different amongst the eight fields. The ANOVA also showed an effect of field of knowledge in the average of articles published in English [$F(7,1872) = 44.4$, $MSE = 273.77$, $p < 0.01$]. The average publication rate of English-medium articles in *Health Sciences* ($M = 21.4$, $SD = 21.1$) was statistically higher than that of *Exact and Earth Sciences* ($M = 12.2$, $SD = 16.0$), $p < 0.001$; *Human Sciences* ($M = 1.3$, $SD = 2.9$), $p < 0.001$; and *Linguistics, Literature, and Arts* ($M = 0.5$, $SD = 1.0$), $p < 0.001$. The average in *Biological Sciences* ($M = 15.3$, $SD = 10.7$) superseded that in *Exact and Earth Sciences* ($M = 12.2$, $SD = 16.0$), $p < 0.001$; *Human Sciences* ($M = 1.3$, $SD = 2.9$), $p < 0.001$; and *Linguistics, Literature, and Arts* ($M = 0.5$, $SD = 1.0$), $p < 0.001$. The average of English-medium articles in *Agricultural Sciences* ($M = 15.2$, $SD = 12.6$) was statistically higher than the number in *Exact and Earth Sciences* ($M = 12.2$, $SD = 16.0$), $p < 0.001$; *Human Sciences* ($M = 1.3$, $SD = 2.9$), $p = 0.002$; and *Linguistics, Literature, and Arts* ($M = 0.5$, $SD = 1.0$), $p < 0.001$. The average in *Exact and Earth Sciences* ($M = 12.2$, $SD = 16.0$) superseded that in *Human Sciences* ($M = 1.3$, $SD = 2.9$), $p < 0.001$; *Linguistics, Literature, and Arts* ($M = 0.5$, $SD = 1.0$), $p < 0.001$; *Health Sciences* ($M = 21.4$, $SD = 21.1$), $p < 0.001$; and *Applied Social Sciences* ($M = 3.1$, $SD = 3.6$). The average of English-medium articles in *Engineering* ($M = 10.5$, $SD = 9.5$) was statistically higher than the number in *Human Sciences* ($M = 1.3$, $SD = 2.9$), $p < 0.001$; *Linguistics, Literature, and Arts* ($M = 0.5$, $SD = 1.0$), $p < 0.001$; and *Applied Social Sciences* ($M = 3.1$, $SD = 3.6$), $p = 0.001$.

In summary, scholars in *Health Sciences*, *Biological Sciences,* and *Agricultural Sciences* published a statistically higher number of English-medium articles than three other fields (*Exact and Earth Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts)*. Academics in both *Exact and Earth Sciences* and *Engineering* had a statistically higher average publication rate of English-medium articles than three other fields (*Human Sciences*, and *Linguistics, Literature, and Arts*, and *Applied Social Sciences)*. Also, the number of articles in English in *Applied Social Sciences* was statistically higher than two other fields of knowledge (*Human Sciences* and *Linguistics, Literature, and Arts*).

Figure 23 below helps illustrate the differences in the publication rate in Portuguese and in English amongst scholars from the different areas.

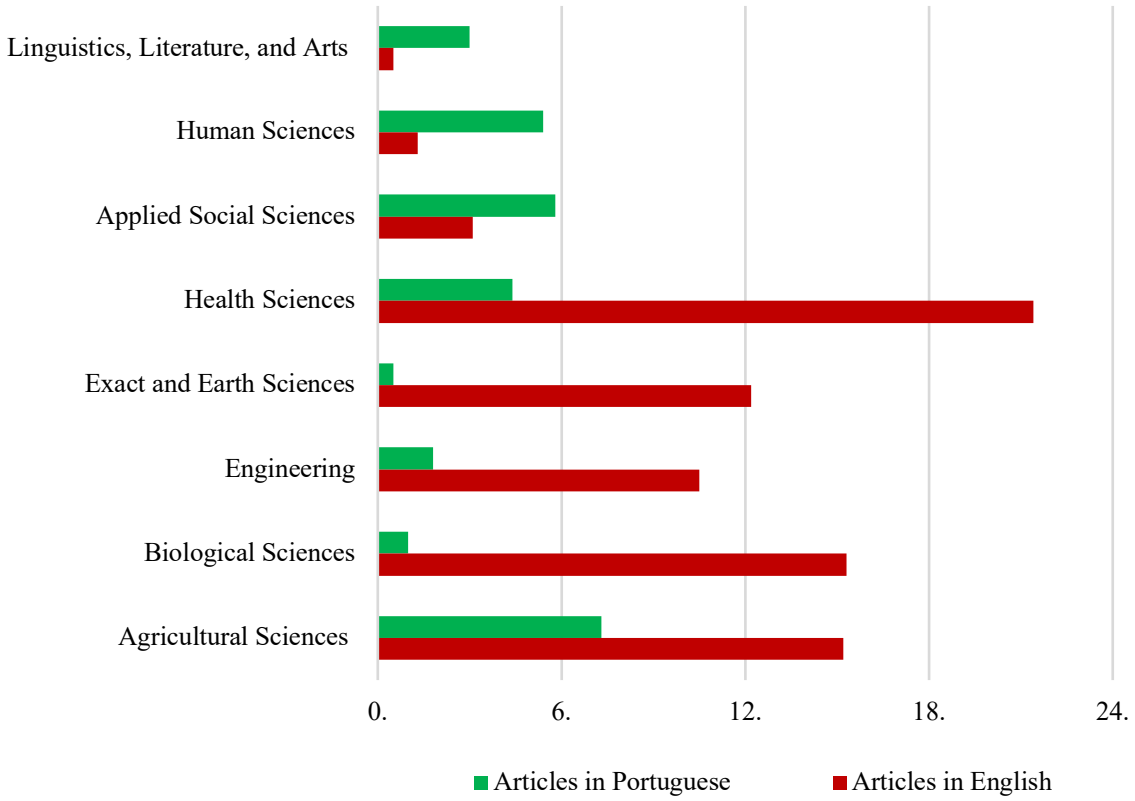

Figure 23. CV study - Average of articles published in Portuguese and English in academic journals by scholars from different fields of knowledge from 2014 to 2016.

4.4.2 Publication of books

In this subsection, I will examine the data gathered from scholars' Lattes CVs, first to describe and compare the numbers of books published in each field of knowledge, and secondly, to the numbers of books published in Portuguese and in English. Descriptive and inferential analyses of the results will be provided.

Overall, the average quantity of book published per scholar was lower than any other type of publication (articles in academic journals, chapters, and papers in conference proceedings), especially in comparison to articles. This is not surprising, since publishing a book is not as prestigious and valued in academic contexts as articles.

Table 17 shows the data regarding the publication of books by scholars from different fields of knowledge, including the mean (*M*), standard deviation (*SD*), median, and range.

Table 17.

CV study- Means, Standard Deviations, Medians, and Ranges of Publication of Books

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Books	Mean (*M*)	0.5	1.1	0.2	0.3	0.2	0.3	1.7	1.2
	Standard Deviation (*SD*)	1.2	1.9	0.7	0.8	0.5	0.8	2.1	1.5
	Median	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
	Range	0-9	0-15	0-8	0-9	0-4	0-6	0-11	0-5

The field with the highest average publication rate of books were the ones that constitute the 'softer' sciences: 1.7 books in *Human Sciences;* 1.2 books in *Linguistics, Literature, and Arts*; and 1.1 books in *Applied Social Sciences*. These academics published between six and eight times more books than those in *Biological Sciences* and *Exact and Earth Sciences* (both with *M*

= 0.2) and between four to five times more than scholars in *Engineering* and *Health Sciences* (both with $M = 0.3$), which are fields that belong to the 'harder' sciences.

Figure 24 below helps illustrates the average publication rate of books across the eight fields of knowledge.

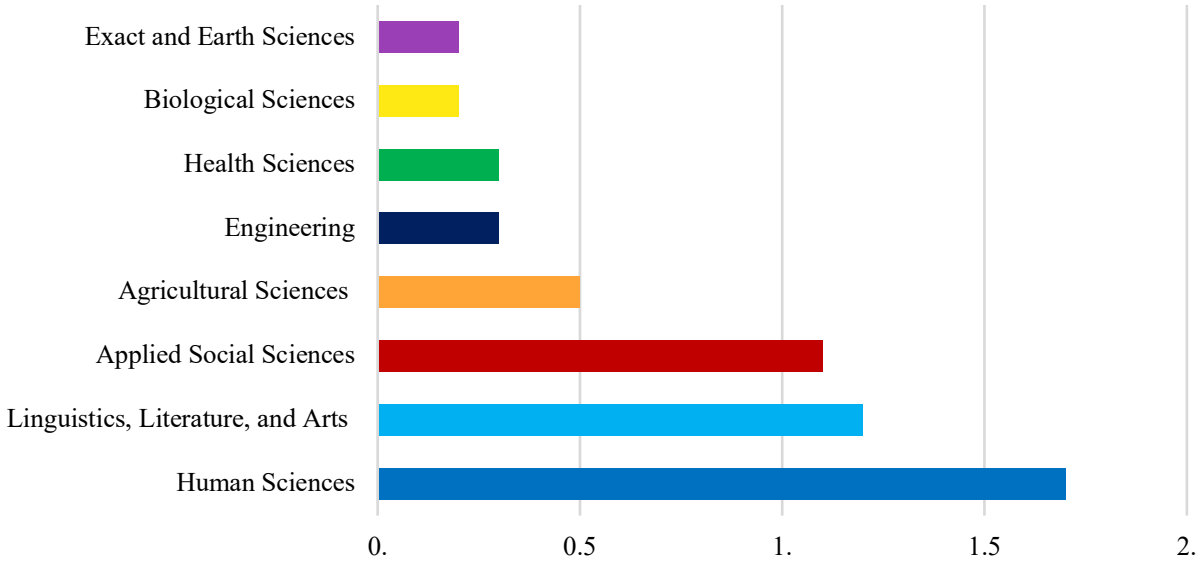

Figure 24. CV study - Average of publication of books by scholars from different fields of knowledge from 2014 to 2016.

When taking into consideration the mean (M), standard deviation (SD), median and range, the results indicated that in *Human Sciences* ($M = 1.7$, $SD = 2.1$), the field in which the number of books were the most spread out around the mean, the range was 0 to 11 books and the mean was 1.0. This demonstrated that half the 232 academics in the field published from 0 to 1 book in the three-year period examined, while the other half published from 1 to 11 books.

An ANOVA was conducted to examine whether the average of articles published in English were different amongst the eight fields. The ANOVA test showed a field of knowledge effect in the average of books published [$F(7,1873) = 51.7$, $MSE = 69.41$, $p < 0.01$]. The average publication rate in *Human Sciences* (($M = 1.7$, $SD = 2.1$) was statistically higher than that in

Agricultural Sciences ($M = 0.5$, $SD = 1.2$), $p < 0.001$; *Applied Social Sciences* ($M = 1.1$, $SD = 1.9$), $p < 0.001$; *Biological Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; *Engineering* ($M = 0.3$, $SD = 0.8$), $p < 0.001$; *Exact and Earth Sciences* ($M = 0.2$, $SD = 0.5$), $p < 0.001$; and *Health Sciences* ($M = 0.3$, $SD = 0.8$), $p < 0.001$. The average in *Linguistics, Literature, and Arts* ($M = 1.2$, $SD = 1.5$) superseded that in *Agricultural Sciences* ($M = 0.5$, $SD = 1.2$), $p < 0.001$; *Biological Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; *Engineering* ($M = 0.3$, $SD = 0.8$), $p < 0.001$; *Exact and Earth Sciences* ($M = 0.2$, $SD = 0.5$), $p < 0.001$; and *Health Sciences* ($M = 0.3$, $SD = 0.8$), $p < 0.001$. The average book publication rate in *Applied Social Sciences* ($M = 1.1$, $SD = 1.9$) was statistically higher than that in *Agricultural Sciences* (M = 0.5, SD = 1.2), p = 0.001; *Biological Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; *Engineering* ($M = 0.3$, $SD = 0.8$), $p < 0.001$; and *Exact and Earth Sciences* ($M = 0.2$, $SD = 0.5$), $p < 0.001$. The average publication rate in *Agricultural Sciences* ($M = 0.5$, $SD = 1.2$) superseded that in *Exact and Earth Sciences* ($M = 0.2$, $SD = 0.5$), p = 0.031.

Summarizing, scholars in *Human Sciences* had a statistically higher average book publication rate than six other fields of knowledge (*Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences, Engineering*, *Exact and Earth Sciences*, *and Health Sciences);* academics in *Linguistics, Literature, and Arts* published a statistically higher average of books than five other fields (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*); and academics in *Applied Social Sciences* had a statistically higher rate than four other fields of knowledge (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*).

In table 18 below, the mean (M), standard deviation (*SD*), median, and range regarding the publication of books in Portuguese across the different fields of knowledge are displayed.

Table 18.

CV study- Means, Standard Deviations, Medians, and Ranges of Books published in Portuguese

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Books in Portuguese	Mean (*M*)	0.5	1.0	0.2	0.2	0.1	0.3	1.5	1.1
	Standard Deviation (*SD*)	1.1	1.8	0.6	0.6	0.3	0.7	2.0	1.4
	Median	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
	Range	0-9	0-15	0-6	0-7	0-3	0-6	0-11	0-5

Similarly to the figures found for book publication, *Human Sciences* had the highest average publication rate of Portuguese-medium books, (M = 1.5, SD = 2.0), followed by *Linguistics, Literature, and Arts* (M = 1.1, SD = 1.4) and *Applied Social Sciences* (M = 1.0, SD = 1.8). These averages were between seven and three times higher than in those fields that constitute the 'harder' sciences.

An ANOVA was carried out to investigate whether the average of articles published in English were different amongst the eight fields. The ANOVA showed a field of knowledge effect in the average publication rate of Portuguese-medium books [$F(7,1873) = 53.9$, MSE = 0.55, p <0.01]. The average of books published in Portuguese in *Human Sciences* (M = 1.5, SD = 2.0) was statistically higher than that of *Agricultural Sciences* (M = 0.5, SD = 1.1), $p < 0.001$; *Applied Social Sciences* (M = 1.0, SD = 1.8), $p < 0.001$; *Biological Sciences* (M = 0.2, SD = 0.6), $p < 0.001$; *Engineering* (M = 0.2, SD = 0.6), $p < 0.001$; *Exact and Earth Sciences* (M = 0.1, SD = 0.3), $p < 0.001$; and *Health Sciences* (M = 0.3, SD = 0.7), $p < 0.001$. The average publication rate of Portuguese-medium books in *Linguistics, Literature, and Arts* (M = 1.1, SD = 1.4) superseded that in *Agricultural Sciences* (M = 0.5, SD = 1.1), $p < 0.001$; *Biological Sciences* (M = 0.2, SD = 0.6), $p < 0.001$; *Engineering* (M = 0.2, SD = 0.6), $p < 0.001$; and *Exact and Earth Sciences* (M =

0.1, SD = 0.3), $p < 0.001$. The average publication rate of Portuguese-medium books in *Applied Social Sciences* (M = 1.0, SD = 1.8) was statistically higher than that of *Agricultural Sciences* (*M* = 0.5, *SD* = 1.1), $p < 0.001$; *Biological Sciences* (*M* = 0.2, *SD* = 0.6), $p < 0.001$; *Engineering* (M = 0.2, SD = 0.6), $p < 0.001$; and *Exact and Earth Sciences* (M = 0.1, SD = 0.3), $p < 0.001$. Finally, the average of books published in Portuguese in *Agricultural Sciences* (*M* = 0.5, *SD* = 1.1) superseded that in *Exact and Earth Sciences* (M = 0.1, SD = 0.3), $p < 0.001$

The pattern found in the number of books published in Portuguese was rather similar to the one found in the number of books published (Table 18), since most fields of knowledge do not have books as their preferred choice for disseminating knowledge. In sum, scholars in *Human Sciences* had a statistically higher average of Portuguese-medium books published than six other fields of knowledge (*Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences, Engineering*, *Exact and Earth Sciences*, *and Health Sciences);* and academics in both *Linguistics, Literature, and Arts* and *Applied Social Sciences* superseded those of four other fields (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*).

Table 19 below shows the data regarding English-medium books, including the mean (M), standard deviation (*SD*), median, and range across the different fields of knowledge.

Table 19.

CV study- Means, Standard Deviations, Medians, and Ranges of Books published in English

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Books in English	Mean (*M*)	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.3
	Standard Deviation (*SD*)	0.2)	0.2)	0.2	0.7	0.4	0.3	0.3	1.2
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Range	0-2	0-1	0-2	0-9	0-4	0-3	0-1	0-9

All fields of knowledge had a very low average number of publications of English-medium books in comparison to the other written academic genres. As shown in table 18, the average publication rates were very close to 0, varying from no books published in the three-year period in both *Agricultural Sciences* and *Biological Sciences* to 0.3 English-medium books in *Linguistics, Literature, and Arts*. Also, the median in all fields of knowledge was 0.0 and the ranges varied even less than those found in tables 18 and 19.

An ANOVA was ran to examine whether there were differences in the average of articles published in English amongst the eight fields. The ANOVA test showed a field of knowledge effect in the number of English-medium books published [$F(7,1873) = 3.04$, $MSE = 0.55$, $p < 0.01$]. The average publication rate of English-medium books in *Linguistics, Literature, and Arts* ($M = 0.3$, $SD = 1.2$) was statistically higher than that in *Agricultural Sciences* ($M = 0.04$, $SD = 0.2$), $p = 0.011$; *Applied Social Sciences* ($M = 0.1$, $SD = 0.2$), $p = 0.038$; *Biological Sciences* ($M = 0.04$, $SD = 0.2$), $p = 0.005$; and *Health Sciences* ($M = 0.1$, $SD = 0.3$), $p = 0.024$.

Figure 25 summarizes the average publication rate of books in Portuguese and in English in each field of knowledge from 2014 to 2016.

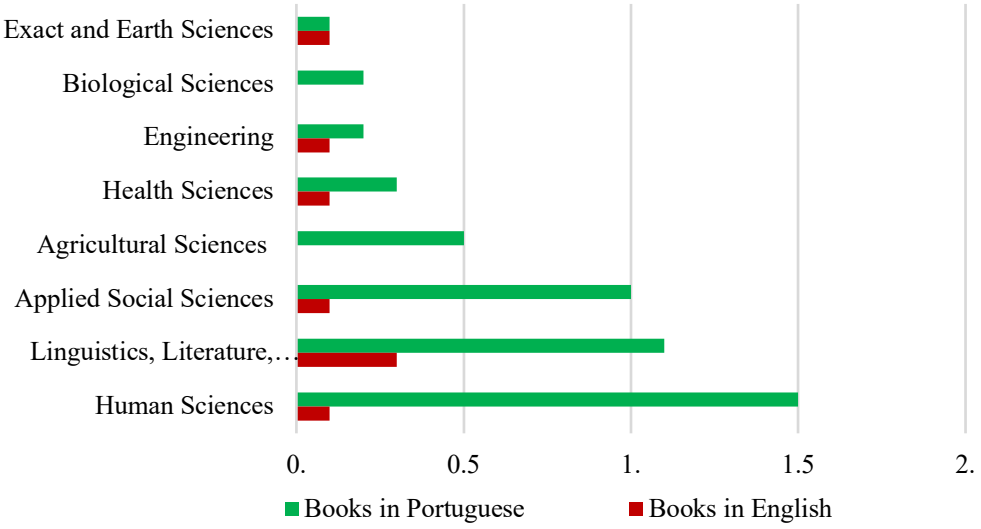

Figure 25. CV study - Average of books published in Portuguese and in English by scholars from different fields of knowledge from 2014 to 2016.

4.4.3 Publication of book chapters

In this subsection, I will analyze the data gathered from scholars' Lattes CVs to describe and compare the average publication rate of book chapters across the eight fields of knowledge.

In table 20 below, the data regarding publication of book chapters is presented, including the mean (*M*), standard deviation (*SD*), median, and range across the different fields of knowledge.

Table 20.

CV study- Means, Standard Deviations, Medians, and Ranges of Publication of Books Chapters

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Book chapters	Mean (*M*)	2.0	3.2	1.1	0.8	0.7	2.1	4.9	4.4
	Standard Deviation (*SD*)	3.6	4.3	1.9	2.0	1.4	3.4	4.7	3.6
	Median	1.0	2.0	0.0	0.0	0.0	1.0	4.0	3.0
	Range	0-33	0-28	0-15	0-18	0-14	0-24	0-24	0-22

The results indicated that the fields with the highest publication rate of book chapters were *Human Sciences* (*M* = 4.9, *SD* = 4.7), *Linguistics, Literature, and Arts* (*M* = 4.4, *SD* = 3.6), and *Applied Social Sciences* (*M* = 3.2, *SD* = 4.3).

Figure 26 below illustrates the average publication rate of books chapters across the eight fields of knowledge.

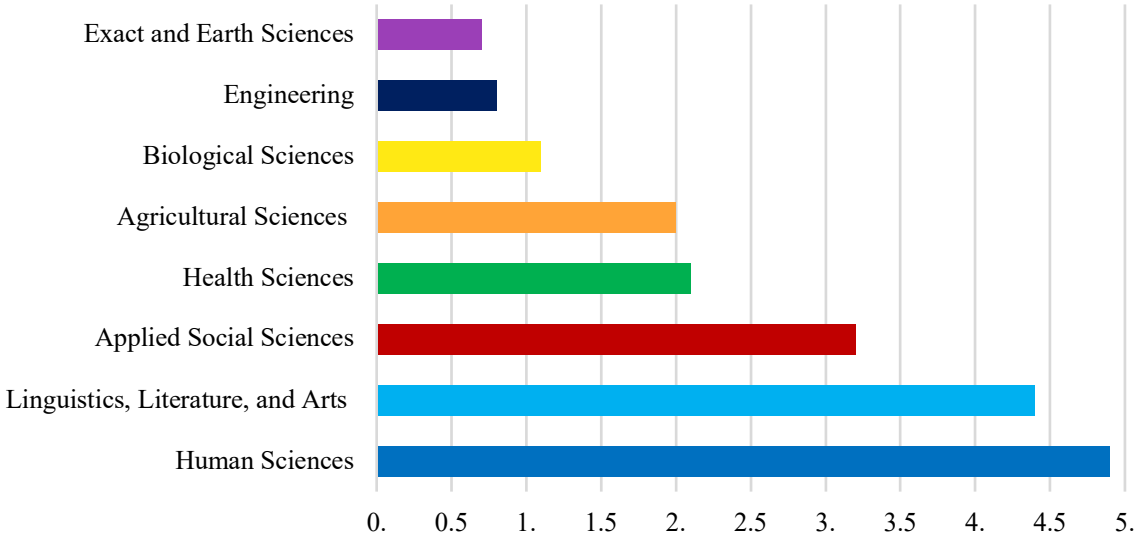

Figure 26. CV study - Average publication of books chapters in general by scholars from different fields of knowledge from 2014 to 2016.

Human Sciences, (M = 4.0, SD = 4.7) had the highest standard deviation, showing that the numbers were more spread around the mean than in the other fields of knwoledge. In addition the range was between 0 to 24 articles and the median 4.0, indicating that 50% of the 232 scholars in the field published between 0 to 4 articles in the three-year period examined, while the remaining 50% pblished between 4 and 24 articles.

An ANOVA was conducted to investigate whether there were differences in the average of articles published in English amongst the eight fields.The ANOVA test showed an effect of field of knowledge in the total number of book chapters published [F(7,1873) = 61.0, MSE = 549.67, p <0.01]. The average publication rate in *Human Sciences* (M = 4.9, SD = 4.7) was statistically higher than the number in *Agricultural Sciences* (M = 2.0, SD = 3.6), p < 0.001; *Applied Social Sciences* (M = 3.2, SD = 4.3), p < 0.001; *Biological Sciences* (M = 1.1, SD = 1.9), p < 0.001; *Engineering* (M = 0.8, SD = 2.0), p < 0.001; and *Exact and Earth Sciences* (M = 0.7, SD = 1.4), p < 0.001; and *Health Sciences* (M = 2.1, SD = 3.4), p < 0.001. The average of book chapters published in *Linguistics, Literature, and Arts* (M = 4.4, SD = 3.6) superseded that in

Agricultural Sciences (M = 2.0, SD = 3.6), $p < 0.001$; *Biological Sciences* (M = 1.1, SD = 1.9), $p < 0.001$; *Engineering* (M = 0.8, SD = 2.0), $p < 0.001$; and *Exact and Earth Sciences* (M = 0.7, SD = 1.4), $p < 0.001$; and *Health Sciences* (M = 2.1, SD = 3.4), $p < 0.001$. The average book chapter publication rate in *Applied Social Sciences* (M = 3.2, SD = 4.3) was statistically higher than that in *Agricultural Sciences* (M = 2.0, SD = 3.6), $p = 0.004$; *Biological Sciences* (M = 1.1, SD = 1.9), $p < 0.001$; *Engineering* (M = 0.8, SD = 2.0), $p < 0.001$; and *Exact and Earth Sciences* (M = 0.7, SD = 1.4), $p < 0.001$; and *Health Sciences* (M = 2.1, SD = 3.4), $p = 0.014$. The average of book chapters published in *Health Sciences* (M = 2.1, SD = 3.4) superseded that in *Biological Sciences* (M = 1.1, SD = 1.9), $p = 0.003$; *Engineering* (M = 0.8, SD = 2.0), $p < 0.001$; and *Exact and Earth Sciences* (M = 0.7, SD = 1.4), $p < 0.001$. The average book chapter publication rate in *Agricultural Sciences* (M = 2.0, SD = 3.6) was statistically higher than the number in *Biological Sciences* (M = 1.1, SD = 1.9), p = 0.023; *Engineering* (M = 0.8, SD = 2.0), p = 0.001; *Exact and Earth Sciences* (M = 0.7, SD = 1.4), $p < 0.001$.

In sum, scholars in *Human Sciences* had a statistically higher average of book chapters published than those in six other fields of knowledge (*Agricultural Sciences*, *Applied Social Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*); academics in both *Linguistics, Literature, and Arts* and *Applied Social Sciences* had statistically higher average publication rates than those in five other fields (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*); and scholars in *Health Sciences* and *Agricultural Sciences* had statistically higher averages of book chapters published than those in three other fields of knowledge (*Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*).

Table 21 shows the data regarding publication of book chapters in Portuguese, including the mean (M), standard deviation (SD), median, and range across the different fields.

Table 21.

CV study- Means, Standard Deviations, Medians, and Ranges of Book Chapters published in Portuguese

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Book chapters in Portuguese	Mean (*M*)	1.7	2.6	0.6	0.2	0.2	1.8	4.1	3.4
	Standard Deviation (*SD*)	3.5	3.7	1.6	0.8	0.7	3.2	4.3	3.2
	Median	0.0	1.0	0.0	0.0	0.0	1.0	3.0	3.0
	Range	0-33	0-24	0-14	0-6	0-6	0-24	0-24	0-22

Human Sciences had the highest average publication rate of Portuguese-medium book chapters ($M = 4.1$, $SD = 4.3$), followed by *Linguistics, Literature, and Arts* ($M = 3.4$, $SD = 3.2$) and *Applied Social Sciences* (M = 2.6, SD = 3.7). These averages were between three and seven times higher than in those fields that constitute the 'harder' sciences.

In order to investigate whether there were differences in the average of articles published in English amongst the eight fields, an ANOVA was conducted. The ANOVA test showed a field of knowledge effect in the number of book chapters published in Portuguese [$F(7,1872) = 67.5$, $MSE = 466.94$, $p < 0.01$]. The average of Portuguese-medium book chapters published in *Human Sciences* (M = 4.1, SD = 4.3) was statistically higher than that in *Agricultural Sciences* ($M = 1.7$, $SD = 3.5$), $p < 0.001$; *Applied Social Sciences* (M =2.6, SD = 3.7), $p < 0.001$; *Biological Sciences* ($M = 0.6$, $SD = 1.6$), $p < 0.001$; *Engineering* ($M = 0.2$, $SD = 0.8$), $p < 0.001$; *Exact and Earth Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; and *Health Sciences* (M = 1.8, SD = 3.2), $p < 0.001$. The average publication rate of Portuguese-medium book chapters in *Linguistics, Literature, and Arts* superseded that in *Agricultural Sciences* ($M = 1.7$, $SD = 3.5$), $p < 0.001$; *Biological Sciences* ($M = 0.6$, $SD = 1.6$), $p < 0.001$; *Engineering* ($M = 0.2$, $SD = 0.8$), $p < 0.001$; *Exact and Earth Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; and *Health Sciences* (M = 1.8, SD =

3.2), p < 0.001. The average of book chapters published in Portuguese in *Applied Social Sciences* (*M* =2.6, *SD* = 3.7) was statistically higher than that in *Biological Sciences* (*M* = 0.6, *SD* = 1.6) *p* < 0.001; *Engineering* (*M* = 0.2, *SD* = 0.8), *p* < 0.001; and *Exact and Earth Sciences* (*M* = 0.2, *SD* = 0.7), *p* < 0.001. *Health Sciences* (M = 1.8, SD = 3.2) superseded *Biological Sciences* (*M* = 0.6, *SD* = 1.6) *p* < 0.001; *Engineering* (*M* = 0.2, *SD* = 0.8), *p* < 0.001; and *Exact and Earth Sciences* (*M* = 0.2, *SD* = 0.7), *p* < 0.001 in publication of Portuguese-medium book chapters. The average publication rate in *Agricultural Sciences* (*M* = 1.7, *SD* = 3.5) was statistically higher than in *Biological Sciences* (*M* = 0.6, *SD* = 1.6), *p* < 0.001; *Engineering* (*M* = 0.2, *SD* = 0.8), *p* < 0.001; and *Exact and Earth Sciences* (*M* = 0.2, *SD* = 0.7), *p* < 0.001.

In summary, scholars in the *Human Sciences* published more Portuguese-medium book chapters than those in six other fields of knowledge (*Agricultural Sciences, Applied Social Sciences, Biological Sciences, Engineering*, *Exact and Earth Sciences*, and *Health Sciences*); academics in *Linguistics, Literature, and Arts* published more book chapters in Portuguese than those from five other fields (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences,* and *Health Sciences*); scholars in *Applied Social Sciences, Health Sciences,* and *Agricultural Sciences* published more book chapters in Portuguese than those in three other fields (*Biological Sciences Engineering*, and *Exact and Earth Sciences)*.

With regards to the publication of English-medium book chapters, table 22 shows the results found for mean (*M*), standard deviation (SD), median, and range.

Table 22.

CV study- Means, Standard Deviations, Medians, and Ranges of Book Chapters published in English

	Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Mean (*M*)	0.3	0.5	0.5	0.5	0.5	0.3	0.5	0.6

Book chapters in English	Standard Deviation (*SD*)	0.9	1.3	0.9	1.8	1.2	0.8	1.2	1.7
	Median	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Range	0-8	0-10	0-7	0-18	0-14	0-8	0-12	0-12

All fields of knowledge, with the exception of *Exact and Earth Sciences* and *Engineering*, had a considerably higher average of book chapters published in Portuguese than in English. In some fields, such as *Agricultural Sciences* and *Health Sciences*, the average publication rates of English-medium book chapters per scholar were approximately 0.3 along a three-year period. Even the field with the highest figure (*Linguistics, Literature and Arts*) did not reach a publication rate of one English-medium book chapter during the three years examined.

As seen in table 22, the average publication rate in the different fields of knowledge were extremely low and rather similar, varying from 0.3 in *Agricultural Sciences* and *Health Sciences* to 0.6 in *Linguistics, Literature, and Arts.* Also, similarly to the results found in English-medium books, for book chapters the median in all fields of knowledge was 0.0 and the ranges varied less than those found for book chapters in general and book chapters in Portuguese.

An ANOVA was carried out to investigate whether there were differences in the average of articles published in English amongst the eight fields. The ANOVA test did not show an effect of field of knowledge in the total number of book chapters published in English [$F(7,1871) = 1.7$, $MSE = 2.41$, $p = 0.115$], suggesting a similar number of book chapters published in English in the eight fields of knowledge. It should be noted that, in all fields, the average publication rate of English-medium book chapters varies from 0.3 to 0.6 during the three-year period examined, which is not a large variation.

Figure 27 below summarizes the averages of book chapters published in Portuguese and in English in each field of knowledge from 2014 to 2016.

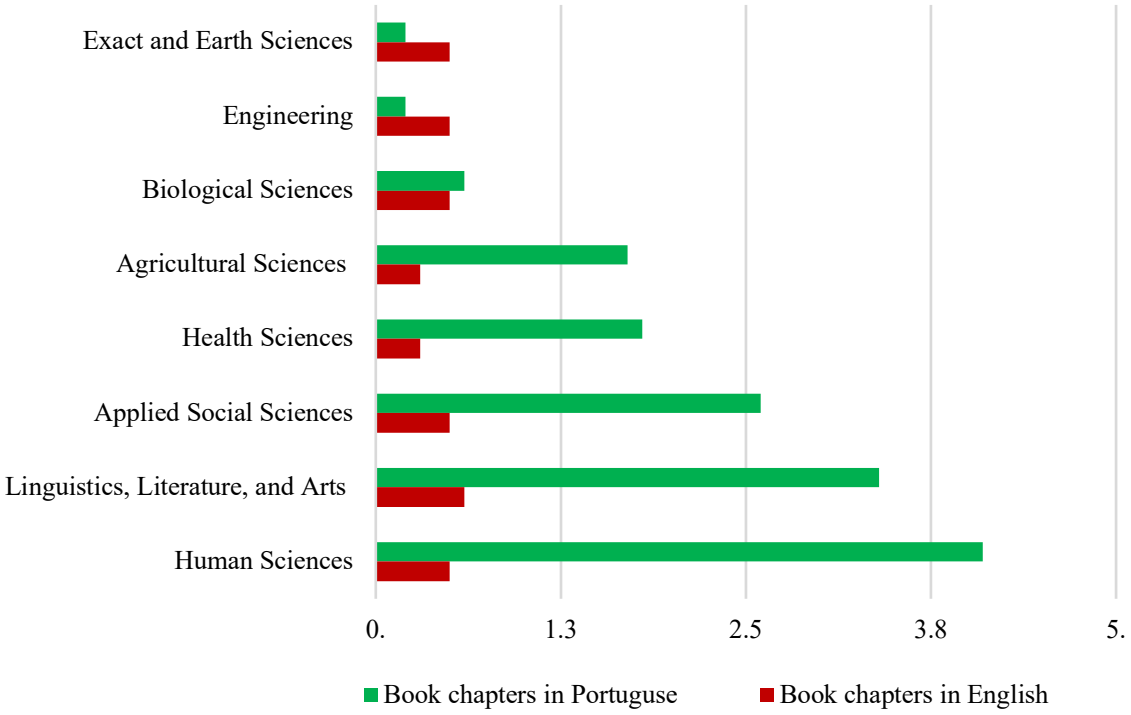

Figure 27. CV study - Average of book chapters published in Portuguese and in English by scholars from different fields of knowledge from 2014 to 2016.

4.4.4 Publication of papers in conference proceedings

In this subsection, I will analyze the data gathered from scholars' Lattes CVs to describe and compare the average of papers in conferences proceedings published per scholar across the eight fields of knowledge. I will also analyze the numbers related to papers published in Portuguese and in English. Descriptive and inferential analyses of the results will be provided.

Table 23 below shows the means (M), standard deviations (SD), medians, and ranges of papers published in conference proceedings.

Table 23.

CV study- Means, Standard Deviations, Medians, and Ranges of Publication of Papers in Conference Proceedings

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Papers in conference proceedings	Mean (*M*)	2.9	8.2	1.3	13.7	2.6	0.7	2.1	1.1
	Standard Deviation (*SD*)	6.4	8.9	5.5	15.3	6.0	3.7	4.1	2.6
	Median	0.0	6.0	0.0	10.0	0.0	0.0	0.0	0.0
	Range	0-38	0-49	0-73	0-134	0-40	0-43	0-27	0-18

Two fields of knowledge, *Engineering* (*M*= 13.7) and *Applied Social Sciences* (*M* = 8.2), stood out as the most productive fields, with a substantially higher average of papers published in conference proceedings, when compared to the other six fields of knowledge. Figure 27 below illustrates the average publication rate of papers in conference proceedings across the eight fields of knowledge.

Figure 28 below illustrates the average publication rate of books chapters across the eight fields of knowledge.

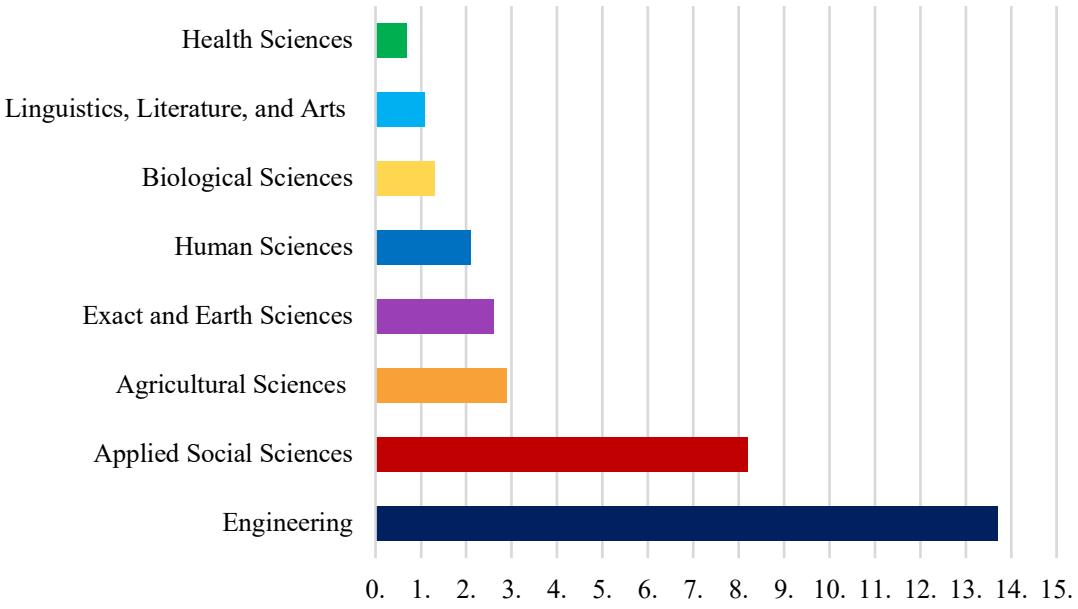

Figure 28. CV study - Average of publication of papers in conference proceedings in general by scholars from different fields of knowledge from 2014 to 2016.

In Engineering (M = 13.7, SD = 15.3), there was a great dispersion in the number of papers published, with the number of papers was considerably spread out around the mean. In addition, the range was between 0 and 134 articles, which showed that there were academics who did not publish any papers during the three years examined, while there was one scholar who had a publication rate of 134 papers in the same period. This scholar, along with seven others who published more than 50 papers, brought the average considerably up. In addition, the median was 10.0, indicating that 50% of the 247 scholars in *Engineering* published between 0 and 10 papers and the remaining 50% published between 10 and 134 papers. In contrast, in *Applied Social Sciences* (M = 8.2, SD = 8.9) the numbers were less spread around the mean in comparison to *Engineering*. The range in *Applied Social Sciences* was lower (0 to 49) and the median was 6.00.

With regards to the fields with lower average publication rates of papers in conference proceedings, in *Biological Sciences* (M =1.3, SD = 5.5), for instance, the number of publications

was considerably spread out around the mean in comparison to *Health Sciences* and *Linguistics, Literature and Arts* .The range was 0 to 73 articles and the median was 0.0, indicating that half of the 358 academics in the field did not publish any papers in conference proceedings during the three-year period examined, while the other half published between 0 to 73 articles. The scholar who published 73 papers brought the average up, along with three other scholars who published over 20 papers in the same period. In the two fields with the lowest average publication rates (0.7 papers in *Health Sciences* and 1.1 papers *Linguistics, Literature, and Arts* in the three-year period), the numbers ranged less (from 0 to 43 in *Health Sciences* to 0 to 18 in *Linguistics, Literature and Arts*) and, in both of them, the median was zero.

In order to investigate whether there were differences in the average of articles published in English amongst the eight fields, an ANOVA was conducted. The ANOVA test showed a an effect of field of knowledge in the total number of papers published in conference proceedings [$F(7,1873) = 81.3$, $MSE = 4729.19$, $p < 0.01$]. The average quantity of publication of papers conference proceedings per scholar in *Engineering* ($M = 13.7$, $SD = 15.3$) was statistically higher than the average in all other fields: *Agricultural Sciences* ($M = 2.9$, $SD = 6.4$), $p < 0.001$; *Applied Social Sciences* ($M = 8.2$, $SD = 8.9$), $p < 0.001$; *Biological Sciences* ($M = 1.3$, $SD = 5.5$), $p < 0.001$; *Exact and Earth Sciences* ($M = 2.6$, $SD = 6.0$), $p < 0.001$; *Health Sciences* ($M = 0.7$, $SD = 3.7$), $p < 0.001$; *Human Sciences* ($M = 2.1$, $SD = 4.1$), $p < 0.001$; and *Linguistics, Literature, and Arts* ($M = 1.1$, $SD = 2.6$), $p < 0.001$. In *Applied Social Sciences* ($M = 8.2$, $SD = 8.9$), the average superseded that in *Agricultural Sciences* ($M = 2.9$, $SD = 6.4$), $p < 0.001$; *Biological Sciences* ($M = 1.3$, $SD = 5.5$), $p < 0.001$; *Exact and Earth Sciences* ($M = 2.6$, $SD = 6.0$), $p < 0.001$; *Health Sciences* ($M = 0.7$, $SD = 3.7$), $p < 0.001$; *Human Sciences* ($M = 2.1$, $SD = 4.1$), $p < 0.001$; and *Linguistics, Literature, and Arts* ($M = 1.1$, $SD = 2.6$), $p < 0.001$.

In summary, scholars in *Engineering* published more papers in conference proceedings than all other fields of knowledge, while *Applied Social Sciences* published more than all other fields of knowledge, except *Engineering*.

Table 24 shows the data regarding publication of papers in conference proceedings in Portuguese, including the mean (*M*), standard deviation (*SD*), median, and range across the different fields.

Table 24.

CV study- Means, Standard Deviations, Medians, and Ranges of Papers in Conference Proceedings published in Portuguese

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Papers in Portuguese in conference proceedings	Mean (*M*)	2.4	5.9	0.6	7.7	0.7	0.3	1.9	1.0
	Standard Deviation (*SD*)	5.7	7.6	2.7	11.3	2.6	1.7	3.7	2.5
	Median	0.0	3.0	0.0	4.0	0.0	0.0	0.0	0.0
	Range	0-37	0-47	0-36	0-86	0-20	0-22	0-20	0-17

The highest average of Portuguese-medium papers in conference proceedings was found in *Engineering* (7.7 publications), followed by *Applied Social Sciences* (5.9 publications). In contrast, the lowest average publication rates of Portuguese-medium articles were found in *Health Sciences* (0.3 publications) and *Biological Sciences* (0.6 publications).

The analyses of standard deviation regarding conference proceedings publications in Portuguese indicated that *Engineering* ($M = 7.7$, $SD = 11.3$) was the field in which the numbers were the most spread out around the mean. In addition, the range was between 0 and 86 papers, showing that the scholar who published 86 texts, along with five other academics who published

over 40 texts in the three-year period, brought the average publication rate up. The median of 4.0 indicated that half of the 247 scholars in Engineering published between 0 and 4 papers, while the other half published between 4 and 86 papers.

The other field in which the numbers of Portuguese-medium conference proceeding papers were more spread around the mean in comparison to the other fields was *Applied Social Sciences* (M = 5.9, SD = 7.6). The range was between 0 and 47 papers and the median was 3.0.

An ANOVA was ran to investigate whether there were differences in the average of articles published in English amongst the eight fields. The ANOVA showed an effect of field of knowledge in the number of conference proceeding papers published in Portuguese [$F(7,1873)$ = 57.6, MSE = 1707.30, p <0.01]. The average in *Engineering* (M = 7.7, SD = 11.3) was statistically higher than that in *Agricultural Sciences* (M = 2.4, SD = 5.7), $p < 0.001$; *Biological Sciences* (M = 0.6, SD = 2.7), $p < 0.001$; *Exact and Earth Sciences* (M = 0.7, SD = 2.6), p = 0.013; *Health Sciences* (M = 0.3, SD = 1.7), p = 0.002; *Human Sciences* (M = 1.9, SD = 3.7), $p <$ 0.001; and *Linguistics, Literature, and Arts* (M = 1.0, SD = 2.5), $p < 0.001$. In *Applied Social Sciences* (M = 5.9, SD = 7.6), the average of Portuguese-medium papers per scholar superseded that in *Agricultural Sciences* (M = 2.4, SD = 5.7), $p < 0.001$; *Biological Sciences* (M = 0.6, SD = 2.7), $p < 0.001$; *Exact and Earth Sciences* (M = 0.7, SD = 2.6), $p < 0.001$; and *Health Sciences* (M = 0.3, SD = 1.7), $p < 0.001$; *Human Sciences* (M = 1.9, SD = 3.7), $p < 0.001$; and *Linguistics, Literature, and Arts* (M = 1.0, SD = 2.5), $p < 0.001$. *Agricultural Sciences* (M = 2.4, SD = 5.7) superseded *Biological Sciences* (M = 0.6, SD = 2.7), p = 0.004; *Exact and Earth Sciences* (M = 0.7, SD = 2.6), p = 0.013; and *Health Sciences* (M = 0.3, SD = 1.7), p = 0.002 in average of papers published in Portuguese in conference proceedings.

In summary, both *Engineering* and *Applied Social Sciences* had a statistically higher average of Portuguese-medium papers in conference proceedings than six other fields of

knowledge (*Agricultural Sciences*, *Biological Sciences*, *Exact and Earth Sciences*, *Human Sciences*, *Linguistics, Literature, and Arts*, and *Health Sciences*); and *Agricultural Sciences* had a statistically higher average publication rate of papers in Portuguese than three other fields of knowledge (*Biological Sciences*, *Exact and Earth Sciences*, and *Health Sciences*).

With regards to the publication of English-medium papers in conference proceedings, table 25 shows the results for the mean (M), standard deviation (*SD*), median, and range across the different fields of knowledge.

Table 25.

CV study- Means, Standard Deviations, Medians, and Ranges of Papers in conference proceedings published in English

		Agricultural Sciences (211)	Applied Social Sciences (126)	Biological Sciences (358)	Engineering (247)	Exact and Earth Sciences (404)	Health Sciences (229)	Human Sciences (232)	Linguistics, Literature, and Arts (67)
Papers in English in conference proceedings	Mean (*M*)	0.6	2.2	0.7	6.0	1.9	0.4	0.2	0.1
	Standard Deviation (*SD*)	1.8	3.3	3.5	8.3	4.8	2.3	0.7	0.3
	Median	0.0	1.0	0.0	3.0	0.0	0.0	0.0	0.0
	Range	0-13	0-15	0-37	0-48	0-37	0-21	0-6	0-1

The highest average of publication per scholar was, by far, in *Engineering* (6.0 publications). This was also the field in which the numbers were the most spread around the mean (*SD* = 8.3). In addition, the range was between 0 and 48 articles and the median was 3.0, indicating that half of the 247 scholars published between 0 and 3 texts, while the other half published between 3 and 48 texts. The scholar who published 48 papers, along with four others who published an average of over 40 texts in the three-year period examined, brought the average publication rate up.

In order to investigate whether there were differences in the average of articles published in English amongst the eight fields, an ANOVA was carried out. The ANOVA test also showed an effect of field of knowlesge in the number of papers published in English in conference proceedings [$F(7,1872) = 48.1$, $MSE = 882.0$, $p < 0.01$]. In *Engineering* ($M = 6.0$, $SD = 8.3$), the average of English-medium papers in conference proceedings was statistically significant higher than that in all other fields: *Agricultural Sciences* ($M = 0.6$, $SD = 4.8$), $p < 0.001$; *Applied Social Sciences* ($M = 2.2$, $SD = 3.3$), $p < 0.001$; *Biological Sciences* ($M = 0.7$, $SD = 3.5$), $p < 0.001$; *Exact and Earth Sciences* ($M = 1.9$, $SD = 4.8$), $p < 0.001$; *Human Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; *Health Sciences* ($M = 0.4$, $SD = 2.3$), $p < 0.001$; and *Linguistics, Literature, and Arts* ($M = 0.1$, $SD = 0.3$), $p < 0.001$. *Applied Social Sciences* ($M = 2.2$, $SD = 3.3$) superseded *Agricultural Sciences* (M = 0.6, SD = 4.8), $p < 0.001$; *Biological Sciences* (M = 0.7, SD = 3.5), $p = 0.027$; *Health Sciences* ($M = 0.4$, $SD = 2.3$), $p = 0.005$; *Human Sciences* ($M = 0.2$, $SD = 0.7$), $p = 0.001$; and *Linguistics, Literature, and Arts* ($M = 0.1$, $SD = 0.3$), $p = 0.029$ in average of papers published in English. In *Exact and Earth Sciences* ($M = 1.9$, $SD = 4.8$), the average publication rate was statistically higher than that in *Agricultural Sciences* ($M = 0.6$, $SD = 4.8$), p = 0.007; *Biological Sciences* ($M = 0.7$, $SD = 3.5$), p = 0.006; *Health Sciences* ($M = 0.4$, $SD = 2.3$), $p = 0.001$; *Human Sciences* ($M = 0.2$, $SD = 0.7$), $p < 0.001$; and *Linguistics, Literature, and Arts* ($M = 0.1$, $SD = 0.3$), $p = 0.038$.

In summary, scholars in *Engineering* had a statistically higher average publication rate of English-medium papers in conference proceedings than all other fields of knowledge; while scholars in both *Applied Social Sciences* and *Exact and Earth Sciences* published a statistically higher average of papers in English than other five other fields of knowledge (*Agricultural Sciences*, *Biological Sciences*, *Health Sciences, Human Sciences*, and *Linguistics, Literature, and Arts*, and).

Comparing tables 23 and 24, scholars published more papers in conference proceedings in Portuguese than in English in two fields of knowledge from the 'harder' sciences (*Agricultural Sciences* and *Engineering*) and in all three fields from the 'softer' sciences (*Applied Social Sciences*, *Human Sciences,* and *Linguistics, Literature, and Arts).* In some fields of knowledge, the average rate of English-medium papers was extremely low: scholars in *Linguistics, Literature, and Arts* published 0.1 papers in English in the three year-period examined, while those in *Human Sciences* published 0.2 papers.

Figure 29 summarizes the average publication rate of papers in conference proceedings published in Portuguese and English in each field of knowledge from 2014 to 2016.

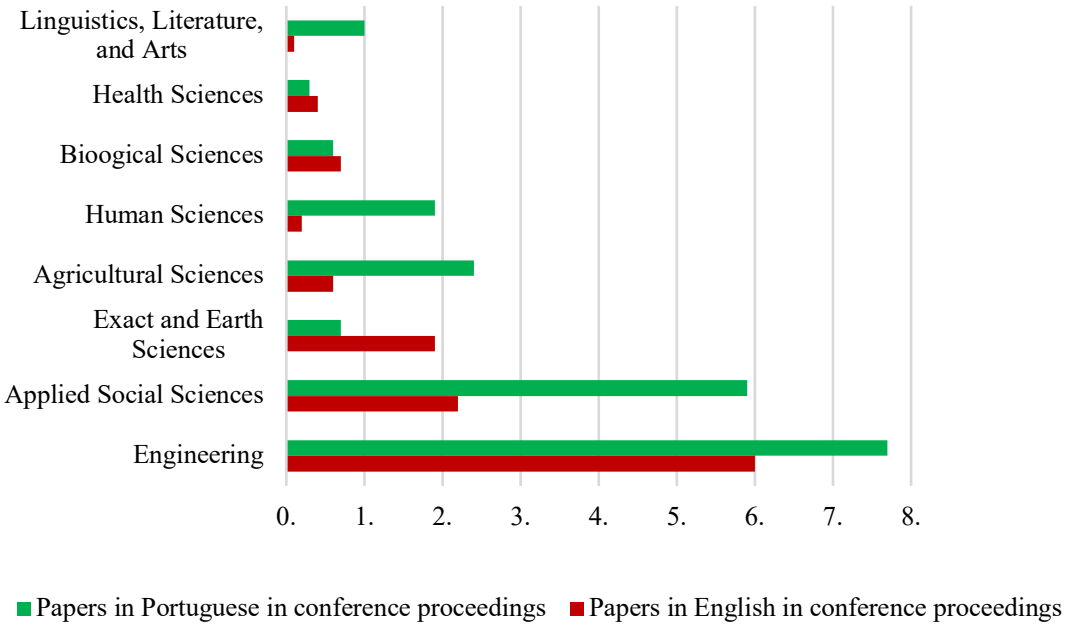

Figure 29. Average of papers published in Portuguese and English in conference proceedings by scholars from different fields of knowledge from 2014 to 2016.

4.4.5. Knowledge production and dissemination: a discussion about the four written academic genres used by scholars from different disciplinary communities

The focus of this subsection relies on the comparison of publication practices within the eight fields of knowledge officially adopted by CNPq (*Agricultural Sciences, Applied Social Sciences, Biological Sciences, Engineering, Exact and Earth Sciences, Health Sciences, Human Sciences,* and *Linguistics, Literature, and Arts*).

Figure 30 below shows the average number of publications per scholar in the four written genres (articles in academic journals, books, book chapters, and papers in conference proceedings) across the eight fields of knowledge. These numbers represent the sum of publications in Portuguese, in English, and in any other language(s).

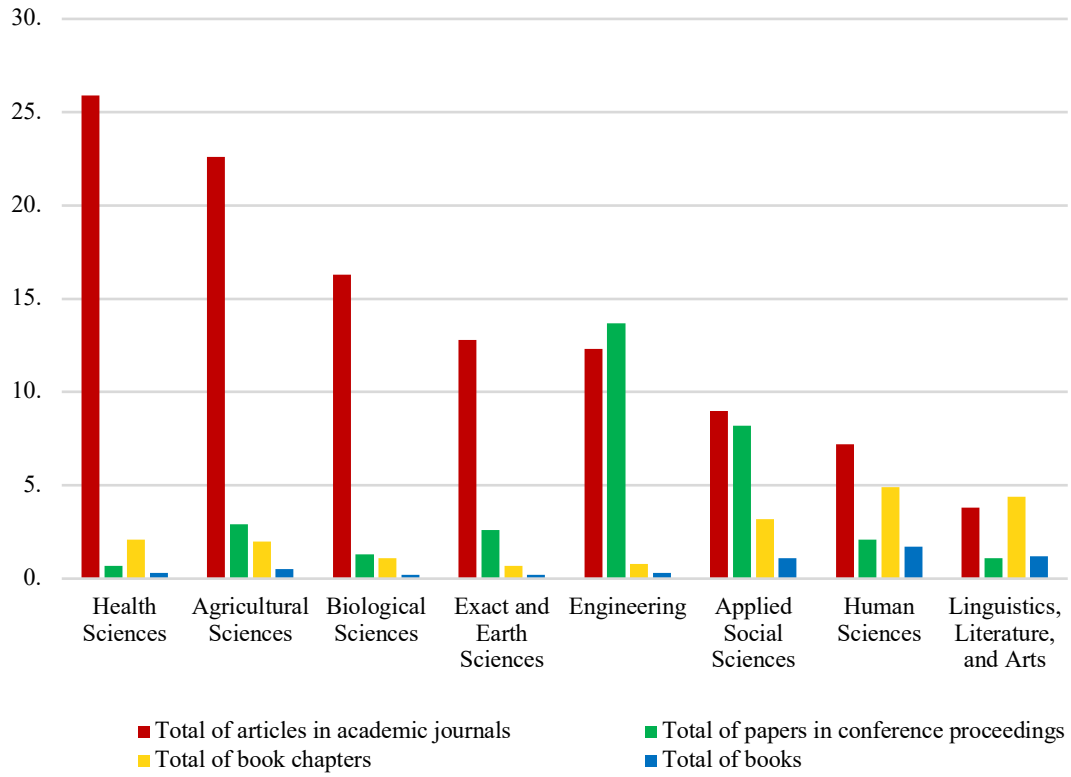

Figure 30. Average number articles in academic journals, books, book chapters, and papers in conference proceedings published by scholars from different disciplinary communities from 2014 to 2016.

When contrasting the differences and similarities amongst the average publication per scholar in each of the eight fields of knowledge (figure 29), some striking differences were found. For instance, in the three-year period analyzed (from 2014 to 2016), the number of publications in

all genres was 29 in *Health Sciences*, 28 in *Agricultural Sciences*, and 27.1 in *Engineering*. In contrast, the total number of publications in all genres in the same period was 10.5 in *Linguistics, Literature* and *Arts* and 15.9 in *Human Sciences*. A tentative explanation can be offered to account for the huge difference in research production. National and international research collaborations that involve shared co-authorship of articles are more frequent in the 'hard' sciences due to the nature of the studies, which usually involve a number of labs around the world. In contrast, in the social and human sciences co-authorship between two scholars is much less frequent than in the 'hard' sciences (Hyland, 2015) and sometimes even discouraged. For example, in the most recent call for CNPq research productivity grants (CNPq, 2018b), there is a clear statement regarding the preference for sole authorship publications in the field of *Linguistics, Literature, and Arts* (p. 138-139 of the document), while there is no reference to this in the criteria used in any other field of knowledge. In contrast, for fields such as *Engineering* and *Exact Sciences*, the document clearly values the volume of publications in qualified peer-reviewed academic journals without mentioning number of authors (CNPq, 2018b p. 56). Thus, researchers from 'hard' sciences end up authoring a greater number of publications and are encouraged to do so in high-prestige journals (Abramov et al, 2009).

Regarding the four different written genres and the average number of publications by academics from the different areas, *Health Sciences* published almost seven times more articles than *Linguistics, Literature, and Arts,* and approximately three times more articles than both *Human Sciences* and *Applied Social Sciences*. The field of *Agricultural Sciences* published six times more articles than *Linguistics, Literature, and Arts,* three times more than *Human Sciences,* and 2.5 times more articles than *Applied Social Sciences*; while *Biological Sciences* published four times more articles than *Linguistics, Literature, and Arts* and two times more articles than both *Applied Social Sciences* and *Human Sciences*. The results also allowed for the identification of a

trend within the fields that constitute the 'softer' sciences, with *Linguistics, Literature, and Arts* clearly accounting for the lower number of articles published, more specifically two times fewer articles than both *Applied Social Sciences* and *Human Sciences*.

In some fields, there were major discrepancies between the publications of different genres, while in others these differences were slighter or even nonexistent. The average publication of articles in *Health Sciences* was 86 times higher than that of full books, 37 times higher than that of papers in conference proceedings, and 12 times higher than that of book chapters. In *Biological Sciences*, the average number of articles was 81 times higher than that of books, 15 times higher than that of book chapters, and 12 times higher than that of papers in conference proceedings. In *Exact and Earth Sciences*, the average quantity of article publication per scholar was 64 times higher than that of books, 18 times higher than that of book chapters, and five times higher than that of papers in conference proceedings. In *Agricultural Sciences*, the average of articles published was 45 times higher than that of books, 11 times higher than that of book chapters, and eight times higher than that of papers in conference proceedings. As previously stated, these differences are related to the value given by institutions and national funding agencies to publication of articles in peer-reviewed and high-indexed journals.

An exception was the field of *Engineering,* in which the average publication rate of the top ranked genre (papers in conference proceedings) was quite similar to that of the second ranked genre (articles in academic journals). In comparison to books, the average of papers in conference proceedings per scholar was 45 times higher, and the average of articles was 41 times higher; while in comparison to book chapters, the average number of papers in conference proceedings was 17 times higher, and the average of articles was 15 times higher.

Conversely, within the fields from the 'softer' sciences, the differences in the number of publications of the four written genres were less marked or, in some cases, nonexistent. In *Applied Social Sciences*, publication of articles and papers in conference proceedings were quite similar, being approximately eight times higher than that of books, and almost three times than that of book chapters. In *Human Sciences*, the average of articles was only four times higher than that of books, three times higher than that of papers in conference proceedings, and 1.5 times higher that than of book chapters. In *Linguistics, Literature, and Arts*, the average of book chapters (the top ranked genre) and the average of articles (second ranked genre) were very similar. They were both approximately three times higher than that of papers in conference proceedings and books.

The results follow the same overall conclusion as previous studies that compared publication patterns in different fields of study (Mabe & Mulligan, 2011; Mare & Wabe, 2015; Skudlik, 1991). They demonstrated that, in general, academics from the fields that constitute the 'harder' sciences published more articles in academic journals than those from the 'softer' sciences. In the Brazilian context, a set of previous bibliometric studies have also indicated that scholars with CNPq research productivity grants in a range of academic disciplines tend to publish articles in academic journals more frequently than any other written academic genre. These studies examined the publishing practices in the disciplines of chemistry (Alves et al, 2014); nursing (Santos et al., 2015); psychology (Weber et al, 2015); archeology, librarian science, social sciences, physiotherapy, speech therapy, and pedagogy (Herculano & Norberto, 2012); and education, humanities, physics, zoology, exact and earth sciences, computer sciences, electrical engineering, and mechatronics (Motta-Roth et al, 2016).

The results found in this investigation showing a greater predominance of articles in the 'harder' sciences, with the exception of *Engineering*, can be related to the fact that scholars in

these fields have adjusted earlier to the criteria established by evaluation and funding agencies regarding citation indexes and impact in comparison to those in the 'softer' sciences. Funds are, to a certain extent, allocated according to such criteria. Research produced in the 'harder' sciences is highly dependent on larger amount of financial resources to equip laboratories than most fields that constitute the 'softer' sciences. Also, the speed of publications also influences the greater prevalence of articles in experimental and empirical disciplines of the 'harder' sciences, as assuring the ownership of ideas and discoveries is key (Mabe & Mulligan, 2011). Conversely, academics from the 'softer' areas still consider longer texts such as books and book chapters more appropriate to publicize their work (Burgess, 2017; Hyland, 2015).

Nevertheless, the results of the present research regarding the 'softer' sciences, in which articles predominated in a smaller scale (*Applied Social Sciences* and *Human Sciences*) or had rather similar numbers to book chapters (*Linguistics, Literature, and Arts*) can be pointing to a shift for these scholars in terms of their traditional vehicles of publication. Books and book chapters attract fewer citations, especially those with limited online access which are placed in a repository, and are often published by much smaller and local publishing houses in comparison to articles and papers in conference proceedings, which may make evaluation agencies see them as not fulfilling quality control (Burgess, 2017). In the Brazilian academic context, for instance books and book chapters are not always peer-reviewed or refereed, unlike articles in academic journals and papers in conference proceedings.

Finally, regarding the clear preference in the field of *Engineering* for papers in conference proceedings in comparison to the other written genres, the results align with those from Motta-Roth et al (2016) in the academic disciplines of computer science, electrical engineering, and mechatronics. However, the present investigation advances the line of inquiry as it explored all

eight fields of knowledge and demonstrated that, after *Engineering*, the second field that was predominant in publication of papers in conference proceedings was *Applied Social Sciences*.

These results might be related to the fact that while in some fields of knowledge only an abstract (of different sizes and formats) is required as a submission to a conference, in others, such as *Engineering* (especially computer sciences), a full peer-reviewed paper is required and is more valued within the field. For example, in the call for papers of the 9th International Conference on Computer Science, Engineering and Applications (ICML 2019 Call for Papers, 2019), to the 5th International Conference on Chemical Materials and Process (ICCMP Call for Paper, 2019), and to the 3rd International Conference on Energy and Environmental Science (About ICEES, 2019), a full peer-reviewed paper in English is required. Thus, academic disciplines in the field of *Engineering* end up having a much higher number of papers in conference proceedings used to disseminate their knowledge production.

Regarding the prevalence of *Applied Social Sciences* over all other fields expect *Engineering*, this might be related to the fact that among the academic disciplines comprised in this field, we find demography, business, economics and information sciences. They might have research topics that demand, in some situations, more speed in the publication of results than other disciplines, which can be achieved through the publication of papers in conference proceedings. In addition, papers could be more valued as there are international conferences that require the submission of full peer-reviewed papers. As examples, we find the call for papers to the 3rd International Conference on E-Business and Internet (ICEBI, 2019) and the 3rd International Conference on Applied Economics and Business (ICAEB Submission, 2019).

Figure 31 below shows the average number of publications in Portuguese per scholar in the four written genres (articles in academic journals, books, book chapters, and papers in

conference proceedings) across the eight fields of knowledge officially adopted by CNPq and the Lattes Platform from 2014 to 2016.

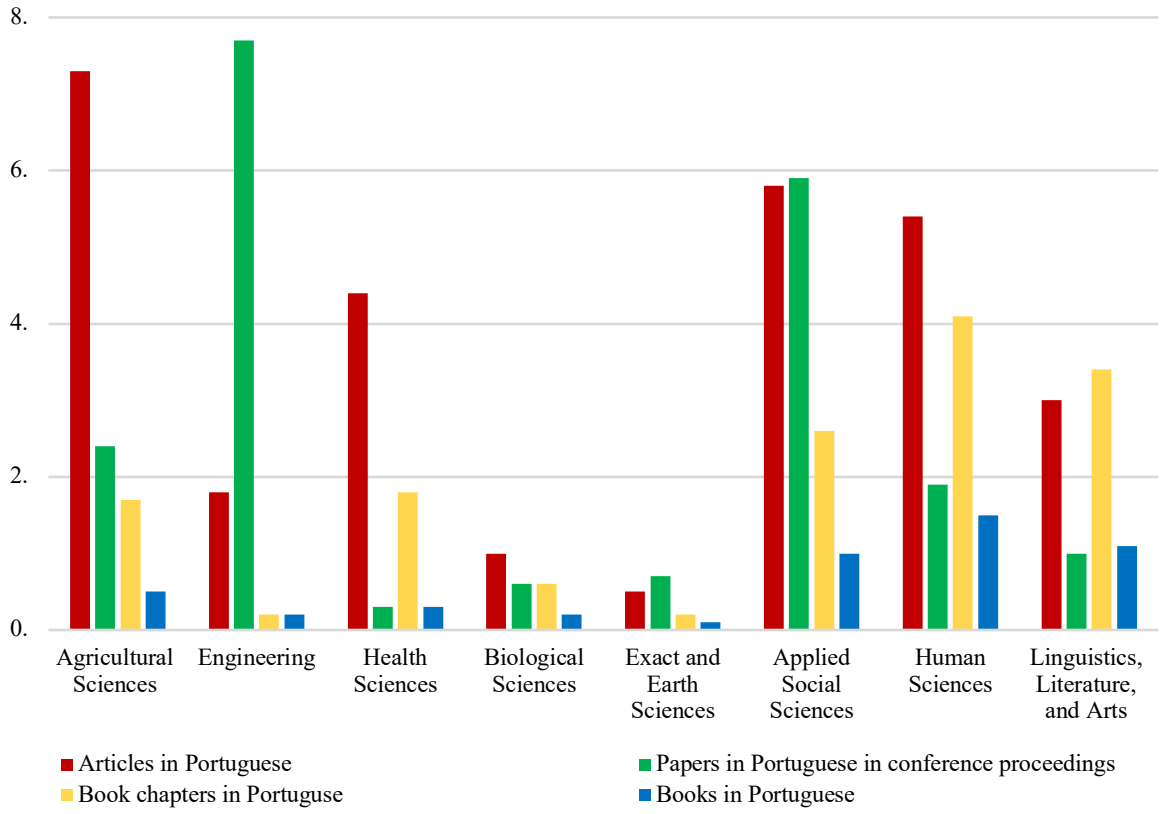

Figure 31. CV study - Average of Portuguese-medium articles in academic journals, books, book chapters, and papers in conference proceedings published by scholars from different disciplinary communities from 2014 to 2016.

The analyses demonstrated that, in some fields of knowledge, there were considerable disparities between the types of publications, as shown in figure 30. The greatest difference was, by far, the one found in *Engineering*, in which the number of Portuguese-medium papers in conference proceedings was 38 times higher than those of books and book chapters. The second biggest difference was in the field of *Agricultural Sciences*, in which the number of Portuguese-medium articles was 14 times higher than that of books. Conversely, in *Biological Sciences*, the number of Portuguese-medium papers in conference proceedings and book chapters were exactly

the same, and were both only three times higher than the number of book chapters. In *Linguistics, Literature, and Arts,* the number of books and papers in conference proceedings was almost the same, and the number of book chapters and articles were also rather similar.

This next figure presents similar data to figure 32, but this time considering publications in English.

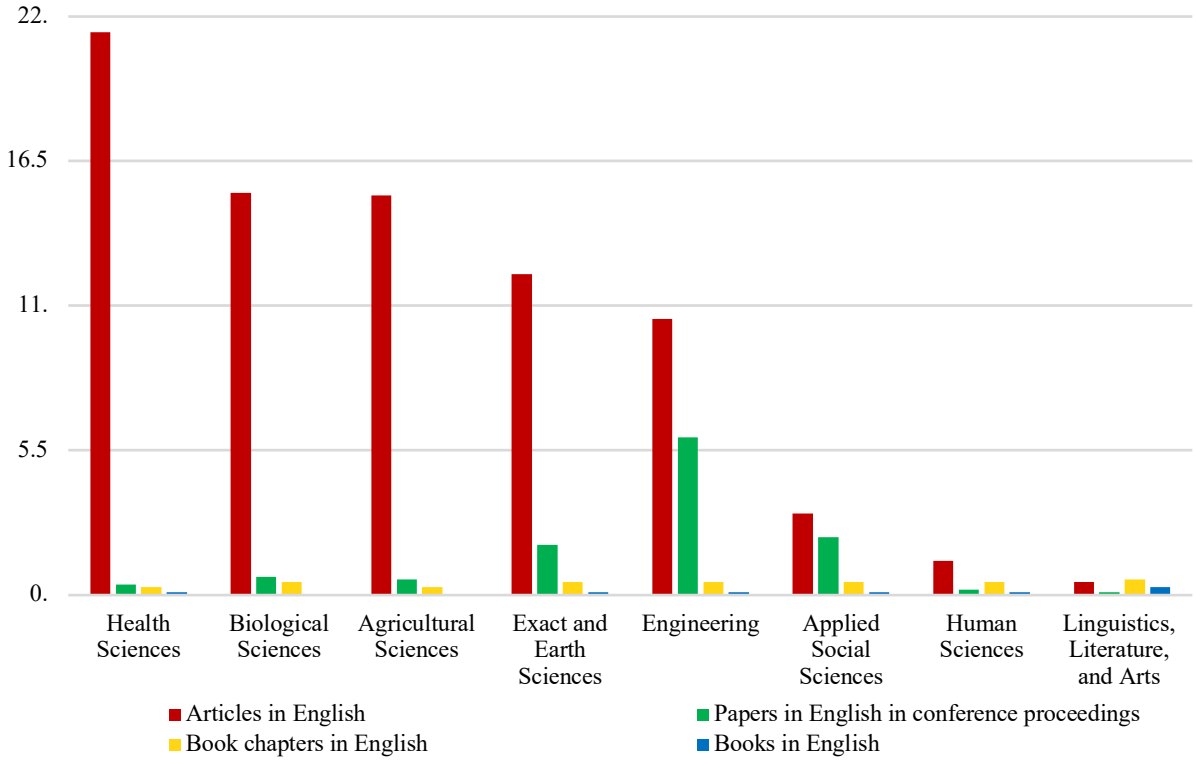

Figure 32. Average of English-medium articles in academic journals, books, book chapters, and papers in conference proceedings published by scholars from different disciplinary communities from 2014 to 2016.

The results shown in figure 31 indicate that in all fields of knowledge, with the exception of *Linguistics, Literature, and Arts*, there was a predominance of English-medium articles over the other types of publications. The predominance was greater in the fields that constitute the 'harder' sciences than in *Applied Social Sciences* and *Human Sciences*. The second ranked type of publication was papers in conference proceedings, with the exception of *Human Sciences* and *Linguistics, Literature, and Arts*. Conversely, in all fields from the 'harder' sciences, as well as

in *Applied Social Sciences* and *Human Sciences*, English-medium books had the lowest number of publications, followed by English-medium book chapters.

When comparing the number of English-medium publications of the four written academic genres within the same disciplinary community, in general, there were major discrepancies between the number of articles and books in the fields from the 'harder' sciences. For instance, the number of English-medium articles was 214 times higher than that of books in *Health Sciences*, 122 times in *Exact and Earth Sciences*, and 105 times higher in *Engineering*. Scholars in *Biological Sciences* and *Agricultural Sciences* published approximately 15 English-medium articles and did not publish any books at all. These disparities were slighter in the field of *Applied Social Sciences*, in which the number of English-medium articles was 31 times higher than that of books. Finally, the differences were clearly smaller in the field of *Human Sciences*, in which the number of articles in English was 13 times higher than that of books.

Figure 33 below gathers the results regarding the publication of all four written academic genres in both Portuguese and English by scholars from the eight fields of knowledge.

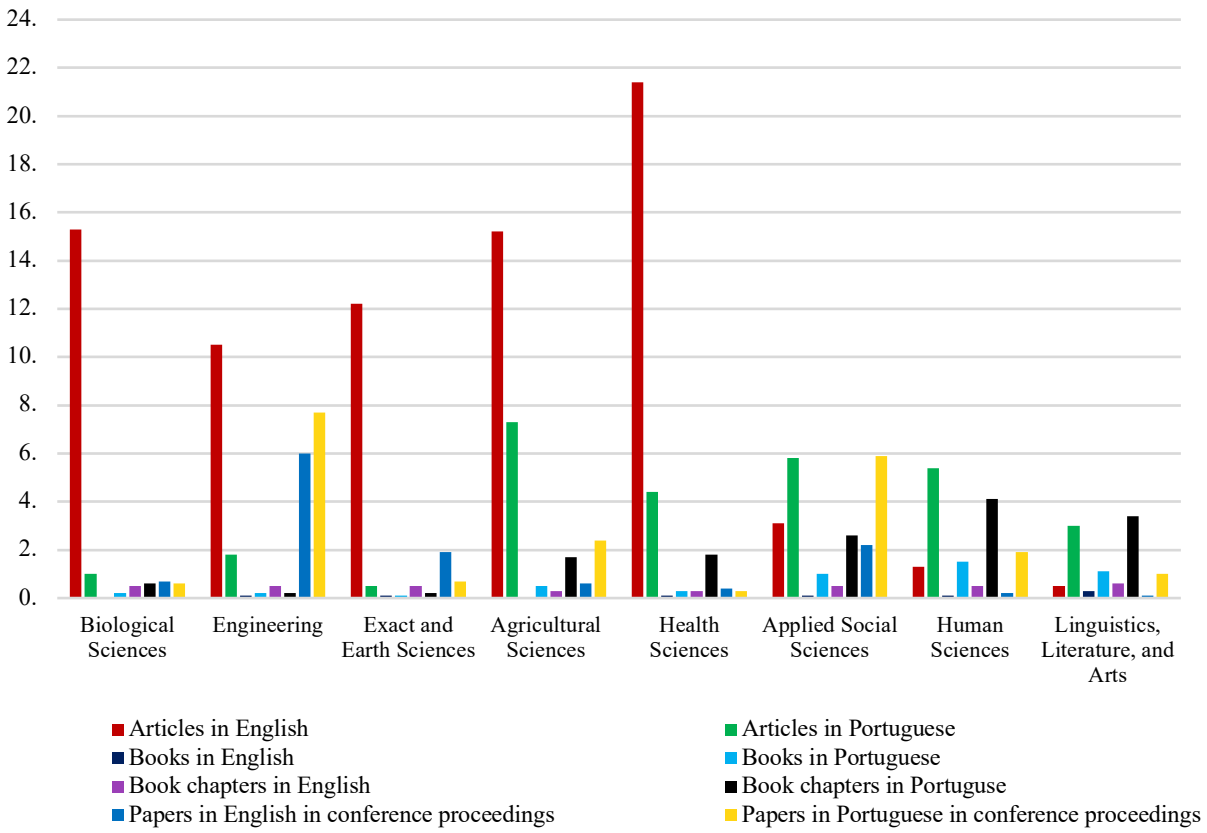

Figure 33. Average of articles in academic journals, books, book chapters, and papers in conference proceedings published in Portuguese and English by scholars from different disciplinary communities from 2014 to 2016.

When examining the results of the use of both Portuguese and English through the four written academic genres, an overall trend was identified. The fields that constitute the 'softer' sciences were predominant in the use of Portuguese, while the fields that integrate the 'harder' sciences prevailed in the use of English. However, there were some exceptions. The field of *Agricultural Sciences* was also predominant in the use of Portuguese in the four genres, while *Applied Social Sciences* also prevailed in English-medium papers in conference proceedings.

The results found in this study point in the same direction of several other investigations (Kuteeva & Airey, 2014; Lopez-Navarro et al, 2015; Mabe & Mulligan, 2011; Mare & Wabe, 2015; Motta-Roth, 1996; Motta-Roth et al, 2016; Petersen and Shaw, 2002; Price, 1965; Lopez-

Navarro et al ,2015; Swales, 1981, 1984, 1988; Solovova, Santos & Verissimo, 2018; Waltham, 2010; Wood, 2001) in that each scientific or academic domain is organized in systems of specific literacy practices regarding language of publication, written genres, speed of publishing, reading behavior, and knowledge production processes in general.

The genre and language chosen for publication is largely dictated by the social norms and values of each disciplinary community (Lopez-Navarro et al, 2015). In the present research, the fields that constitute the 'harder' sciences published more in English and were more exocentric and internationalized. For instance, the clear preference for producing and disseminating knowledge through English-medium articles by academics in these fields seems to be related to the fact that journals with high prestige and citation indexes have practically only English as their language of publication (Curry & Lillis, 2010). In contrast, the results showed that, overall, the fields from the 'softer' sciences were more endocentric and locally-language oriented and produced and disseminated knowledge more frequently in Portuguese.

In the next chapter, the common trends between both studies presented in chapters 3 and 4 (*Questionnaire study* and *CV study*, respectively) will be discussed.

Chapter 5: Common trends of knowledge production and dissemination in English and in Portuguese and their potential relationship with English proficiency

In this chapter, the common trends between the *Questionnaire study* (chapter 3) and the *CV study* (chapter 4) will be discussed. First, I will focus on the common trends identified in both studies regarding knowledge production and dissemination and their relationship with previous studies. Next, the common trends between both studies concerning scholars' self-perceived English proficiency, their potential relationship with the language used for knowledge production and dissemination, and their connection to other investigations will be explored.

It is worth remembering that participants of both studies were recruited based on the following existing filters in the Lattes Platform: (1) field of knowledge; (2) professional activity (country of HE institution); and (3) CNPq research productivity grant. Participants of the *Questionnaire study* were distributed across the eight fields of knowledge as follows: (1) *Agricultural Sciences* (8.8 % of the participants); (2) *Applied Social Sciences* (12.8% of the participants); (3) *Biological Sciences* (10.2% of the participants); (4) *Engineering* (9.0% of the participants); (5) *Exact and Earth Sc*iences (14% of the participants); (6) *Health Scienc*es (16.0% of the participants); (7) *Human Sciences* (16.1% of the participants); and (8) *Linguistics, Literature, and Arts* (5.0% of the participants). The *CV study* had the following allocation of participants: (1) *Agricultural Sciences* (11.2% of the participants); (2) *Applied Social Sciences* (6.8% of the participants); (3) *Biological Sciences* (19.1% of the participants); (4) *Engineering* (13.2% of the participants); (5) *Exact and Earth Sciences* (21.5% of the participants); (6) *Health Sciences* (12.2% of the participants); (7) *Human Sciences* (12.4% of the participants); and (8) *Linguistics, Literature and Arts* (3.6% of the participants).

The discussion of these common trends regarding scholars' language for knowledge production and dissemination practices and self-rated English proficiency will be based on table 26 below, which systematizes the main results of both studies.

Table 26.
Systematization of main results of Questionnaire Study and CV study

	Agricultural Sciences	Biological Sciences	Engineering	Exact and Earth Sciences	Health Sciences	Applied Social Sciences	Human Sciences	Linguistics, Literature, and Arts
I – Average total publication (CV study)	28.0	18.9	27.1	16.3	29.0	21.5	15.9	10.5
II– Average total Portuguese-medium publication (CV study)	11.9 (42.5%)	2.4 (12.7%)	9.9 (36.5%)	1.5 (9.2%)	6.8 (23.4%)	15.3 (71.2%)	12.9 (81.1%)	8.5 (80.9%)
III - Average total English-medium publication (CV study)	16.1 (57.5%)	16.5 (87.3%)	17.2 (63.5%)	14.8 (90.8%)	22.2 (76.5%)	5.9 (27.4%)	2.1 (13.2%)	1.5 (14.3%)
IV - Use of exclusively and mostly Portuguese for publications (Questionnaire study)	12.8%	5.0%	10.5%	10.9%	15.3%	50.5%	63.1%	65.8%
V - Use of exclusively and mostly English for publications (Questionnaire study)	52.5%	82.7%	54.3%	66.3%	50.1%	9.4%	5.4%	3.1%
VI - Use of exclusively and mostly Portuguese for presentations (Questionnaire study)	44.8%	34.3%	30.8%	27.1%	43.2%	54.2%	62.9%	53.7%
VII - Use of exclusively and mostly English for presentations (Questionnaire study)	21.3%	33.2%	29.8%	37.2%	19.8%	9.6%	5.9%	6.2%
VIII - Use of exclusively and mostly Portuguese for collaborations (Questionnaire study)	2.7%	1.9%	3.9%	2.4%	4.8%	5.6%	4.4%	6.3%
IX - Use of exclusively and mostly English for collaborations (Questionnaire study)	28.7%	40.2%	38.1%	38.5%	31.4%	18.8%	16.3%	17.2%
X –English proficiency self-rated as good in the four skills (CV study)	55.8%	79.7%	78.6%	82.3%	72.7%	69.2%	60.0%	63.1%
XI - Self-rated English proficiency (0 to 4 rating scale) (Questionnaire study)	3.07	3.29	3.30	3.28	3.10	3.20	2.91	3.20

Row I of table 26 shows the average number of publications (articles in academic journals, books, book chapters, and papers in conference proceedings) written in Portuguese, in English, or in any other language(s) by scholars from the *CV study* from 2014 to 2016. Rows II and III show the same data from Row I but divided by language: publications in Portuguese are presented in Row II whereas publications in English are portrayed in Row III. Rows IV to IX present the results of the *Questionnaire study* regarding the three contexts of knowledge production and dissemination examined. The first context is publication: percentage of academics who used exclusively Portuguese and mostly Portuguese for publication purposes (row IV) and percentage of scholars who used English and mostly English for publication purposes (row V). The second context is presentation: percentage of scholars who used exclusively Portuguese and mostly Portuguese for presentation purposes (row VI) and percentage of academics who used exclusively English and mostly English for presentation purposes (row VII). The third and final context is international collaboration: percentage of scholars who used Portuguese and mostly Portuguese for international collaboration purposes (row VIII) and percentage of academics who used exclusively English and mostly English for international collaboration purposes (row IX). Finally, the results regarding scholars' self-rated English proficiency are shown in rows X and XI: the percentage of *CV study* academics who self-rated their proficiency in the four skills in English as good (row X) and the self-rated English proficiency of *Questionnaire study* scholars, on a 0 to 4 rating scale (row XI).

With regards to row I of table 26, it is important to highlight that, the average numbers presented take into consideration publications in Portuguese, in English, and in any other language(s). The five fields that integrate the 'harder' sciences (*Agricultural Sciences, Biological Sciences, Engineering, Exact and Earth Sciences, Health Sciences*) did not have any publication in other languages. In contrast, the fields that constitute the 'softer' sciences had the

following average of publications in languages other than Portuguese or English: 0.3 publications in *Applied Social Sciences* (which represents 1.4% of the total average number of publications); 0.9 publications in *Human Sciences* (which represents 5.7% of the total average number of publications); and 0.5 publications in *Linguistics, Literature, and Arts* (which represents 4.8% of the total average number of publications).

When examining the extent to which scholars from the eight different fields of knowledge used English or Portuguese, overall, the results of the *CV study* regarding publication in four written academic genres (rows II and III of table 26) and the results of the *Questionnaire study* about the three contexts of knowledge production and dissemination (rows III and IV of table 26) pointed in the same direction, with a clear and significant contrast regarding the more frequent use of English to share knowledge by academics in the 'harder' sciences in comparison to those in the 'softer' sciences.

According to rows III, V, VII, and IX, it is possible to see that the fields that constitute the 'harder' sciences prevailed over the fields in the 'softer' sciences in the use of English, while the fields that integrate the 'softer' sciences prevailed in the use of Portuguese (rows II, IV, VI, and VIII). Also, Brazilian scholars in the latter fields prefer Portuguese to English to produce and disseminate knowledge. This behavior probably favors a domestic audience, hampering scholars to share knowledge with a greater audience around the globe, and impairing the international awareness of the country's scientific contributions.

These results are aligned with previous studies carried out in non-Anglophone contexts around the globe (Ammon 1998, as cited in Hamel, 2007, 2003, 2006, 2010; Bordons and Gomez, 2004; Carlu & Carelesu, 2003; Burgess, 2014; Flowerdew & Li, 2009; Frame and Carpenter 1979; Fergusson 2007; Hammel, 2007; Kronegger et al. 2011; Lopez-Navarro et al, 2015; Petersen and Shaw 2002; Rey-Rocha and Martin-Sempere 1999; Sanz et al, 1995;

Solovova, Santos & Verissimo, 2018), as it demonstrates that (1) the 'harder' sciences have been adopting English as a global scientific and academic language more predominantly than the fields that constitute the 'softer' sciences; and that (2) in the 'softer' sciences, scholarly practices are more endocentric and locally-oriented than those in the 'harder' sciences, and English has not achieved the same standing as a global language.

One of the possible reasons is that research in the 'harder' sciences is more commonly addressed to international readers, with English playing the role of the most functional language for knowledge dissemination (Ammon, 2006). In addition, English seems to be more easily adopted due to the exactitude which prevails in the 'harder' sciences. In some cases, the employment of quantitative and formal terms and the precise measurements might be rather distinct from the 'softer sciences' and, consequently, causes less difficulties in the writing process of the findings either in the local language or in English (De Swaan, 2001b). The results showing that English is less employed for knowledge production and dissemination in the 'softer' sciences can be related to the fact that these fields are largely influenced by cultural and historical factors. Moreover, academic disciplines in this field are more locally oriented and commonly have a greater intra-national interest from their academic community (Ammon, 2006; Solovova, Santos & Verissimo, 2018). In these fields, audiences accept and understand publications and other genres from the academic domain more readily in their countries' dominant language. In addition, *Human Sciences and Social Sciences* are much more strongly bound to language, with discourse tending to be more complex and playing a more crucial role than in the 'harder' sciences. In many academic disciplines in the humanities research commonly involves interpretation and argumentation rather than verification and falsification and, thus, does not favor uniform linguistic expression, while in the 'harder' sciences the presentation of

results from empirical studies allow for the use of linguistic standards that are easier assimilated (Skudlik, 1991).

It is important to note that none of the studies aforementioned investigated the use of English for scientific and academic knowledge production and dissemination in all different fields of knowledge simultaneously nor included both scholars with and without research grants, as the present research. Also, only one of the above studies investigated the use of English and scholars' first language in specific written academic genres used by a few disciplinary communities was found (Skudlik, 1991). No large-scale quantitative research has focused on specific literacy practices, with a variety of written and oral genres from the academic domain in different languages used by scholars in each field of knowledge, as was done in this investigation.

Furthermore, the findings of both the *Questionnaire study* and the *CV study* allowed for the identification of peculiarities in the language choices by scholars in some fields of knowledge which had not been explored yet. One of them is the field of *Health Sciences*, whose results in the *CV study* demonstrated a clear predominance in English-medium publications. Conversely, when it comes to presentations in academic events *(Questionnaire study),* scholars in this field preferred Portuguese (43.2%) over English (19.8%). Scholars in this field had a lower self-rated English proficiency when compared to the those in three other fields in the 'hard' sciences (*Biological Sciences, Engineering,* and *Exact and Earth Sciences*) (rows X and XI of table 26). In addition, results from the ANOVA in the *Questionnaire study* also indicated that *Health Sciences* had a statistically lower score of self-rated English proficiency than *Biological Sciences, Engineering,* and *Exact and Earth Sciences* (chapter 3). The high publication rate in English can be linked to the regular use of intermediaries in the writing process of English texts, the so called literacy brokers (Lillis & Curry, 2006a). Additionally, in this field the allocation of

resources to pay for language and copy-editing services seems to be more frequent, which ends up not requiring a high English proficiency of these academics.

Another field whose results should be further explored is *Applied Social Sciences.* In the same manner as scholars in the other two fields in the 'soft' sciences (*Human Sciences* and *Linguistics, Literature, and Arts*), academics in *Applied Social Sciences* in the *CV study* had a higher average of total publications in Portuguese than in English (rows II and III of table 26), and they preferred Portuguese to English in the three contexts examined in the *Questionnaire study* (rows IV to IX of table 26). However, when examining the data in the *CV study* regarding publications*,* there was a key difference between the results found in *Applied Social Sciences* and those found in the other two fields in the 'softer' sciences. As described in chapter 4, *Applied Social Sciences* was the only field in the 'softer' sciences that had a statistically higher average of total papers in conference proceedings than most fields in the 'harder' sciences, with the exception of *Engineering*. Scholars in *Applied Social Sciences* also had a statistically higher average of English-medium papers in conference proceedings than three fields in the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, and *Health Sciences*), and a statistically higher average of Portuguese-medium papers than four fields in the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, *Exact and Earth Sciences*, and *Health Sciences*).

Therefore, the data of the *CV study* demonstrated that *Applied Social Sciences* has distinct characteristics than the other fields in the 'softer' sciences - scholars in this field tend to use more English in comparison to the others. An explanation may be that the classification adopted by CNPq (CNPq, n.d) for the academic disciplines that integrate the field of *Applied Social*

Sciences[32]. If we understand the distinction between 'harder' and 'softer' sciences in a *continuum* related to perceived scientific methodological rigor, exactitude, and objectivity differences (Helmenstine, 2018; Pigliucci, 2009; Storer, 1967) (see more in chapter 3, subsection 3.1.1), some of the academic disciplines in *Applied Social Sciences* lean towards the 'softer' end (communication, law, social services, tourism, museology, and home economics); while others (business, economics, and demography, architecture and urbanism) can be 'softer' or 'harder', depending on the scientific method adopted.

When taking into consideration the total number of publications (row I of table 26), publications in Portuguese (row II) and publications in English (row III) together, the results may be pointing to a correlation in which those scholars in the *CV study* who published the most (*Health Sciences*, *Engineering*, and *Agricultural Sciences,* and *Biological Sciences*) tended to prefer English. In contrast, those academics who published the least (*Linguistics, Literature, and Arts* and *Human Sciences*), tended to prefer Portuguese. It is important to highlight that this possible relationship is of correlation, not of causality. This correlation might be justified by some characteristics of the fields in the 'harder' sciences, as these scholars (1) have already adjusted to the criteria set by institutions and funding agencies of publishing in high-indexed English-medium journals; (2) very frequently have multi-authored publications; and (3) conduct research with empirical or experiential findings that need to be published faster and can more easily be reported in an objective and concise way, which also affects the speed of publications. In the 'harder'areas, publishing in English has become almost mandatory if scholars want to have their research widely read, recognized, and valued in the global scientific scenario. We can

[32] According to this classification, the field of *Applied Social Sciences* includes the following academic disciplines: architecture and urbanism; business; communication; demography; economics; home economics; industrial design; information sciences; law; museology; social service; tourism; and urban and regional planning.

argue that the traditional expression ‘publish or perish’ (Garfield, 1996; Wilson, 1942) can be adapted today to ‘publish in English or perish’. In some cases, using English is a condition to publish even in Brazilian journals, as some of the most prestigious journals in the country only accept submissions in this language. In the field of *Health Sciences*, for instance, the Brazilian Journal of Psychiatry (Scielo, 2018a), the Dementia & Neuropsychologia Journal (Scielo, 2018b), and the Journal of Applied Oral Science (Scielo, 2018c) only accept English-medium publications.

In addition, the *CV study* showed that, in general, scholars in the ‘harder’ sciences had articles in academic journals as the main genre for knowledge production and dissemination and prevailed over academics in the fields in the ‘softer’ sciences, while the latter had books and book chapters as the predominant genres. Thus, when considering both the genre and the language used, the results demonstrated that scholars in the ‘harder’ sciences preferred English over Portuguese and were predominant in article publication, while scholars in the ‘softer’ sciences preferred Portuguese over English and prevailed in book and book chapter publication. This may be indicating a correlation between scholars’ preferred language for publication and the written genre they used to produce and disseminate knowledge. In the fields that integrate the ‘harder’ sciences, there tends to be more rigor in the system for publications, as Brazilian scholars most often publish in high-indexed and English-medium journals (or conference proceedings, in the case of *Engineering*), which are practically always peer-reviewed. The citation indexes of a journal vary immensely across the fields in the ‘harder’ and ‘softer’ sciences. This comparison can be made through a journal’s h-index, which can be calculated with data from Web of Science, Scopus or Google Scholar. As an example, the highest ranked Brazilian journal in the field of Biochemistry - the Brazilian Journal of Medical and Biological Research - has an h-index of 76 in 2017 (Scimago Lab, 2018), while the highest ranked

Brazilian Journal in Human Sciences - the *Boletim do Museu Paraense Emilio Goeldi: Ciencias Humanas* - has an h-index of 8 in the same year (Scimago Lab, 2018b). In addition, the rejection rates index of journals might indicate the degree of difficulty to publish in certain areas. Nevertheless, data about rejection rate indexes are not commonly published (Shultz, 2010; Aarsen et al, 2008), and rejection rates for highest ranked Brazilian journals were not found in their official websites or other databases.

With respect to the common trends regarding scholars' self-rated English proficiency in both the *Questionnaire Study* and the *CV study* and their potential relationship with the use of English to produce and disseminate knowledge, both studies pointed to some similar trends. It should be noted that, as previously explored in chapter 2 of this dissertation (subsection 2.3), several authors (Ingram, 1985; LeBlanc & Painchaud, 1985; Oskarsson, 1980, 1989; Wilson & Lindsey, 1999) argue for the validity of self-rated language proficiency as the measure of an individuals' knowledge of a given language. Therefore, the results about English proficiency of the present research can be considered valid for the purposes of establishing potential relationships with other data that constitute this investigation.

In both the *Questionnaire Study* and the *CV study*, academics from three of the five fields that integrate the 'harder' sciences (*Biological Sciences*, *Engineering*, and *Exact and Earth Sciences*) had higher self-rated English proficiency than the other fields of knowledge (rows X and XI of table 26). In addition, results from the ANOVA conducted in the *Questionnaire study* showed that academics in these same fields had statistically higher scores for self-rated English proficiency than scholars in three other fields (*Agricultural Sciences*, *Health Sciences* and *Human Sciences*) (chapter 3, section 3.4). Regarding knowledge production and dissemination, overall, scholars from *Biological Sciences*, *Engineering*, and *Exact and Earth Sciences* used English to a greater extent in publications in the *CV study* (row III of table 17), and in all three

contexts analyzed in the *Questionnaire study* (publications, presentation, and international collaborations - rows V, VII, and IX of table 17, respectively) than those in the other fields of knowledge. The use of English was especially greater when compared to the three fields in the 'softer' sciences (*Applied Social Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts*).

Therefore, the trends found in both studies could suggest a possible association between the tendency to use English more frequently in *Biological Sciences, Engineering,* and *Exact and Earth Sciences* and scholars' higher self-rated English proficiency. However, it is not clear what comes first, i.e., if these academics are sharing more knowledge in English due to their higher English proficiency or if their higher English proficiency is influenced by the amount of English they use in their academic production and interactions. Whatever the explanation, there seems to be a self-perpetuating dynamic, in which members of disciplinary communities of the 'harder' sciences start using English since the beginning of their post-secondary studies to read the research published exclusively or predominantly in English and, thus, start practicing the language and becoming proficient to a greater extent than the members of the disciplinary communities from the 'softer' sciences, who do not have the same type of access to English texts.

Finally, with regards to the fields that integrate the 'softer' sciences, overall, in both studies scholars in *Human Sciences* had lower self-rated English proficiency in comparison to the other fields (rows X and XI of table 17). In the *CV study*, the fields in the 'softer' sciences had lower percentages of participants who self-rated their proficiency in English as good in the four skills, and in the *Questionnaire study*, the ANOVA showed that their English proficiency scores were lower than those in all other fields of knowledge (chapter 3, subsection 3.4). *Human Sciences* was also among the three fields with the highest average of Portuguese-medium publications

(row II of table 26), the lowest average of English-medium publications (row III), and among the fields who prioritized the use of Portuguese rather than English in the three contexts of knowledge production and dissemination examined (rows IV, VI, and VIII). Unlike scholars from the 'harder' fields, these participants may be using less English due to their lower English proficiency. One may also hypothesize that, as some academic disciplines in *Human Sciences* do not require the use of English due to a greater intra-national audience, members of these communities do not feel the need to learn the language leading, this way, to lower English proficiency.

In conclusion, the findings of both studies pointed in the same direction, with a marked contrast regarding the greater extent in the use of English to produce and disseminate knowledge by scholars in the 'harder' sciences when compared to those in the 'softer' sciences. Thus, the results suggest common trends in which: (1) the preference of English over Portuguese in *Biological Sciences*, *Engineering*, and *Exact and Earth Sciences* to share knowledge might be associated to scholars' higher self-rated English proficiency; and (2) the preference of Portuguese over English to share knowledge in *Human Sciences* might be related to their lower self-rated English proficiency. It should be noted that, as stated before, the greater use of English or Portuguese is also attributed to a range of other factors.

All the results discussed above constitute another contribution of the present research to the field, since there are still few investigations that focus on examining the association (or not) between non-anglophone scientists' English proficiency and knowledge dissemination in English. Man et al (2004) and Bauwens et al (2007) conducted studies in international contexts, using data from scholars' scores on TOEFL exams and their publications to demonstrate that English proficiency is a strong determinant for publishing in English. In the Brazilian context,

the only data-driven study found was the one by Vasconcelos et al (2008), who have argued about the impact of English communication skills on the visibility of Brazilian science in English language journals by proving the association between number of English-medium publications and scientists' writing competence.

In the next chapter, I will present some final remarks regarding this investigation, including implications for the development of international dissemination of scientific and academic knowledge produced in Brazil, and for the further inclusion of Brazilian scholars from various disciplinary communities into the globalized scientific and academic scenario. I will also discuss the limitations of this study and suggest potential future research.

Chapter 6: Conclusion

The quantitative analyses that encompassed the present investigation (*Questionnaire study* and *CV study*) allowed for the achievement of its general objective, i.e. the examination of the Brazilian scholarly scenario of knowledge production and dissemination by academics from different fields of knowledge in Portuguese and English, as well as their self-rated English proficiency.

Regarding the research questions that guided this investigation, first, the questions related to the *Questionnaire study* will be answered and, next, the questions connected to the *CV study* will be discussed.

Questionnaire study

1. Are there any differences and similarities in the frequency of self-reported use of Portuguese and English amongst Brazilian scholars from different fields of knowledge for

1.1 publication purposes in the last five years? Scholars in the five fields of knowledge that integrate the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*) use English to a much greater extent than Portuguese in publications. The differences regarding the preference for one of the two languages are striking. For instance, 82.7% of Biological Sciences scholars use exclusively and mostly English, and only 5.0% of the academics use exclusively and mostly Portuguese; while 66.3% of Exact and Earth Sciences scholars use exclusively and mostly English, and only 10.9% of them use exclusively and mostly Portuguese. In contrast, academics from the three fields in the 'softer' sciences (*Applied Social Sciences*, *Human* Sciences and *Linguistics, Literature, and Arts*) clearly employ Portuguese more frequently than English for publication purposes. The differences in the use of the two languages are also marked. For example, 65.1%

of *Languages, Literature, and Arts* academics use exclusively and mostly Portuguese and only 3.1% of them use exclusively and mostly English; while 63.1% of Human Sciences scholars use exclusively and mostly Portuguese and only 5.4% use exclusively and mostly English.

1.2 presentations in academic events in the last five years? Academics in seven fields of knowledge employ Portuguese more frequently than English to present their work in academic events. The use of the two languages present (1) rather small differences in *Biological Sciences* and *Engineering Sciences*; (2) approximately twofold differences in *Agricultural Sciences* and *Health Sciences*; and (3) major discrepancies in *Applied Social Sciences*, *Human Sciences*, and *Linguistics, Literature, and Arts*. The only field in which academics use English to a greater extent than Portuguese in presentations is *Exact and Earth Sciences*. However, the difference between the use of the two languages is slight.

1.3 international collaborations? Scholars from all fields of knowledge employ English more frequently than Portuguese to collaborate internationally. However, the differences in the use of the two languages are much greater in the fields that integrate the 'harder' sciences than the differences in the 'softer' sciences. For instance, scholars in *Biological Sciences* use English 21 times more than Portuguese to collaborate and those in *Exact and Earth Sciences* use it 16 times more than Portuguese. Conversely, academics in *Applied Social Sciences*, *Linguistics, Literature, and Arts*, and *Human Sciences* use Portuguese only three times more than English for establishing collaborations.

2. Are there any differences and similarities in the self-rated proficiency in English amongst Brazilian scholars from different fields of knowledge? Scholars in four fields of knowledge (*Exact and Earth Sciences*, *Biological Sciences*, and *Engineering*) have statistically higher scores of self-rated English proficiencies than those in three other fields of knowledge (*Agricultural Sciences*, *Health Sciences* and *Human Sciences*). Academics in *Human Sciences*

have statistically lower scores of self-rated English proficiency than those in all other fields of knowledge (*Agricultural Sciences*, *Biological Sciences*, *Health Sciences*, *Exact and Earth Sciences*, *Applied Social Sciences*, *Engineering*, and *Linguistics, Literature, and Arts*); while scholars in *Health Sciences* have statistically lower scores of self-rated English proficiency than those in three other fields in the 'harder' sciences (*Biological Sciences, Engineering*, and *Exact and Earth Sciences).*

CV study

3. Are there any differences in number and types of publications (articles in academic journals, books, book chapters, and papers in conference proceedings) amongst scholars from different fields of knowledge with a CNPq research productivity grant

3.1 in total numbers? Scholars from the five fields of knowledge in the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences,* and *Health Sciences*) have a higher publication rate than those in two fields from the 'softer' sciences (*Human Sciences* and *Linguistics, Literature, and Arts*). It should be highlighted that the figures in *Linguistics, Literature, and Arts* are especially lower in comparison to the fields in the 'harder' sciences. Regarding types of publications, (1) academics from *Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences, Health Sciences, Applied Social Sciences and Human Sciences* prefer articles; (2) scholars in *Engineering* prevail in publication of papers in conference proceedings; and (3) academics in *Linguistics, Literature, and Arts* tend to disseminate their knowledge in book chapters. In the fields in the 'harder' sciences, there are major discrepancies between the types of publication, while in the fields in the 'softer' sciences, these differences are slight or nonexistent.

3.2 in Portuguese? Overall, the fields that constitute the 'softer' sciences (*Applied Social Sciences*, *Human Sciences* and *Linguistics, Literature, and Arts*) are predominant in the use of Portuguese, along with the field of *Agricultural Sciences*. There is a prevalence of Portuguese-medium articles over the other genres in the fields of *Biological Sciences*, *Health Sciences*, *Agricultural Sciences*, and *Human Sciences*; Portuguese-medium papers in conference proceedings markedly prevail over the other genres in *Engineering*; there is a rather similar average number of Portuguese-medium articles and papers in conference proceedings in *Exact and Earth Sciences* and *Applied Social Sciences*; and book chapters in Portuguese prevail over articles in academic journals by a small margin in *Linguistics, Literature, and Arts*.

3.3 in English? The five fields in the 'harder' sciences (*Agricultural Sciences*, *Biological Sciences*, *Engineering*, *Exact and Earth Sciences*, and *Health Sciences*) have a strong preference for English over Portuguese in publications, with considerable higher average publication rates of English-medium texts than the fields in the 'softer' sciences. In all fields of knowledge, with the exception of *Linguistics, Literature, and Arts*, there is a predominance of English-medium articles over the other types of publications, followed by papers in conference proceedings, with the exception of *Human Sciences* and *Linguistics, Literature, and Arts*. Conversely, in all fields from the 'harder' sciences, as well as in *Applied Social Sciences* and *Human Sciences*, English-medium books had the lowest number of publications, followed by English-medium book chapters.

4. Are there any differences and similarities in the frequency of scholars with a CNPq research productivity grant who self-rated their proficiency in English as good in the four skills (comprehension/understanding, speaking, reading, and writing) amongst the different fields of knowledge? When all four skills are considered, *Exact and Earth Sciences*

have the highest percentage of scholars who self-rate their general English proficiency as good, followed by *Biological Sciences*, and *Engineering*. In contrast, academics in *Agricultural Sciences* and *Human Sciences* have the lowest percentages of scholars who self-rate general their English proficiency as good. It must be observed that there are rather important differences between the general self-rated proficiency of scholars who ranked at the top and those who ranked at the bottom.

In sum, the results of both the *Questionnaire study* and the *CV Study* indicate common trends in which scholars who publish the highest total number of texts (*Health Sciences*, *Engineering*, *Agricultural Sciences*, and *Biological Sciences*) tend to (1) use English to a greater extent than Portuguese, and to (2) publish articles in English more frequently than the other types of English-medium publications, with the exception of *Engineering*, in which the number of papers in conference proceedings surpasses that of articles by a small margin. In contrast, academics who publish the lowest total number of texts (*Linguistics, Literature, and Arts* and *Human Sciences*) tend to (1) use Portuguese to a greater extent than English and to (2) publish books and book chapters more frequently. This indicates a correlation between scholars' preferred language for publication and the amount of publication.

As discussed throughout this dissertation, a myriad of factors is involved in the genre and language choices made by scholars, such as characteristics of the work produced by each disciplinary community, the audience of the research, the type of language used, and the need to assure funding for carrying out research.

Along those lines, one of the limitations of the present research is that the results found in both studies regarding the use of Portuguese and English for knowledge production and dissemination do not reflect other factors that influence the amount and language of publications, especially the prominent role played by literacy brokers, i.e., those who mediate English-medium

text production in various ways. This can be done in a future study through interviews with different stakeholders. Another limitation is the fact that the present investigation focused on the eight fields of knowledge officially adopted by CNPq and the Lattes Platform and did not examine the specific characteristics of the various academic disciplines that comprise these fields. Some disciplines considered to be in the 'softer' sciences, for instance, adopt scientific methodologies that have rigor, exactitude, and objectivity. The results of a study that takes into consideration such differences may show different trends that would allow for the identification of nuances within the categories.

Although investigations in the field of ERPP have been growing in various geolinguistic regions in the global periphery or semi-periphery over the last years, they are still extremely scarce in Brazil. There is an urgent need to improve our understanding of Brazilian scholarly disciplinary communities and the elements that are likely to influence scholars' publication habits, patterns, and motivations.

Some of these elements could be examined in quantitative investigations using the data collected in the *Questionnaire study* to complement the present research with answers from the close-ended questions that were not analyzed, such as scholars' seniority, gender, location of HE institution, and category/level of CNPq research productivity grant, type of English proficiency exam taken, grade achieved, reasons for taking these exams, and language barriers faced during international collaborations. Qualitative methodologies could also be applied to code and analyze the open-ended questions of the questionnaire, such as scholars' learning process of English and other additional languages, their language practices during international academic mobility courses, and their comments and suggestions about the use of English in Brazilian HE. In addition, an investigation focusing specifically on the use of English to teach undergraduate and

graduate courses in different academic disciplines, known as English as a Medium of Instruction (EMI), could also be conducted.

Other elements that influence the publication habits, patterns, and motivations of academics could be analyzed through qualitative methods such as interviews and surveys with open-ended questions aiming to understand scholars' perceptions about scholarly knowledge productions and dissemination more in-depth, including their reasons for adopting certain practices and languages, their perceived difficulties and needs in general and in different sections of the most pre-eminent written academic genre (articles in academic journals), as well as the role played by literacy brokers in different disciplinary communities.

Finally, some concluding remarks with respect to the adoption of English as the global common language for academic and scientific communication should be made. Undoubtedly, the use of English helps to accelerate scientific progress in all fields of knowledge. For plurilingual EAL scholars in the periphery of the non-anglophone center of knowledge production, such as Brazilian scholars, the use of English is decisive for being included and having a "voice" in the global scientific and academic scenario. Those who advocate against the imperialist dominance of English must be reminded that if they want their critiques to be effective and reach a larger audience, this needs to be done in English.

This does not mean that plurilingual EAL scholars should produce and disseminate knowledge exclusively in English. Other languages still have a purpose, since research results are commonly reported more than once through several written and oral academic genres, which are addressed to different groups of readers who are more or less internationalized. Thus, I understand that the extent of the use of English by Brazilian scholars should take into consideration the needs and goals of each specific disciplinary community and each context. Nevertheless, when academics from disciplinary communities in the 'softer' sciences publish

exclusively or mostly in their local language(s), as shown in the results of the present investigation, there is a high risk that significant knowledge remains restricted to members of these local communities, in a process described by Gibbs (1995) as the 'lost science'.

Along the same lines of other researchers in the field of English for Research and Publication Purposes (ERPP) (Corcoran et al, 2019; Hanauer & Englander, 2011), I advocate for the adoption of a critical-pragmatic approach. The term was coined by Pennycook (1994) and discussed by Flowerdew (2007), and highlights the need to give more equal opportunity for plurilingual EAL scholars, and, at the same time, to encourage training and provide a systematic pragmatic support to scientific writing in English. According to Hanauer and Englander (2011), the critical-pragmatic approach understands that (1) the inequitable and unjust situation of plurilingual EAL scholars in the periphery or semi-periphery of non-Anglophones knowledge production centers should be acknowledged; (2) editors, reviewers, funding agencies, and HE and scientific institutions should be aware of this situation and should implement ways to accommodate the needs of these scholars; (3) locally, continued, and institutionally situated extended support should be provided to scholars and graduate students' English writing process, which includes the establishment of writing centers in HE institutions; and (4) the responsibility of publishing quality scientific research in English does not exclusively belong to scholars, but also to different stakeholders, such as the research centers and graduate programs they belong to, funding agencies, and national and international scientific institutions, which should intervene to provide financial support. In sum, the goal is to "promote change by describing and promoting pragmatic educational resources and informed writing-support approaches that can provide second language scientists with the support they really need in order to publish research in English" (Hanauer & Englander, p. 13).

As Packer (2016) points out when examining the complex Brazilian scenario,

> the adoption of English is a policy decision that involves stimuli and barriers related to priorities of the research, idiosyncrasies of the respective communities of researchers, interests and target audiences involved, and financial resources for translation or proofreading of English.[33]

I expect that the present research, along with future unfolding of analyses of the broader data gathered, can be useful to inform national and institutional policies and investments in Brazilian HE, aiming to improve scholars' English proficiency and provide continued support specific to the needs of their academic disciplines and disciplinary community. These actions will certainly foster the inclusion of Brazilian scholars of all fields of knowledge in the global scenario of knowledge production and dissemination.

[33] A adoção do inglês é uma decisão de política editorial que envolve estímulos e barreiras relacionados como as prioridades da pesquisa que comunicam, idiossincrasias das respectivas comunidades de pesquisadores, interesses e públicos-alvo envolvidos e recursos financeiros para tradução ou revisão do inglês (Packer, 2016).

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Appendix A

Portuguese original version of the questionnaire applied to scholars with a PhD affiliated with Brazilian HE institutions.

O uso da língua inglesa no ensino superior brasileiro

Prezado(a) Professor(a),

Você está sendo convidado para participar da pesquisa "O uso da língua inglesa no ensino superior brasileiro" sob a responsabilidade da Profa. Dra. Simone Sarmento, do Programa do Programa de Pós-Graduação em Letras. Nesta pesquisa busco entender como se dá o uso do inglês no ensino superior brasileiro. A sua participação nesta pesquisa se deve, assim, ao fato de você ser professor doutor com vínculo empregatício em instituição de ensino superior brasileira e é voluntária. Sua participação consiste em responder a um questionário eletrônico online. Ao responder ao questionário, você poderá não ter nenhum benefício direto ou imediato. No entanto, os resultados desta pesquisa poderão ajudar na construção de uma compreensão do papel da língua inglesa na educação superior brasileira, a fim de contribuir para o processo de internacionalização das instituições de ensino superior.

Você não terá nenhum gasto ou ganho financeiro por participar na pesquisa. Sua resposta será enviada automaticamente para Laura Knijnik Baumvol. Os conhecimentos resultantes deste estudo serão constituídos por dados estatísticos e também qualitativos. Os sujeitos participantes não serão mencionados ou identificados. Dessa forma, será garantido que em nenhum momento durante os processos de análise e divulgação dos resultados os mesmos terão a identidade exposta.

A pesquisa será divulgada em revistas especializadas e eventos na área de Linguística Aplicada, Educação e Internacionalização. Os dados coletados constituirão um banco de dados que ficará sob a guarda da pesquisadora e somente serão utilizados para projetos de pesquisa que prezem pela preservação de sua identidade com a devida autorização do Comitê de Ética em Pesquisa da UFRGS. Tratando-se de uma pesquisa que busca verificar questões referentes ao uso da língua inglesa, há risco de embaraço ao responder o questionário, ou ainda desgaste mental ao preencher o instrumento de pesquisa, o que pode demandar tempo no entendimento das questões, situações nas quais o participante poderá interromper ou desistir de participar. A decisão em não participar da pesquisa não acarretará nenhum tipo de constrangimento. Além disso, o participante poderá retirar seu consentimento a qualquer momento, sem qualquer tipo de prejuízo ou dano. A qualquer momento, o participante poderá fazer perguntas aos pesquisadores, que têm a obrigação de prestar os devidos esclarecimentos. Para tanto, você poderá entrar em contato com a Profa. Dra. Simone Sarmento (IL UFRGS/PPGLET UFRGS), pelo e-mail simone.sarmento@ufrgs.br ou com Laura Knijnik Baumvol, pelo e-mail lkbaumvol@gmail.com , a fim de sanar quaisquer dúvidas sobre a pesquisa.

Você também poderá entrar em contato com o Comitê de Ética na Pesquisa com Seres Humanos – Universidade Federal do Rio Grande do Sul: Av. Paulo Gama, 110, Sala 317, Prédio Anexo 1 da Reitoria Campus Centro, pelo fone 51 3308 3738 ou pelo e-mail etica@propesq.ufrgs.br.

*Obrigatório

1. **Para participar da pesquisa, é necessário que você concorde com o Termo de Consentimento Livre e Esclarecido. Você concorda em participar desta pesquisa?** *

- ◯ Sim
- ◯ Não *Pare de preencher este formulário.*

Perfil do respondente

2. **Você possui título de doutor(a) e é professor(a) em instituição de ensino superior no Brasil? (Se você está fora do paÍs, mas mantém vínculo empregatício com instituição de ensino superior brasileira, marque "Sim")** *

- ◯ Sim
- ◯ Não *Pare de preencher este formulário*

Perfil do respondente

3. **1.1 Qual sua nacionalidade?** *

Marque todas que se aplicam.

- ☐ Brasileira
- ☐ Outro: _____

4. **1.2 Qual seu sexo?** *

Marcar apenas uma oval.

- ◯ Feminino
- ◯ Masculino

5. **1.3 Qual sua faixa etária?** *

Marcar apenas uma oval.

- ◯ 20 a 30 anos
- ◯ 31 a 40 anos
- ◯ 41 a 50 anos
- ◯ 51 a 60 anos
- ◯ 61 a 70 anos
- ◯ 71 anos ou mais

6. **1.4 Qual é sua língua materna? (Marque mais de uma língua, caso se aplique)** *

Marque todas que se aplicam.

- [ ] Português
- [ ] Inglês
- [ ] Espanhol
- [ ] Francês
- [ ] Alemão
- [ ] Italiano
- [ ] Outro: _____

7. **1.5 Quando você obteve seu título de doutor? (Caso tenha concluído mais de um doutorado, escolha o mais recente)** *

Marcar apenas uma oval.

- ◯ A partir de 2010
- ◯ Entre 2000 e 2009
- ◯ Entre 1990 e 1999
- ◯ Entre 1980 e 1989
- ◯ Entre 1970 e 1979
- ◯ Antes de 1970

8. **1.6 Qual a localização da instituição na qual você trabalha? (Marque mais de uma opção, se for o caso)** *

- [ ] AC
- [ ] AL
- [ ] AP
- [ ] AM
- [ ] BA
- [ ] CE
- [ ] DF
- [ ] ES
- [ ] GO
- [ ] MA
- [ ] MT
- [ ] MS
- [ ] MG
- [ ] PA
- [ ] PB
- [ ] PR
- [ ] PE
- [ ] PI
- [ ] RJ
- [ ] RN
- [ ] RS
- [ ] RO
- [ ] RR
- [ ] SC
- [ ] SP
- [ ] SE
- [ ] T0

9. **1.7 Qual a categoria de sua instituição? (Marque mais de uma opção, se for o caso)** *
   Marque todas que se aplicam.

   - [ ] Universidade Pública Federal
   - [ ] Universidade Pública Estadual
   - [ ] Universidade Pública
   - [ ] Municipal Universidade
   - [ ] Privada
   - [ ] Instituto Federal
   - [ ] Centro Universitário Privado/Faculdade Privada
   - [ ] FATECS
   - [ ] Outro: _____

10. **1.8 Qual o nome da sua instituição(ou instituições, se for o caso)?**

    _____

11. **1.9 Qual o tipo de contrato que você possui?** *
    Marcar apenas uma oval.

    - ◯ Horista
    - ◯ Tempo integral (40horas)
    - ◯ Dedicação exclusiva
    - ◯ Outro: _____

12. **1.10 Qual sua principal área de atuação?** *
    Marque todas que se aplicam.

    - [ ] Ciências Agrárias
    - [ ] Ciências Biológicas
    - [ ] Ciências da Saúde
    - [ ] Ciências Exatas e da
    - [ ] Terra Ciências Humanas
    - [ ] Ciências Sociais
    - [ ] Aplicadas Engenharias
    - [ ] Linguística, Letras e Artes
    - [ ] Outro: _____

13. **1.11 Em qual(is) nível(is) de ensino você atua?** *

Marque todas que se aplicam.

- [ ] Graduação
- [ ] Especialização
- [ ] Mestrado Acadêmico
- [ ] Mestrado Profissional
- [ ] Doutorado
- [ ] Outro: _____

14. 1.12 Você tem Bolsa de Produtividade em Pesquisa do CNPq? *

Marcar apenas uma oval.

- ◯ Sim
- ◯ Não *Ir para a pergunta 16*

Bolsistas de Produtividade

15. 1.13 Qual a categoria de sua Bolsa de Produtividade em Pesquisa do CNPq? *

Marcar apenas uma oval.

- ◯ SR
- ◯ 1A
- ◯ 1B
- ◯ 1C
- ◯ 1D
- ◯ 2

Línguas/Inglês

16. 2.1 Como você classifica seu conhecimento de LEITURA em inglês? *

Marcar apenas uma oval.

	1	2	3	4	
Nenhum	◯	◯	◯	◯	Avançado

17. 2.2 Como você classifica seu conhecimento GERAL em inglês? *

Marcar apenas uma oval.

	1	2	3	4	
Nenhum	◯	◯	◯	◯	Avançado

18. **2.3 Comente sobre seu aprendizado de inglês:**

19. **2.4 Você sabe alguma outra língua estrangeira?** *
Marcar apenas uma oval.
- ◯ Sim
- ◯ Não *Ir para a pergunta 22.*

Línguas

20. **2.5 Qual outra língua estrangeira você sabe? (Marque mais de uma língua, se for o caso)** *
Marque todas que se aplicam.
- ☐ Alemão
- ☐ Espanhol
- ☐ Francês
- ☐ Italiano
- ☐ Nenhuma
- ☐ Outro: _____

21. **2.6 Comente sobre seu aprendizado de outra(s) língua(s) estrangeiras**

Línguas/Inglês

22. **3.1 A sua IES oferece**
Marque todas que se aplicam.
- ☐ O Programa Idiomas sem Fronteiras (Programa do MEC)
- ☐ Aulas gratuitas de inglês para professores
- ☐ Aulas pagas de inglês para professores
- ☐ Apoio para redigir artigos acadêmicos em inglês
- ☐ Apoio pedagógico para professores que ministram ou querem ministrar aulas em inglês

- [ ] Aulas gratuitas de inglês para alunos
- [ ] Aulas pagas de inglês para professores
- [ ] Nenhum tipo de apoio linguístico ou aulas de inglês
- [ ] Outro: _____

23. 3.2 Você já realizou algum teste de proficiência de inglês? *

Marcar apenas uma oval.

- ◯ Sim *Ir para a pergunta 24.*
- ◯ Não *Ir para a pergunta 27.*

Teste de Proficiência

24. 3.3 Qual o teste de proficiência inglês que você realizou mais recentemente? *

Marque todas que se aplicam.

- [ ] TOEFL ITP (em papel)
- [ ] TOEFL IBT (computador)
- [ ] IELTS
- [ ] Exames da Universidade de Cambridge (FCE, CAE, CPE, etc)
- [ ] Michigan
- [ ] Outro: _____

25. 3.4 Qual nota você obteve (se souber)?

_____

26. 3.5 Por que você realizou o teste? *

Marque todas que se aplicam.

- [ ] Para participar de mobilidade acadêmica.
- [ ] Por exigência de universidade estrangeira.
- [ ] Para conhecer o nível de inglês.
- [ ] Por exigência de universidade brasileira
- [ ] Outro: _____

Experiência acadêmica no exterior

Entende-se por experiência acadêmica no exterior: cursos de graduação, mestrado ou doutorado (pleno ou sanduíche), pós-doutorado, MBA, período como colaborador de pesquisa, professor visitante ou professor com vínculo empregatício no exterior.

27. 4. Você já teve alguma experiência acadêmica no exterior? *

Marcar apenas uma oval.

- Sim *Ir para a pergunta 28.*
- Não *Ir para a pergunta 33.*

Experiência acadêmica no exterior

28. 4.1 Você teve experiência acadêmica no exterior como (marque todas as alternativas válidas): *

Marque todas que se aplicam.

- [ ] Aluno de Graduação plena
- [ ] Aluno de Graduação sanduiche
- [ ] Aluno de Mestrado pleno
- [ ] Aluno de Mestrado sanduíche
- [ ] Aluno de Doutorado pleno
- [ ] Aluno de Doutorado Sanduíche
- [ ] Pós-doutorando(a)
- [ ] Aluno de MBA
- [ ] Colaborador dw Pesquisa
- [ ] Professor visitante
- [ ] Professor com vínculo empregatício no exterior
- [ ] Outro: _____

29. 4.2 Em qual país foi sua experiência acadêmica? (Marque mais de uma opção, caso se aplique) *

Marque todas que se aplicam.

- [ ] Alemanha
- [ ] Canadá
- [ ] Espanha
- [ ] Estados Unidos
- [ ] França
- [ ] Inglaterra
- [ ] Itália
- [ ] Portugal
- [ ] Outro:

30. **4.3 Qual a língua mais frequentemente utilizada em sua(s) experiência(s) acadêmica(s)?** *

Marcar apenas uma oval.

- ◯ Alemão
- ◯ Espanhol
- ◯ Francês
- ◯ Inglês
- ◯ Italiano
- ◯ Português
- ◯ Outro: _____

31. **4.4 Qual a segunda língua mais frequentemente utilizada em sua(s) experiência(s) acadêmica(s)?**

Marcar apenas uma oval.

- ◯ Alemão
- ◯ Espanhol
- ◯ Francês
- ◯ Inglês
- ◯ Italiano
- ◯ Português
- ◯ Apenas uma língua foi utilizada
- ◯ Outro: _____

32. **4.5 Você teria algum outro comentário sobre as línguas utilizadas em suas experiências acadêmicas no exterior?**

_____

_____

_____

Graduação

33. **5. Você atua na graduação em alguma instituição de ensino superior?** *

Marcar apenas uma oval.

- ◯ Sim
- ◯ Não *Ir para a pergunta 40.*

Graduação

34. 5.1 Qual sua área de atuação na graduação?

_____

35. 5.2 A bibliografia de sua(s) disciplina(s) de graduação geralmente é *

Marcar apenas uma oval.

- ◯ Somente em português
- ◯ Majoritariamente em português
- ◯ Em Português e inglês
- ◯ Majoritariamente em inglês
- ◯ Somente em inglês
- ◯ Outro: _____

36. 5.3 Em suas aulas de graduação você geralmente fala *

Marcar apenas uma oval.

- ◯ Somente português
- ◯ Preferencialmente português
- ◯ Português e inglês
- ◯ Preferencialmente inglês
- ◯ Somente inglês
- ◯ Outro: _____

37. 5.4 Em suas aulas de graduação os alunos geralmente falam *

Marcar apenas uma oval.

- ◯ Somente português
- ◯ Preferencialmente português
- ◯ Português e inglês
- ◯ Preferencialmente inglês
- ◯ Somente inglês
- ◯ Outro: _____

38. **5.5 Em suas aulas de graduação, os alunos geralmente realizam provas e/ou trabalhos** *

Marcar apenas uma oval.

- ◯ Somente em português
- ◯ Preferencialmente em português
- ◯ Em português e inglês
- ◯ Preferencialmente em inglês
- ◯ Somente em inglês
- ◯ Outro: _____

39. **5.6 Você tem algum comentário sobre o uso de línguas em suas aulas de graduação?**

_____

_____

_____

Pós-graduação

40. **6. Você atua em pós-graduação *stricto sensu* alguma instituição de ensino superior?** *

Marcar apenas uma oval.

- ◯ Sim *Ir para a pergunta 41.*
- ◯ Não *Ir para a pergunta 47.*

Pós-Graduação

41. **6.1 Qual sua área de atuação na pós- graduação?**

_____

42. **6.2 A bibliografia das sua(s) disciplina(s) de pós-graduação geralmente é** *

Marcar apenas uma oval.

- ◯ Somente em português
- ◯ Majoritariamente em português
- ◯ Em português e inglês
- ◯ Majoritariamente em inglês
- ◯ Somente em inglês

Outro: _____

43. 6.3 Em suas aulas de pós-graduação você geralmente fala *

Marcar apenas uma oval.

Somente português

Somente inglês

Português e inglês

Preferencialmente inglês

Preferencialmente português Outro:

_____

44. 6.4 Em suas aulas de pós-graduação os alunos geralmente falam *

Marcar apenas uma oval.

Preferencialmente português

Somente português

Somente inglês

Português e inglês

Preferencialmente inglês

Outro: _____

45. 6.5 Em suas aulas de pós-graduação, os alunos geralmente realizam provas e/ou trabalhos *

Marcar apenas uma oval.

Somente em português

Preferencialmente em português

Em português e Inglês

Preferencialmente em inglês

Somente em inglês

Outro: _____

46. 6.6 Você tem algum comentário sobre o uso de línguas em sua(s) disciplina(s) de pós- graduação?

_____

_____

_____

Pesquisa

47. 7. Você já atuou em colaboração com alguma instituição de ensino superior estrangeira? *

Marcar apenas uma oval.

- ◯ Sim *Ir para a pergunta 48.*
- ◯ Não *Ir para a pergunta 51.*
- ◯ Outro: _____

Pesquisa

48. 7.1 Qual o país da instituição estrangeira com a qual você colaborou? (Marque mais de uma, caso se aplique) *

Marque todas que se aplicam.

- ☐ Alemanha
- ☐ Canadá
- ☐ Espanha
- ☐ Estados Unidos
- ☐ França
- ☐ Inglaterra
- ☐ Itália
- ☐ Portugal
- ☐ Outro: _____

49. 7.2 Durante as colaborações a comunicação geralmente ocorria ou ocorre *

Marcar apenas uma oval.

- ◯ Somente em português
- ◯ Preferencialmente em português
- ◯ Em português e inglês
- ◯ Preferencialmente em inglês
- ◯ Somente em inglês
- ◯ Outro: _____

50. 7.3 Quais dificuldades linguísticas você teve ou está tendo nas colaborações? *

Marque todas que se aplicam.

- ☐ Dificuldades de falar com os pesquisadores estrangeiros
- ☐ Dificuldades em entender os pesquisadores estrangeiros

- [ ] Dificuldades de falar com pessoas fora do ambiente acadêmico ou de pesquisa
- [ ] Não enfrentei dificuldades
- [ ] Outro: _____

Publicações e Eventos Científicos

51. 8.1 Nos últimos 5 anos, você publicou artigos, capítulos, livros ou trabalhos completos em Anais *

Marcar apenas uma oval.

- ◯ Somente em português
- ◯ Majoritariamente em português
- ◯ Em português e inglês
- ◯ Majoritariamente em inglês
- ◯ Somente em inglês
- ◯ Não tive publicações nos últimos 5 anos
- ◯ Outro: _____

52. 8.2 Os principais periódicos brasileiros em sua área aceitam publicações *

Marcar apenas uma oval.

- ◯ Somente em português
- ◯ Preferencialmente em português
- ◯ Em português e inglês
- ◯ Preferencialmente em inglês
- ◯ Somente em inglês
- ◯ Outro: _____

53. 8.3 Os principais periódicos estrangeiros da sua área aceitam publicações *

Marcar apenas uma oval.

- ◯ Somente em inglês
- ◯ Preferencialmente em inglês
- ◯ Outro: _____

54. 8.4 As apresentações nos principais eventos acadêmicos NO BRASIL em sua área ocorrem *

Marcar apenas uma oval.

- Somente em português
- Preferencialmente em português
- Em português e inglês
- Preferencialmente em inglês
- Somente em inglês
- Outro: _____

55. 8.5 As apresentações nos principais eventos acadêmicos ESTRANGEIROS em sua área ocorrem *

Marcar apenas uma oval.

- Somente em inglês
- Preferencialmente em inglês
- Outro: _____

56. 8.6 Nos últimos 5 anos, você apresentou trabalho em eventos acadêmicos *

Marcar apenas uma oval.

- Somente em português
- Majoritariamente em português
- Em português e inglês
- Majoritariamente em inglês
- Somente em inglês
- Não apresentei trabalho nos últimos 5 anos
- Outro: _____

Inglês como Meio de Instrução

57. 9.1 Na sua opinião, quais os principais benefícios de aulas ministradas em inglês em instituições brasileiras? *

Marque todas que se aplicam.

- [ ] Os alunos melhoram seu nível de proficiência em inglês
- [ ] Os professores aprimoram seu nível de proficiência em inglês
- [ ] As aulas ocorrem no idioma em que o conhecimento científico e acadêmico mais circula

- [ ] Os alunos têm uma experiência de internacionalização de ensino, mesmo estando no Brasil
- [ ] Os professores têm uma experiência de internacionalização do ensino, mesmo estando no Brasil
- [ ] Os alunos estarão mais preparados para seu futuro profissional e para o mercado de trabalho
- [ ] Mais qualidade do ensino nas IES brasileiras
- [ ] Alunos estrangeiros podem participar das aulas
- [ ] Não há benefícios
- [ ] Outro: _____

58. 9.2 Na sua opinião, quais as principais limitações/riscos de aulas serem ministradas em inglês em instituições brasileiras? *

Marque todas que se aplicam.

- [ ] Exclusão dos professores que não correspondem às exigências linguísticas
- [ ] Perda da identidade linguística e cultural brasileiras
- [ ] Menor circulação e produção de conhecimento em língua portuguesa
- [ ] Exclusão dos alunos que não correspondem às exigências linguísticas
- [ ] Hegemonia da língua inglesa
- [ ] Não há limitações/riscos
- [ ] Outro: _____

59. 9.3 Você é estimulado por alguma de suas instituições a ministrar aulas em inglês? *

Marcar apenas uma oval.

- ◯ Sim
- ◯ Não
- ◯ Outro: _____

60. 9.4 Qual benefício é oferecido pela sua instituição para professores que ministram aulas em inglês?

Marque todas que se aplicam.

- [ ] Incremento financeiro
- [ ] Diminuição de carga horária em sala de aula
- [ ] Auxílio de monitor(es) para a disciplina
- [ ]

Bolsista(s) de Iniciação Científica

- [ ] Minha instituição não oferece benefício
- [ ] Outro: _____

61. 9.5 Na sua opinião, o que as instituições de ensino superior brasileiras poderiam fazer para aumentar o número de aulas ministradas em inglês?

_____

_____

_____

62. 9.6 Você já ministrou aula em inglês em sua instituição? *

Marcar apenas uma oval.

- ◯ Sim *Ir para a pergunta 63.*
- ◯ Não *Ir para a pergunta 66.*

Inglês como Meio de Instrução

63. 9.7 Qual(is) disciplina(s) você já ministrou em inglês?

_____

_____

_____

64. 9.8 Quais as principais dificuldades você já enfrentou ao ministrar aulas em inglês?*

Marque todas que se aplicam.

- [ ] Baixa proficiência linguística dos alunos
- [ ] Pouco ou nenhum suporte pedagógico
- [ ] Pouco ou nenhum apoio do departamento e/ou colegas
- [ ] Falta de regulamentação das aulas e/ou disciplina(s)
- [ ] Baixa proficiência linguística do professor
- [ ] Pouco ou nenhum incentivo institucional
- [ ] Não enfrentei dificuldade
- [ ] Outro: _____

65. 9.9 Por que você já ministrou aula em inglês? *

Marque todas que se aplicam.

- [ ] Para aumentar a pontuação da minha IES em avaliações/rankings
- [ ] A coordenação do meu Curso ou Programa de Pós-Graduação solicitou
- [ ]

Para alunos estrangeiros poderem participar das aulas

- [ ] Os textos da minha área são em inglês
- [ ] Para oferecer mais oportunidade de prática na língua inglesa aos alunos brasileiros
- [ ] A minha instituição de ensino superior solicitou
- [ ] Para preparar meus alunos para atuarem em inglês estando no Brasil
- [ ] Os termos e conceitos da minha área são em inglês
- [ ] Para preparar meus alunos para atuarem/estudarem/pesquisarem no exterior
- [ ] Os eventos e discussões acadêmicas da minha área são em inglês
- [ ] Para aumentar a pontuação do meu Curso ou Programa de Pós-Graduação em avaliações/rankings
- [ ] Já tive ou tenho alunos estrangeiros em minhas aulas
- [ ] Para eu ter mais prática em língua inglesa
- [ ] Outro: _____

Finalizando

66. 10. Você gostaria de deixar sugestões ou comentários sobre o uso de inglês no ensino superior brasileiro?

_____

_____

_____

67. Caso você tenha interesse em conhecer o resultado desta pesquisa, deixe seu email aqui que enviaremos o relatório após a finalização da investigação:

_____

68. Caso deseje fazer perguntas aos pesquisadores, entre em contato pelos e-mails simone.sarmento@ufrgs.br ou lkbaumvol@gmail.com. Muito obrigada por responder a este questionário.

Marcar apenas uma oval.

- ◯ Enviar relatório

Appendix B

English version of the questionnaire applied to scholars with a PhD affiliated with Brazilian HE institutions.

The use of English in Brazilian Higher Education

Dear Professor,

You are being invited to participate in the investigation "The use of English in Brazilian higher education", under the responsibility of the researcher Laura Knijnik Baumvol (PhD student) and supervised by Dr. Simone Sarmento, from the Language Graduate Program of the Federal University of Rio Grande do Sul. This research seeks to understand the use of English in Brazilian higher education. Your participation, on a volunteer basis, is due to the fact that you are a professor with a PhD affiliated with a Brazilian higher education institution. Your participation consists of responding to an online questionnaire. By responding, you may have no direct or immediate benefit. However, the results of this investigation may help the understanding of the role of English in Brazilian higher education, in order to contribute to the internationalization process of the country's institutions. You will not have any expenses or financial gain for participating in the survey. Your answer will automatically be sent to the researcher Laura Knijnik Baumvol. The results of this study will consist of quantitative and qualitative data. Participants will not be mentioned or identified. It will be guaranteed that, at no time during the processes of analysis and disclosure of the results, participants will have their identity exposed. The research will be published in specialized journals and academic events in the field of Applied Linguistics, Education and Internationalization. The material collected will constitute a database that will be under the researcher's guard and will only be used for research projects that value the preservation of participants' identity, with the authorization of UFRGS Research Ethics Committee. Since the survey contains questions concerning the use of English, there is a risk of participants' embarrassment when answering them or, furthermore, mental exhaustion when filling in the survey. This may require time to understand the questions, and, thus, respondents may stop or quit their participation in the research. The decision not to participate in the research will not entail any kind of embarrassment. In addition, the participant may withdraw his consent at any time, without any kind of loss or damage. Throughout his/her participation in the research, the participant may ask questions to the researchers, who have the obligation to provide the necessary clarifications. Any questions you may have regarding the investigation, please contact Dr. Simone Sarmento (IL UFRGS / PPGLET UFRGS), by the e-mail simone.sarmento@ufrgs.br. or Laura Knijnik Baumvol, by the email lkbaumvol@gmail.com .

You can also contact the Human Research Ethics Committee - Federal University of Rio Grande do Sul: Av. Paulo Gama, 110, Room 317, Building Annex 1, Campus Center, by email or by phone 51 3308 3738.

*Required

1. **To participate in the survey, you must agree to the above Consent Form. Do you agree to participate in this survey?**

   Mark only one oval.

   ◯ Yes

   ◯ No

2. **Do you hold a PhD and are you affiliated with a Higher Education (HE) institution in Brazil? (If you are abroad, but keep the affiliation with a Brazilian HE institution, choose "Yes")***

   Mark only one oval.

   ◯ Yes

   ◯ No

Respondent's profile

3. **1.1 What is your nationality? ***

   Mark only one oval.

   ◯ Brazilian

   ◯ Other:

4. **1.2 What is your gender? ***

   Mark only one oval.

   ◯ Male

   ◯ Female

5. **1.3 How old are you? ***

   Mark only one oval.

   ◯ Between 20 and 30 years old

   ◯ Between 31 and 40 years old

   ◯ Between 41 and 50 years old

   ◯ Between 51 and 60 years old

   ◯ Between 61 and 70 years old

   ◯ Over 70 years old

6. **1.4 Which is your first language? (Choose more than one language if this is the case)***

- [ ] Portuguese
- [ ] English
- [ ] Spanish
- [ ] French
- [ ] German
- [ ] Italian
- [ ] Other: _____

7. **1.5 When did you get your PhD degree? (If you have more than one PhD degree, choose the most recent one).***

Mark only one oval.

- ◯ After 2010
- ◯ Between 2000 and 2009
- ◯ Between 1990 and 1999
- ◯ Between 1980 and 1989
- ◯ Between 1970 and 1979
- ◯ Before 1970

8. **1.6 What is the location of your HE institution? (Choose more than one option if this is the case)**

- [ ] AC
- [ ] AL
- [ ] AP
- [ ] AM
- [ ] BA
- [ ] CE
- [ ] DF
- [ ] ES
- [ ] GO
- [ ] MA
- [ ] MT
- [ ] MS
- [ ] MG
- [ ] PA
- [ ] PB
- [ ] PR
- [ ] PE
- [ ] PI
- [ ] RJ
- [ ] RN
- [ ] RS
- [ ] RO
- [ ] RR
- [ ] SC
- [ ] SP
- [ ] SE
- [ ] TO

9. **1.7 What is the category of your HE institution? * (Choose more than one option, if this is the case)**

Mark only one oval.

- [ ] Public Federal University
- [ ] Public State University
- [ ] Public Municipal University
- [ ] Private University
- [ ] Federal Technical Institute
- [ ] Private College
- [ ] FATECS
- [ ] Other: _____

10. **1.8 What is the name of your HE institution(s)?**

_____

11. **1.9 What type of work contract do you have?**

Mark only one oval.

- ◯ Hourly contract
- ◯ Full time contract
- ◯ Other: _____

12. **1.10 Which is your main field of work? *(Choose more than one option if this is the case)**

- ◯ Agricultural Sciences
- ◯ Applied Social Sciences
- ◯ Biological Sciences
- ◯ Engineering
- ◯ Exact and Earth Sciences
- ◯ Health Sciences
- ◯ Human Sciences
- ◯ Linguistics, Arts and Languages
- ◯ Other: _____

13. **1.11 What level(s) do you teach at?**

- [ ] Undergraduate
- [ ] Graduate *(lato sensu)*
- [ ] Masters
- [ ] Masters(Professional)
- [ ] Doctoral
- [ ] Other: _____

14. 1.12 Do you hold a CNPq research productivity grant? *

Mark only one oval.

- [ ] Yes
- [ ] No *Skip to question 16.*

Research Grant Holders

15. 1.13 Which category/level is your CNPq research productivity grant?

Mark only one oval.

- [ ] SR
- [ ] 1A
- [ ] 1B
- [ ] 1C
- [ ] 1D
- [ ] 2

Languages/English

16. 2.1 How would you rate your READING proficiency in English? *

Mark only one oval.

	1	2	3	4	
None	◯	◯	◯	◯	Advanced

17. **2.2 How would you rate your general proficiency in English?** *

Mark only one oval.

	1	2	3	4	
None	◯	◯	◯	◯	Advanced

18. **2.3 Comment on how you have learned English:**

19. **2.4 Do you know any other additional language?**

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 22.*

20. **2.5 Which other additional language do you know?** * **(Choose more than one option if this is the case)**

Mark only one oval.

- ☐ German
- ☐ Spanish
- ☐ French
- ☐ Italian
- ☐ Other: _____

21. **2.6 Comment on how you have learned (an)other additional language(s).**

Languages/English

22. 3.1 Your HE institution offers *

Tick all that apply.

- [ ] Free English classes for teachers
- [ ] Pedagogical support for professors who teach or want to teach in English
- [ ] Free English classes for students
- [ ] Support to write articles or papers in English
- [ ] Paid English classes for students
- [ ] No linguistic support, nor English classes
- [ ] Paid English classes for teachers
- [ ] The Language without Borders Program (MEC Program)
- [ ] Other: _____

23. 3.2 Have you ever taken a proficiency test in English? *

Mark only one oval.

- ◯ Yes *Skip to question 24.*
- ◯ No *Skip to question 27.*

Proficiency Tests

24. 3.3 What was the most recent proficiency test that you have taken? *

Mark only one oval.

- ◯ TOEFL ITP (paper-based)
- ◯ TOEFL IBT (computer-based)
- ◯ IELTS
- ◯ University of Cambridge Exams (FCE, CAE, CPE, etc)
- ◯ Michigan English Test
- ◯ Other: _____

25. **3.4 What is your most recent grade (if you remember)?**

26. **3.5 What was your main reason for taking the test?**

Mark only one oval.

- ◯ To take part in study abroad programs
- ◯ It was required by a foreign university
- ◯ To know my English proficiency level
- ◯ It was required by a Brazilian university
- ◯ Other: _____

International academic experience

By international academic experience abroad we understand: undergraduate program, Master's or PhD (full or visiting periods), post-doctoral fellowships, MBA, short-term courses, research collaborations, visiting professor and professor/lecturer hired by HE institution

27. **4. Have you ever had an international academic experience?** *

Mark only one oval.

- ◯ Yes *Skip to question 28.*
- ◯ No *Skip to question 33.*

International academic experience

28. **4.1 You had an international academic experience as:** *

Tick all that apply.

- ☐ Undergraduate student
- ☐ Undergraduate visiting student
- ☐ Master's student
- ☐ Master's visiting student
- ☐ PhD student
- ☐ PhD visiting student
- ☐ Visiting Professor/Lecturer
- ☐ Professor/Lecturer hired by foreign HE institution

- [ ] Other: _____

29. **4.2 In which countries were your international academic experiences?** *

Tick all that apply.

- [ ] Germany
- [ ] Canada
- [ ] Spain
- [ ] The United States
- [ ] France
- [ ] England
- [ ] Italy
- [ ] Portugal
- [ ] Other: _____

30. **4.3 Which language did you use the most in your international academic experience(s)?** *

Mark only one oval.

- ◯ English
- ◯ German
- ◯ Spanish
- ◯ French
- ◯ Italian
- ◯ Portuguese
- ◯ Other: _____

31. **4.4 Which was the second most used language in your international academic experiences?**

Mark only one oval.

- ◯ English
- ◯ German
- ◯ Spanish

French

Italian

Portuguese

Only one language was used.

Other: _____

32. 4.5 Do you have any comments about the language(s) used in your international academic experiences?

_____

_____

_____

Undergraduate level

33. 5. Do you teach undergraduate courses? *

Mark only one oval.

Yes

No *Skip to question 40.*

Undergraduate level

34. 5.1 Which is your main field at the undergraduate level?

35. 5.2 The references used in your undergraduate courses are usually *

Tick all that apply.

Only in Portuguese

Mostly in Portuguese

In Portuguese and English

Mostly in English

Only in English

Other: _____

36. 5.3 In your undergraduate courses you usually speak *

Tick all that apply.

Only Portuguese

Mostly Portuguese

Portuguese and English

Mostly English

Only English

Other: _____

37. 5.4 In your undergraduate courses students speak *

Tick all that apply.

Only Portuguese

Mostly Portuguese

Portuguese and English

Mostly English

Only English

Other: _____

38. 5.5 In your undergraduate course students do assignments and take tests *

Tick all that apply.

Only in Portuguese

Mostly in Portuguese

In Portuguese and English

Mostly in English

Only in English

Other: _____

39. 5.6 Do you have any comments about the use of English in your undergraduate courses?

_____

_____

_____

Graduate level

40. 6. Do you teach graduate courses?

Mark only one oval.

Yes *Skip to question 41.*

No *Skip to question 47.*

Graduate level

41. 6.1 What is your main field at the undergraduate level?

42. 6.2 The references used in your graduate courses are usually *

Tick all that apply.

- ☐ Only in Portuguese
- ☐ Mostly in Portuguese
- ☐ In Portuguese and English
- ☐ Mostly in English
- ☐ Only in English
- ☐ Other: _____

43. 6.3 In your graduate courses you usually speak *

Tick all that apply.

- ☐ Only Portuguese
- ☐ Mostly Portuguese
- ☐ Portuguese and English
- ☐ Mostly English
- ☐ Only English
- ☐ Other: _____

44. 6.4 In your graduate courses students usually speak *

Tick all that apply.

- ☐ Only Portuguese
- ☐ Mostly Portuguese
- ☐ Portuguese and English
- ☐ Mostly English
- ☐ Only English
- ☐ Other: _____

45. **6.5 In your graduate course students do assignments and take tests** *

Tick all that apply.

- ◯ Only in Portuguese
- ◯ Mostly in Portuguese
- ◯ In Portuguese and English
- ◯ Mostly in English
- ◯ Only in English
- ◯ Other: _____

46. **6.5 Do you have any comments about the use of English in your graduate courses?**

_____

_____

_____

_____

Research

47. **7. Have you ever established a research collaboration with any foreign HE institution?** *

Mark only one oval.

- ◯ Yes *Skip to question 48.*
- ◯ No *Skip to question 51.*

Research

48. **7.1 Where is the HE institution that you have collaborated with? (Choose more than one option if this is the case)**

- ☐ Germany
- ☐ Canada
- ☐ Spain
- ☐ The United States

- [ ] France
- [ ] England
- [ ] Italy
- [ ] Portugal
- [ ] Other: _____

49. 7.2 During the collaboration(s) the interactions were usually *

Mark only one oval.

- ◯ Only in Portuguese
- ◯ Mostly in Portuguese
- ◯ In Portuguese and English
- ◯ Mostly in English
- ◯ Only in English
- ◯ Other: _____

50. 7.3 Which language difficulties/barriers did you face during the collaboration(s)?

Tick all that apply.

- ◯ Difficulties to speak with foreign researchers
- ◯ Difficulties to speak with people outside the academic environment
- ◯ Difficulties to understand foreign researchers
- ◯ I didn't face any language difficulties
- ◯ Other: _____

Publication and Academic Events

51. 8.1 In the last 5 years, you have published articles, books, book chapters, and full papers in conference proceedings *

Mark only one oval.

- ◯ Only in Portuguese
- ◯ Mostly in Portuguese

- In Portuguese and English
- Mostly in English
- Only in English
- I did not have any publications in the last 5 years
- Other: _____

52. **8.2 The most important Brazilian journals in your field accept publications** *

Mark only one oval.

- Only in Portuguese
- Preferably in Portuguese
- In Portuguese and English
- Preferably in English
- Only in English
- Other: _____

53. **8.3 The most important foreign journals in your field accept publications** *

Mark only one oval.

- Only in English
- Preferably in English
- Other: _____

54. **8.4 The most important academic events in BRAZIL in your field accept presentations** *

Mark only one oval.

- Only in Portuguese
- Preferably in Portuguese
- In Portuguese and English
- Preferably in English
- Only in English
- Other: _____

55. **8.5 The most important foreign academic events in your field accept presentations** *

Mark only one oval.

- ◯ Only in English
- ◯ Preferably in English
- ◯ Other: _____

56. **8.6 In the last 5 years, you have presented papers in academic events**

Mark only one oval.

- ◯ Only in Portuguese
- ◯ Mostly in Portuguese
- ◯ In Portuguese and English
- ◯ Mostly in English
- ◯ Only in English
- ◯ I did not present in academic events in the last 5 years
- ◯ Other: _____

English as a Medium of Instruction

57. **9.1 In your opinion, what are the main benefits of offering classes in English in Brazilian HE institutions?** *

Tick all that apply.

- ☐ Classes are taught in the language in which most scientific and academic knowledge is disseminated
- ☐ Teachers improve their English proficiency
- ☐ Teachers have an international education experience while in Brazil
- ☐ Students improve their English proficiency
- ☐ Students have an international education experience while in Brazil
- ☐ Students will be better prepared for their future careers and the labour market
- ☐ Foreign students can attend classes
- ☐ The quality of Brazilian HE institutions will improve

- [ ] There are no benefits
- [ ] Other: _____

58. **9.2 In your opinion, what are the main limitations/risks of offering classes in English in Brazilian HE institutions?** *

Tick all that apply.

- [ ] Exclusion of teachers who do not meet the linguistic requirements
- [ ] Exclusion of students who do not meet the linguistic requirements
- [ ] Loss of Brazilian cultural and linguistic identity
- [ ] Less knowledge dissemination and production in Portuguese
- [ ] English language hegemony
- [ ] There are no limitations/risks

59. **9.3 Does your HE institution encourage the implementation of classes in English?** *

Mark only one oval.

- ◯ Yes
- ◯ No

60. **9.4 What benefit or compensation does your HE institution offer to teachers who teach in English?**

Mark only one oval.

- ◯ Financial benefits
- ◯ Less teaching hours
- ◯ Teaching Assistants to work in the course
- ◯ Research Assistants
- ◯ It doesn't offer any benefit or compensation
- ◯ Other: _____

61. **9.5 In your opinion, what could Brazilian HE institutions do to increase the number of classes taught in English?**

62. **9.6 Have you ever taught classes in English in your HE institution?** *

Mark only one oval.

- Yes *Skip to question 63.*
- No *Skip to question 66.*

63. **9.7 Which courses have you taught in English?** *

64. **9.8 What were the main difficulties you faced while teaching in English?** *

Tick all that apply.

- [ ] Students' low English proficency
- [ ] Teacher's low English proficiency
- [ ] None or very little pedagogical support
- [ ] None or very little institutional incentives
- [ ] None or very little support from the faculty and/or colleagues
- [ ] Lack of institutional regulation
- [ ] No difficulties/challenges
- [ ] Other:

65. **9.9 Why have you taught classes in English?** *

Tick all that apply.

- [ ] Most articles in my field are written in English
- [ ] The concepts and expressions in my field are in English
- [ ] The academic events and discussions in my field are in English
- [ ] The coordinator/director of the graduate program requested
- [ ] My HE institution requested
- [ ] To improve the graduate program's position in rankings
- [ ] To improve my position in rankings
- [ ] I have had or currently have foreign students in my course
- [ ] To allow foreign students to attend my course
- [ ] To offer more English practice opportunities to Brazilian students
- [ ] To prepare Brazilian students to study and research in English while in Brazil
- [ ] To prepare Brazilian students to study and research abroad
- [ ] To have more English practice opportunities myself
- [ ] Other: _____

66. 10. Would you like to give any suggestion or make any comment about the use of English in Brazilian HE?

_____

_____

_____

_____

_____

_____

_____

67. If you're interested in receiving the results of this research, please provide your email and we will send you a report:

_____

68. **If you wish to ask questions to the researchers, please get in touch by email (simone.sarmento@ufrgs.br or lkbaumvol@gmail.com).**

Thank you for participating in this survey.

Mark only one oval.

Send