

Translating the Environment:

A comparative analysis of monolingual corpora and corpus-based resources, their usability and their effectiveness in improving translation students' comprehension and usage of specialized terminology in the field of the environment

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ABSTRACT

Corpora and corpus-based resources have received much attention with regard to translator training, terminology, and specialized resource development. With a specialized monolingual corpus and a specialized online dictionary, the DiCoEnviro, we sought to provide insight into the usability and effectiveness of both types of resources in improving translation students' comprehension and usage of specialized terminology in the field of the environment.

We assessed a specialized corpus and the DiCoEnviro through three lenses adapted from the usability framework proposed by Nielsen (2001): effectiveness, efficiency, and satisfaction. We used data (screen recordings, questionnaires, translation exercises) collected from six translation students enrolled in undergraduate and graduate programs at the University of Ottawa School of Translation and Interpretation (UO-STI).

Through quantitative and qualitative data analysis, we provide insight into the usability of both types of resources and into the prospective application of these findings in translator training programs and the development of specialized resources.

Keywords: translator training, specialized translation, corpora, corpus-based resources, DiCoEnviro, terminology, usability

RÉSUMÉ

Les corpus et les ressources à base de corpus reçoivent beaucoup d'attention en ce qui concerne la formation du traducteur, la terminologie et le développement de ressources spécialisées. Avec un corpus monolingue spécialisé et un dictionnaire en ligne spécialisé, le DiCoEnviro, nous avons cherché à donner un aperçu de la facilité d'utilisation et de l'efficacité de ces deux ressources pour l'amélioration de la compréhension des étudiants en traduction et l'utilisation de la terminologie spécialisée dans le domaine de l'environnement.

Nous avons évalué un corpus spécialisé et le DiCoEnviro selon trois critères adaptés du cadre d'utilisabilité proposé par Nielsen (2001) – efficacité, productivité et satisfaction – en utilisant les données recueillies auprès de six étudiants de traduction dans les programmes de premier et de deuxième cycles à l'École de traduction et d'interprétation de l'Université d'Ottawa (UO-STI).

Grâce à l'analyse quantitative et qualitative des données, nous offrons des informations sur l'utilisabilité des deux ressources en plus d'informations sur l'application prospective de ces résultats dans les programmes de formation de traducteurs et le développement de ressources spécialisées.

Mots clés : formation en traduction, traduction spécialisée, corpus, ressources à base de corpus, DiCoEnviro, terminologie, utilisabilité

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INTRODUCTION

0.1 Context and motivation

Translation pedagogy concerns itself with the nature, norms, practices, and developments that surround the education of future translation professionals. Much research has focused on the ways and means that educators can help to improve translation students' performance, targeting the specific skills and knowledge necessary for success as a professional translator. Preparing students for the profession also means ensuring that students have access to the most effective and efficient types of translation tools and resources in the classroom so that they are armed with the tools to succeed upon graduation.

Many changes in the field of communications have affected language professionals in general and translators in particular. However, for translators, there are two main aspects that have remained consistent in helping them to succeed: (1) a translator must be fluent in at least two languages; and (2) a translator must possess the knowledge and skills to be able to transfer a message from one language to another with clarity and appropriateness so that that message can be fully understood by the target language audience. Translators are also expected to work with countless texts, whether general or specialized. They must therefore be able to discern the idiosyncrasies of both source and target languages, in addition to distinguishing the subtle differences in meaning and usage of terminology in specialized domains, from texts dealing with popular topics such as travel to rarer topics such as taxidermy.

Specialized translation can be quite a difficult task, even for a professional translator. In many cases, translators are working in specialized fields where their understanding and usage of terminology relevant to this particular field is not that of an expert. Regardless of a translator's

level of experience or familiarity with the field, the expected quality of the output remains the same. Translating in an unknown field is even more difficult for students as they are still involved in the learning process. Often, students are under the assumption that all language is created equally and that an acceptable translation is merely one that is both grammatically and semantically correct (Bowker 1999: 161).

While grammar and semantics are both important aspects of language quality in a specific field, accurate and idiomatic usage of specialized terminology is arguably one of the most significant parts of the translation process. In fact, Delisle (2013: 156) stated that for translators working in a specialized field, one of the most important skills is thorough knowledge of the terminology of that particular field.¹ Others, like Martínez and Faber (2009: 108), have also stated that the successful translation of scientific and technical texts requires a translator to have not only an understanding of terminology but also specialized knowledge representation. This, among other things, means that students must develop an awareness and understanding of the differences between language for general purposes and language for specialized purposes and subsequently recognize the terminological complexity present in each specialized context. For example, the term *translation* has a different meaning in the fields of linguistics, mathematics, and even genetics, and is therefore used differently, depending on the context (Korkas, Pavlides & Rogers 2005: 7). Even a verb such as *generate*, although familiar to most and found in the general language lexicon, is a term² that is most often used in the field of renewable energy, as opposed to other similar verbs such as *produce* and *create*. As a result, possessing the knowledge, skills and ability to make

¹ From: « *Une des compétences les plus importantes que l'on s'attend de trouver chez un traducteur spécialisé, c'est la connaissance approfondie de la terminologie du secteur d'activité dans lequel il travaille.* »

² As highlighted by L'Homme (2010: 8), most terms tend to be “predominantly nominal in character” in a more traditional sense; however, recent terminology research is moving away from the traditional nominal definition of term and is focused on different parts of speech. It is from this perspective that this study was conducted.

correct terminological choices has been seen, and continues to be seen, as a core component of translation competence, despite the fact that there exist several schools of thought concerning the optimal skill set necessary for translation students to gain success in their field. For example, The Process of Acquisition of Translation Competence and Evaluation Group (PACTE 2003) and the European Master's in Translation (EMT 2009)³ propose frameworks with different foci. However, despite the variation in emphasis and structure, terminological competence remains a crucial component of these translation competence models and a fundamental part of translation students' education.

Despite their importance, it is difficult to integrate the teaching of terminological comprehension and usage effectively within the confines of a post-secondary translation program, as there is a substantial gap between theory and practice. This is due to both the unique development of terminology and recent technological advances. Both factors have influenced the type of linguistic and conceptual information that is included in specialized resources. It has also had an effect on the types of resources that are used in the translation classroom.

The type of information present in language resources has partially to do with the way in which terminology has evolved, as it has not benefited from the same "natural development" (Cabr  2003: 168) that other disciplines underwent. Even today, it is considered a relatively new field of study, and consequently the approaches taken to terminology continue to evolve. Much terminological work is strongly influenced by the General Theory of Terminology (GTT), which originated in the early half of the twentieth century. This work includes terminology banks such as TERMIUM and the *Grand Dictionnaire Terminologique* (GDT), both of which continue to be used in translation training programs and professional language environments (L'Homme 2006).

³ As surmised by Chodkiewicz (2012).

Even with the limitations posed by the GTT, Cabré (2003: 169) hypothesizes that this terminological theory stood alone for some time as the sole approach to terminology mainly due to the fact that there was: (1) a lack of strong theorists in the field of terminology; (2) low interest in terminology by specialists of other branches of science; and (3) a general absence of any other real “confrontation of opinions” concerning this approach. As a result, the conceptual approach to the structuring of terminology dominated the field. It was only with the advent of technology, towards the end of the twentieth-century, alongside the introduction of *electronic* corpora, that other approaches to the structuring of terminology began to gain importance and be used in the field.

Corpora, or collections of large bodies of electronic text, offered new possibilities, and terminologists were thus required to make adjustments to the conventional approach in order to take full advantage of them. The exploration of other approaches, for example the lexico-semantic approach, provided terminologists and researchers with alternate frameworks that were more compatible with electronic corpus data, allowing them to create resources that presented key semantic and linguistic information, ultimately helping users to better understand and use specialized terminology. At the same time, many Translation Studies academics and researchers contemplated methods in which translators, and translation students in particular, could use and exploit the raw corpus data themselves with corpus analysis tools in order to improve their overall translation performance.

Electronic corpora and corpus analysis tools have begun to alter language information retrieval and understanding; however, corpora and their exploitation are still relatively new and not necessarily fully integrated into training programs, leaving a substantial gap between theory and practice. Translation students continue to struggle with terminological problems, such as

polysemy and pseudo-synonymy⁴, when working in specialized fields, and at the same time, are not necessarily aware of these relatively new methods, resources, or practices that could help them to better understand terms, no matter the field, and apply those terms as a field specialist would (Martínez & Faber 2009: 88). Keeping translation students' preferences and needs in mind, we need to re-evaluate the structure of translation training programs, with specific reference to terminological understanding and usage, and the tools used in the classroom. It is within this context that we frame this project: exploring and testing specialized resources that have the potential to help translation students develop their terminological awareness and understanding in order to produce accurate and idiomatic translations in the target language, thus better preparing them for their careers as professional translators.

0.2 Research questions and objectives

Stemming from (1) the development of new specialized terminological resources, (2) the increasing prevalence and use of corpora and corpus analysis tools, and (3) the desire to help improve translation students' accuracy and idiomaticity, this observational study was designed to provide some insight into the following questions:

1. What resources do students typically use to resolve terminological challenges?
2. How do students use corpora and corpus-based specialized resources to resolve the same types of terminological challenges?

⁴ Where polysemy is defined as “[a] relationship between designations and concepts in a given language in which one designation represents two or more concepts sharing certain characteristics” and a pseudo-synonym is defined as “[a] designation incorrectly used for a given concept as a result of misunderstanding correct usage, confusion between a generic and a specific, etc. Example: *Y2K virus* instead of *Y2K bug*” (Pavel & Nolet 2001: 113). Both concepts are discussed in more detail in [section 1.1.3](#).

3. How effective are these student methods and what are the potential future implications for translator training and the development of specialized resources?

There are many information fields where change occurs quickly and often, and the domain of the environment is a prime and relevant example. From a translation perspective, communicating specialized ideas from one language to another in this field can be particularly challenging, as the traditional approach taken to creating specialized resources takes considerable time, and these types of resources therefore become outdated fairly quickly. They are unable to fully and accurately represent ideas and terminology at the same rate as the changing field. There are, however, electronic resources that are in the beginning stages of development, which are more easily updatable and thus offer the possibility of helping with this transition. They include corpora (and corpus analysis tools) and corpus-based resources. The DiCoEnviro,⁵ a specialized online environmental dictionary (based on the lexico-semantic approach to the structuring of terminology), is a relatively new example of corpus-based specialized resources and is therefore a noteworthy component of this study.

If translation students are experiencing issues with specific terminological problems such as pseudo-synonymy and polysemy and are also having difficulty finding accurate information to help them complete translation projects in specialized fields, how can we help them to improve? Would they perform better with the help of corpora or corpus-based specialized resources?

The aim of this thesis project is to further explore these ideas. We evaluate a specialized corpus with an online interface⁶ and a corpus-based specialized resource (the DiCoEnviro) with

⁵ For more information on the DiCoEnviro, follow this link: <http://olst.ling.umontreal.ca/cgi-bin/dicoenviro/search-enviro.cgi?ui=en&mode=terme&lang=fr&prec=exact&equi=1&rq=>.

⁶ A corpus is typically navigated with the help of a concordancer. In this case, we used Intercorpus – an online interface that enables users to conduct searches within any corpus. In this case, it was the specialized online corpus described in [Chapter 2](#).

regard to the resources' perceived ability to help translation students to better understand and use specialized terminology when working from French to English. Using the usability framework (adapted from Nielsen 2001), we present the following objectives:

1. **Resource effectiveness:** To determine the relative impact of both resources on students' ability to *better* understand and use specialized terminology as measured in a series of comprehension and translation exercises;
2. **Resource efficiency:** To determine the relative impact of both resources on students' ability to *quickly* understand and use specialized terminology when completing the above-mentioned exercises; and
3. **Resource satisfaction:** To determine students' overall *satisfaction* when interacting with both resources, with specific reference to users' confidence levels and preferences when using both resources.

These objectives are designed to contribute to the discourse on corpora and corpus-based resources and their potential benefits for translators and translation students. We aim to continue the discussion surrounding the most appropriate approaches to translator training with regard to students' specific needs and the requirements to succeed in the profession.

0.3 General methodology

In order to meet the objectives of this thesis project, we took an observational and questionnaire-based approach, with quantitative and qualitative analysis of the results. We first sought to identify common terminological issues experienced by translation students (e.g. pseudo-synonymy and polysemy), analyze the types of specialized resources available to and used by translation students, and identify the types of information included in such resources.

The resources used for testing (e.g. specialized corpus, DiCoEnviro) were either created (corpus) or added to (DiCoEnviro) to ensure that they included the key environment-related terms, highlighting instances of pseudo-synonymy and polysemy. Next, testing material including a profile questionnaire, a series of comprehension and usage exercises, and a follow-up questionnaire was developed.

As this project included the participation of human subjects, a proposal was submitted to the Research Ethics Board of the University of Ottawa and was granted before the study could be pilot-tested.⁷

Both undergraduate and graduate students of UO-STI participated in the study, and subsequently the data obtained from screen recordings and their completed exercises were annotated and organized. An analysis of data was then completed to study the potential of these resources for aiding in specialized translation tasks, specifically those conducted by translation students.

By achieving these objectives and completing the steps outlined above, we were able to conclude with a discussion of current challenges, possible solutions, potential implications for both translators in training and the development of effective resources for students and professional translators, and ideas for future work.

0.4 Scope and limitations

Due to the limitations posed by recruitment measures, timing, and the availability and willingness of participants, there are, of course, elements that are beyond the scope of this Master's thesis project in Translation Studies.

⁷ For full ethics approval notices granted, see [Appendix A](#).

As there were a total of six participants, all undergraduate or graduate students enrolled in translation programs offered at the University of Ottawa School of Translation and Interpretation (UO-STI), most of the analysis is qualitative. The low number of participants ultimately reduced our ability to make any quantitative and conclusive statements. However, due to the nature of the project and the specific objectives outlined above, we believe that the data obtained from the screen recordings of each participant provide valuable insight that can be applied in future works.

0.5 Outline

In Chapter 1, we begin by highlighting the literature pertinent to this study. We discuss: (1) the translator in training with reference to translation competence frameworks and the skills and knowledge required in specialized translation; (2) terminology and specialized resources, with specific reference to the changing approaches to the structuring of terminology (from the GTT to the usage of corpora); and (3) specialized resource evaluation frameworks, in which we highlight the various approaches taken to evaluating resource usability, serving as a theoretical framework for the development of this study's methodology.

In Chapter 2, we expand upon the methodology of this research project (briefly described above). This includes a detailed step-by-step description of: (1) the candidate term selection; (2) the creation of the testing material; and (3) the approach to results analysis.

In Chapter 3 we present the data collected from participants' screen recordings, questionnaires, and translation exercises, highlighting strengths, weaknesses, and translation strategies which contribute to a much broader discussion of translation students' experiences with terminology and research tools.

Finally, in the conclusion, we consider the potential influence of the results on: (1) translator training and (2) resource development. We evaluate the methodology, results, and limitations, and conclude with suggestions and ideas for future work. Additionally, this thesis contains a list of references consulted and appendices containing the formal Ethics approval granted by the University of Ottawa and a sample of the material used for testing.

CHAPTER 1: LITERATURE REVIEW

The following chapter is a compilation of research focused on the following three areas: (1) translator training; (2) terminology and specialized resource development; and (3) functionality, utility, and usability in specialized resources.⁸

In section 1.1, we highlight various frameworks developed to describe translation competence, which leads into a brief discussion centered around terminological understanding and its role in specialized translation. This is followed by an overview of some of the research surrounding key terminological issues that students tend to experience when translating.

Section 1.2 connects our understanding of translation competence and what translation students need to succeed within the field of terminology and the specialized resources that are at their disposal. This section offers an overview of the evolution of the field of Terminology, the shortcomings of the traditional approach to terminology, in addition to some of the theories and methodologies that have developed since the 1990s as a response to the traditional approach. This also includes an overview of some of the resources that are available to students, including one specific type of resource in particular, corpora. With the use of corpus analysis tools, we describe how users are able to retrieve specialized information from raw corpus data.

In the last section of the literature review, section 1.3, we further examine specialized resources, while highlighting the research surrounding dictionary criticism, web interface usability, and the approaches in data collection. This is noteworthy as it forms the basis for the

⁸ While most of the research is focused on professional translators, it is perfectly acceptable to apply these theories, understandings, and hypotheses concerning translation to students in particular, which of course is relevant, given the nature of this study, while also realizing its limitations.

creation of this study and the approach to the analysis of results, leading us into Chapter 2: Methodology.

1.1 The translator in training

Translation pedagogy is a substantial component of Translation Studies and most of the research in this area is focused on translation teaching practices and their overall impact on translation students' success. In section 1.1.1, we begin by establishing what it takes to be a translator as we explore notions of translation competence. Section 1.1.2 describes specialized translation and the importance of terminological competence. Section 1.1.3 further examines key terminological issues in translation, and finally, section 1.1.4 discusses how translation programs respond to the notion of translation competence, in addition to the importance of possessing the knowledge and access to resources to be able to translate in specialized fields and deal with key terminological issues.

1.1.1 Translation competence frameworks

According to Rodriguez-Inés & Albir (2012: 98), “[t]he overall aim of translation education is the development of translation competence (TC) in students”. But what exactly *is* translation competence? There are many different definitions of translation competence that describe the core set of skills necessary for translators to be successful in their field. For example, the PACTE Group defines translation competence as “the underlying system of knowledge required to translate” (PACTE 2011: 4), while the EMT Framework states that translation competence is a “combination of aptitudes, knowledge, behaviour and know-how necessary to carry out a given [translation] task under given conditions” (Chodkiewicz 2012: 38). Others, like Bowker (1998: 2), state that competency in translation means having: “a solid understanding of

the subject matter treated in the source text; an excellent command of the target language; and a good knowledge of the source language”, while Kiraly simplifies translation competence as “the ability to comprehend a text written in one language and produce an ‘adequate’ target text for speakers of a different language on the basis of that original text” (Kiraly 2000: 10). All are valid definitions of what it means to be competent in translation, but how exactly does this manifest itself in practical terms in the training of translators? The following sections are intended to further explore these sub-competences of translation competence and highlight the importance of teaching terminological and technological skills in translation.

1.1.1.1 The PACTE group

The PACTE research group (Process in the Acquisition of Translation Competence and Evaluation), based at the Universitat Autònoma de Barcelona, have perhaps the most “well devised” conceptual framework for translation competence (Krüger 2012: 512). First presented in 1997⁹, the translation competency model is composed of 5 sub-competences, all of which are interrelated: (1) bilingual; (2) extra-linguistic; (3) instrumental; (4) knowledge about translation, and (5) strategic (PACTE Group 2005: 610) and pictured in Figure 1.

⁹ Forthcoming publication (expected February 2017) with regards to the “PACTE Group’s experimental research in Translation Competence since 1997” (Albir 2017).

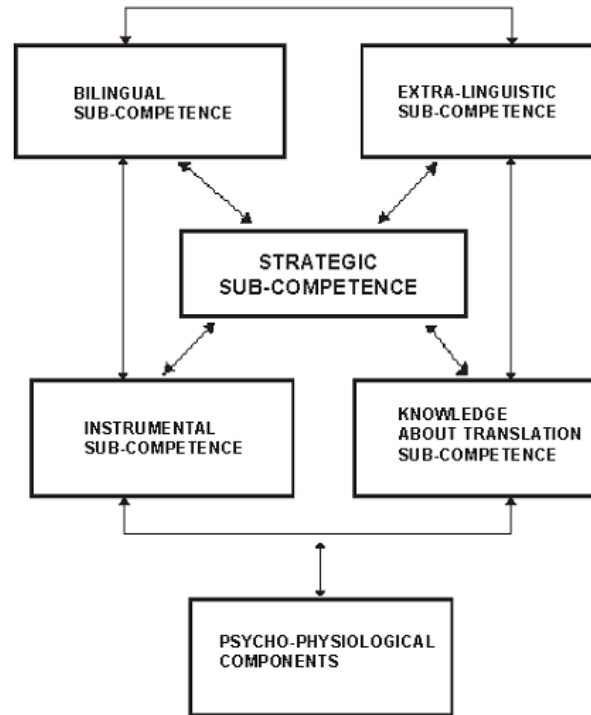


Figure 1 - PACTE Group Framework for Translation Competence (2005)

From this, the PACTE Group further describes bilingual sub-competency as being “expert knowledge not possessed by all bilinguals”, made up of “pragmatic, socio-linguistic, textual and lexical-grammatical knowledge in each language” (PACTE Group 2005: 610). Extra-linguistic competence refers to “encyclopedic, thematic and bicultural knowledge”, translation knowledge refers to the “principles that guide translation and the profession”, instrumental competence refers to “knowledge related to the use of documentation sources and information technologies applied to translation”, and lastly, strategic competence, linked to problem solving and process efficiency (PACTE Group 2005: 610). All of these sub-competences are interrelated and form an overall translation competence, much like what is described in the EMT framework.

1.1.1.2 EMT Translation Competence framework

The European Master's in Translation (EMT) framework was developed by the European Union to ensure standardization of the quality of translation programs and translators across Europe, and in 2007, they developed “a reference framework for training programs in translation” (Chodkiewicz 2012: 38). The EMT has compiled a list of six competences, all of which are weighted equally, but interrelated, and include the following: (1) language, (2) thematic, (3) intercultural, (4) technological, (5) information mining, and (6) translation service provision (Chodkiewicz 2012:39).

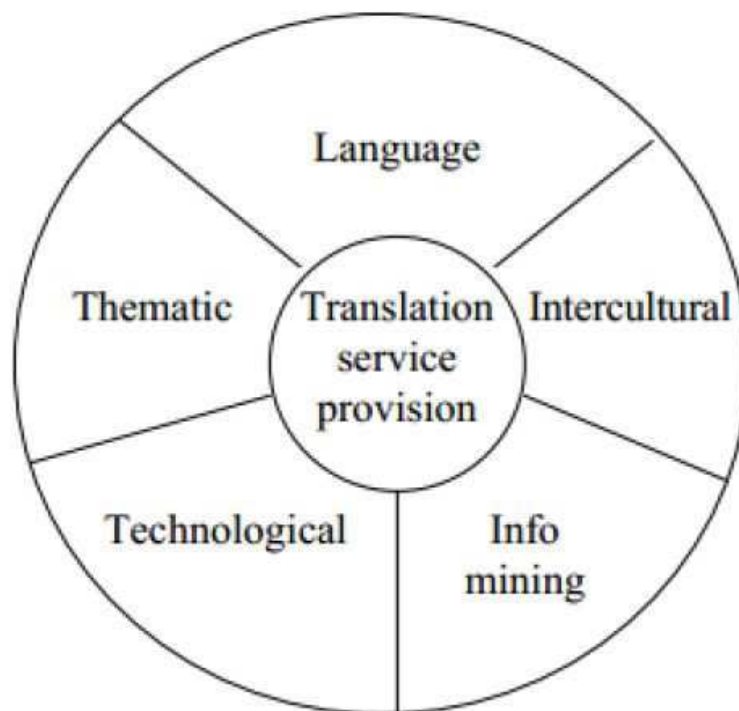


Figure 2 - EMT Framework for Translation Competence (2007)

This framework, borrowing from past translation competency models, focuses on “the competence of providing translation services” (Chodkiewicz 2012: 41), in contrast with the PACTE group and its focus on strategic competence, as discussed further in section 1.1.1.3.

1.1.1.3 A closer look at terminological and instrumental competence

An examination of translation competence and its various frameworks highlights the complexities of what it means to be a translator. While the frameworks established by the EMT and PACTE Group differ in certain regards (e.g. strategic competence versus translation services), it is clear that both terminology and technology are important, no matter the framework. While various aspects of terminology are often categorized as components of terminological and instrumental competence specifically, it is important to note that elements of terminological competence fall within a number of different competences, as seen below. Both terminological and technological competences are indispensable skills within the modern translation competence framework and, as such, are found at the heart of translator training programs.

First of all, terminological comprehension and awareness have always been important for translators and some researchers, like Austermühl (2009), even go as far as saying that “terminological competence *is* translation competence” [emphasis my own]. As Kiraly (2000) stated (qtd. in Bowker & Marshman 2009: 60), “terminology has become an extremely important sub-field of translator training,” and therefore students will be expected to “manage terminology once they graduate,” no matter where their career takes them. Categorized as both “bilingual” and “extra-linguistic” sub-competences within the PACTE Group framework or “thematic” competence within the EMT framework respectively, terminological comprehension and usage are found in both models and highlight translation students’ “need [to] develop their knowledge about [...] terminology” (Chodkiewicz 2012: 40).

As highlighted in both translation competence models, no sub-competence exists in isolation. Accordingly, in order for students to understand and use terminology properly in translation, they require the understanding and ability to be able to “exploit the wealth of

information available on the Web” in an efficient and effective manner (Bernardini, Stewart & Zanettin 2003: 7). In the EMT Translation Competence framework, this is referred to as “information mining competence” or “developing strategies for documentary and terminological research” (Chodkiewicz 2012: 40); in the PACTE TC framework, it is called an instrumental sub-competence and is focused on the “use of documentation sources and information and communication technologies applied to translation” (Rodriguez-Inés & Albir 2012: 98). Possessing information mining and/or instrumental competence as a translator is of utmost importance in this day and age as technology has completely altered the way in which we interact with information. As Pym (2008) points out, “[t]here is such an abundance of information that the key is to know when and how to discard that which is least authoritative.” We often experience the overwhelming power of “information overload”: having access to ample online resources can appear to be a blessing, but oftentimes, is more of a curse. This is especially true for translators and translators-in-training as the expectation regarding the output remains the same; however, the type and amount of work has drastically changed (Bowker 2004(b)). Terminological and technological/instrumental competences are therefore necessary to be a successful translator, especially when working in specialized fields.

1.1.2 Specialized translation

Terminological awareness and usage are extremely important in translation, especially when translating in a specialized field, for in large part, the quality and usage of specialized terminology in a translation “determines to a great extent the quality of a translation” (Martínez & Faber 2009: 91-2). This means that “it is not enough for translators to understand the concepts and

identify the equivalent terms”, they also need “information about how to properly use specialized terminology” (Bowker 1998: 4). But as a student translator, how is this possible?

One might assume that, with this knowledge, translators are therefore expected to be experts in all specialized fields in which they work, but, in fact, it is quite the contrary. Even so, as Faber (2009: 107)¹⁰ points out, many believe that specialized texts should be translated only by experts as “it is impossible for translators to acquire the necessary expert knowledge”. At the same time, many translators “believe that their syntactic and semantic knowledge of two languages guarantees an adequate translation of a scientific or technical text without any other previous preparation or documentation” (ibid.). Both opinions are inherently incorrect as “terms not only represent specialized concepts, but also have syntax and collocational patterns within general language use” (ibid.), further illustrating the fact that translators need the tools and training to be able to properly communicate specialized concepts in the writing style of an expert.

As Neubert (2000) states (qtd. in Martínez & Faber 2009: 92), students must have the capacity to “rapidly acquire expert knowledge” and adequate research skills in order to “write like an expert on the leading edge of technical disciplines” (Marshman 2014: 227). As Martínez and Faber (2009: 92-3) state, “[o]bstacles to the transmission of specialized knowledge stem from the translator’s unfamiliarity with the terminological units, their meaning in discourse, and their possible correspondences in the target language”, making it that much more important to be able to convince the readership of their prowess in the field in question. This is essentially what researchers like Robinson (qtd. in Maia 2003: 52) have come to describe as the capacity to “fake a lot of specialized knowledge”. Kozlova (2001: 287) states that the goal of post-secondary

¹⁰ Original discussion in Pym (2008).

translator-training programs should be to give students the skills and tools to be able to “become quickly specialized in particular areas when the need arises”.

While the argument stands that terminological and technological competences are imperative, especially when working in a specialized field, their integration in the classroom does not come without its challenges for students. As Kübler (2003: 35) states, “[w]hen reading a text to be translated, translators are liable to find terms they will not understand because they are too specialized,” and they therefore require specific knowledge and strategies to help them with terminological research (Martínez & Faber 2009: 89). Translators need to be “aware of how to identify and resolve terminology problems” (Martínez & Faber 2011: 90) in order to convince the audience of the writer’s specialized voice. Translators therefore need to be able to “make use of terms in real-life contexts and situate these specialized knowledge units within the context of dynamic communication processes” (Martínez & Faber 2009: 88), since as Pym (2008: 2) states, “translators work not on sentences but on texts”. This complicates the situation even more as each field has its own variety of specialized language, and as noted by Korkas, Pavlides and Rogers (2005: 7), “terms can designate different concepts in different fields, irrespective of whether they are semantically related (polysemy) or not (homonymy)”.

For student and professional translators alike, this is particularly onerous as they are tasked with the job of dealing with terms (and their translations) with which they are unfamiliar, and as signaled by Kübler (2003: 35), are still liable for their work, despite the fact that the subject matter may be too specialized for them to fully comprehend the concepts. This is why “the availability of and the speedy access to pre-processed and reliable bi- or multilingual specialized information are of utmost importance” (Austermühl 2009: 2) to help translators.

Specialized translation is especially difficult as “[t]he lack of reliable terminological resources obliges translators to acquire information management skills and be able to manage terminology ad hoc in order to resolve translation problems” (Martínez & Faber 2009: 92). This becomes a tangled web as “translators generally do not have the same level of expert knowledge as text originators and receivers” (Martínez & Faber 2009: 89-90) and are consequently unable to manage specialized terminology despite having the technological and/or instrumental competence to be able to accomplish such a task. This problem is compounded by the fact that the fields in which translation students are working are constantly changing.

For translation students, having access to corpora and corpus-based resources would enable them to produce accurate and idiomatic translations within the target language of various specialized fields. As stated, it is important for translator training programs to focus on developing students’ terminological and instrumental competences, as this would ultimately help them to deal with the variety of terminological issues that may arise.

1.1.3 Terminological issues in translation

Bowker (1998: 2) stated that errors in comprehension tend to “result from a lack of understanding of the subject field, rather than a lack of understanding of the foreign language”. Translators are competent in general language; however, they may not be aware of the nuances in language functionality specific to the field in which they are working. As Edmonds and Hirst (2002: 105) observed, a “word can express a myriad of implications, connotations, and attitudes in addition to its basic ‘dictionary’ meaning [and that] in order to find the right word to use in any particular situation – the one that precisely conveys the desired meaning and yet avoids unwanted implications – one must carefully consider the differences between all of the options.” This is

illustrated by the example given by Korkas, Pavlides and Rogers (2005: 7): that the term *translation* in and of itself holds different meanings in the context of linguistics, mathematics, and genetics respectively. When working in specialized translation, terminological issues such as polysemy or pseudo-synonymy have a tendency to occur “quite frequently in specialized communication [...] generat[ing] translation problems” (Martínez & Faber 2009: 89) as a result of translators often somewhat limited knowledge of specialized fields.¹¹

According to Pavel and Nolet (2001: 113), polysemy is defined as the “relationship between designations and concepts in a given language in which one designation represents two or more concepts sharing certain characteristics.” Others, like Faniran (2016: 7-8) have defined it “as the existence for a single lexical word having multiple meanings solely depending on how it is used in context” or the tendency for “lexical items to have more than one meaning when considered from a single subject field” (L’Homme 2015: 16). Pseudo-synonymy¹², or the “property of several words that are very close in meaning, yet not identical, for whatever reason” (Edmonds 1999: 3) is also a complex phenomenon in terminology and poses problems to translation students when confronted with lexical choice.

From a translation perspective, this is even further complicated by the fact that one is responsible for representing this sense distinction across languages. This requires individuals (whether students or professionals) to either possess the knowledge of these distinctions or have

¹¹ Polysemous and pseudo-synonymous terms are not the only issues for translation students. Typically, students tend to experience problems related to understanding and equivalency; however, these two particular terminological issues were chosen because of the finer distinctions in meaning and usage. Additionally, these are problems that can be handled particularly closely and well by the lexico-semantic approach to terminology, as will be discussed in section 1.2.4.

¹² This is oftentimes referred to as near-synonymy, partial synonymy, or quasi-synonymy as well, depending on the author. Pavel and Nolet (2001: 114) describe the concept of *quasi-synonym* as being a “term that designates the same concept as another, but which is not interchangeable with the other term in all contexts as its use is limited to certain communication situations.” At the same time, they define a *pseudo-synonym* as being “a designation incorrectly used for a given concept as a result of misunderstanding correct usage, confusion between a generic and a specific.”

access to resources that help them to distinguish between these terminological differences. Translator training programs therefore seek to provide students with the skills and knowledge to overcome these obstacles, as highlighted in section 1.1.4 below.

1.1.4 Translator training programs

Translator training is a complex and ever-changing field as the trainers are constantly seeking the most appropriate balance between theory and practice: should student training focus more on developing workplace skills, or should it focus more on a global approach, teaching transferable skills and tools? As illustrated above, student translators should ultimately possess the necessary terminological and technological/instrumental competences to be able to write like specialists, no matter the field. Students will always experience difficulties, especially during the learning process; however, it is important to recognize this while also seeking the best possible approach to ensuring that they will be successful upon graduation.

At the School of Interpretation at the University of Ottawa, terminological competence and instrumental competence are often taught in isolation. Courses pertaining to both of these competences specifically include the following: Lexicology and Documentation (TRA2988); Introduction to Terminology and Terminotics (TRA3155 and 3555, depending on the program option, i.e. language direction); Translation Technologies (TRA3956); Computers and Translation (TRA5903); and Developments in Translation Studies (TRA6985). Although other courses can be added as electives in some years, it is possible that while students are offered the chance to explore these areas, their treatment in isolation does not necessarily offer students the chance to apply this acquired knowledge in their courses in general or specialized translation.

Like other translator training programs, the University of Ottawa tends to be more course-based than program-based in terms of approach, as deduced through the analysis of course syllabi.¹³ This means that students are not necessarily given the opportunity to apply their learning pertaining to terminology and computers in other aspects of their program, therefore limiting their ability to develop and practice these skills. Additionally, knowledge about corpora and corpus-based resources that students acquire outside of translation-specific classes often goes unused or is forgotten when working with other professors who may not necessarily be as familiar or as comfortable with such developments.

In the following section (1.2), we examine specialized resources, their growth and development and strengths and weaknesses, in addition to some of the ways in which terminologists are looking to alter the field to ensure that students have access to better resources that help them comprehend and use specialized terminology effectively and efficiently when working in a specialized field.

1.2 Terminology and specialized resources

Specialized resources are created using various methodologies and based upon numerous terminological theories. Originally, there was little diversity in points of view pertaining to how terminology should be viewed, specifically as a discipline (Cabr  2003). As such, most resources, like terminological banks and databases, borrowed elements from the General Theory of Terminology.

¹³ Where in this case, we refer to Pr gent, Bernard and Kozanitis (2011: 1), who define course-based approach to be an individualistic approach whereby each professor is responsible for the individual planning and delivery of instruction, more or less with no interaction or collaboration with other professors (decentralized), while a program-based approach to teaching is centered around collaboration. In this case, no professor is really the ‘owner’ of a course, and as such, each professor is working towards the same set of objectives.

This section aims to give a brief overview of Terminology as a discipline and how it came to be, with reference to what is now most commonly referred to as the traditional approach to terminology (General Theory of Terminology). This will also include a look at two noteworthy resources, TERMIUM and the GDT, both of which are still used by many (including, but not limited to, terminologists, translators, and translation students). Next, in section 1.2.3, we highlight some of the shortcomings and challenges that have arisen from the traditional approach, beginning in the early 1990s, and we provide a brief outline of the theories that developed in response to these shortcomings. This is followed by a more in-depth account of some of the alternate approaches to the structuring of terminology in section 1.2.4, including frame-based terminology, explanatory and combinatory lexicology, and the lexico-semantic approach to terminology (which includes a description of the DiCoEnviro). In section 1.2.5, we explore the notion of corpora: what they are, how they are used, and their functionality as resources for translators and translation students alike. Corpora as specialized resources challenge, once again, the conceptual approach to terminology as they enable individuals to see terms in context and explore specialized terminology in their own—often creative—ways.

1.2.1 The traditional perspective on the structuring of terminology

Terminology is a relatively new field that developed in a unique way. In the following sections, we highlight the history of the field (how terminology became somewhat of a *standardization practice*) and explore some of the resources that borrow from some elements of this theory, such as TERMIUM and the GDT. This is followed by a brief outline of some of the arguments against this approach that have emerged over the years.

1.2.1.2 The general theory of terminology: a traditional perspective

The discipline of Terminology, or “the study of specialized language” (Faber 2009: 110)¹⁴ has its roots in the 1930s, beginning with Eugen Wüster (1898-1977), an engineer with a penchant for information science. His work, *The Machine Tool, an Interlingual Dictionary of Basic Concepts* (Wüster 1968), was “a systematically arranged French and English dictionary of standardized terms” (Cabr  2003: 165). Wüster was concerned with standardizing terminology – mainly technical language concerning physical objects, procedures and measurements in engineering (Cabr  2003). As a result, he “developed a theory about what terminology should be in order to ensure unambiguous plurilingual communication, and not about what terminology actually is in its great variety and plurality” (Cabr  2003: 165). In fact, as Cabr  (2003) mentions in Faber (2009: 112), Wüster had 3 primary objectives: (1) to standardize terms (i.e. the elimination of “ambiguity from technical languages”; (2) to persuade technical language users that the standardization of terms was beneficial; and (3) to “establish terminology as a discipline for all practical purposes and to give it the status of a science”.

From Wüster’s work, the General Theory of Terminology (GTT) was born, and for many years, functioned as the “only set of principles and premises for compiling terminological data” (Faber 2009: 111), despite its rigidity and “uniformly limited representation of specialized knowledge concepts” (ibid.). Normalization was its primary objective and “great pains were taken to strive for totally unambiguous communication through standardization” (ibid.: 110) for it was “based on an implicit and very strong assumption that there is a perfect correspondence between

¹⁴ It is interesting to note here that there is a distinction, as highlighted by Faber (2009: 110) between *terminology* (with a lowercase t) and Terminology (with a capital t), where *terminology* refers to “the units in any specialized knowledge field”. This section is intended to recount the development of the field of *Terminology*.

knowledge representation and terms” (L’Homme 2015: 17).¹⁵ The belief that “a term or a specialized language unit can be distinguished from a general language word by its single-meaning relationship with the specialized concept it designates” (Faber 2009: 111) prevailed, despite the fact that upon closer examination, it became more apparent that the “same concept can often be designated by more than one term, and the same linguistic form can be used to refer to more than one concept” (Faber 2009: 112), depending on the “parameters of specialized communication”, or “the knowledge and prestige of the speakers, text function, text content, etc.” (ibid.).

The General Theory of Terminology was the “first theoretical proposal” (Faber 2009: 110) and was prescriptive in nature. Stemming from the “need to facilitate specialized communication and translation” (Faber 2009: 109), it functioned as the principal theory of terminology, unchallenged and unquestioned until the 1990s. As Cabré (2000: 169) argues, terminology was seen as “a simple practice for satisfying specific needs or as a field of knowledge whose signs had nothing to do with the signs of language”. The field of Terminology has developed substantially since then as it has been integrated into a “wider social, communicative, and linguistic context” (Faber 2009: 112) with new and innovative approaches to terminology¹⁶; however, its influence runs far and wide and even functioned as the basis for many terminological resources that are still used academically and professionally in the translation world, two of which include TERMIUM and the *Grand Dictionnaire Terminologique (GDT)* discussed in section 1.2.2 below.¹⁷

¹⁵ In Terminology, this is defined as *univocity*, or “one-to-one reference between term and concept” (Faber 2009: 110) and is also described in Temmerman (2000: 10).

¹⁶ These alternative theories of Terminology are discussed in more detail in [section 1.2.3](#).

¹⁷ While we do discuss the different approaches of the Translation Bureau (TB) and the *Office québécois de la langue française* (OQLF), we place an emphasis on the TB and TERMIUM as TERMIUM is a resource created by the TB that participants in this study called upon most frequently.

1.2.2 Terminological resources and the GTT

As highlighted by L'Homme (2006), terminological work in Canada is mainly a result of the stronghold of two governmental institutions: The Translation Bureau (TB) and the *Office québécois de la langue française* (OQLF). The work of both are extremely important as they continue to have “a strong influence on the way terminology is taught in universities and, to some extent, on research topics prioritized by researchers” (L'Homme 2006: 3). The Translation Bureau is concerned with terminology as a way of supporting the activities of translators (L'Homme 2006: 3), which essentially equates to “providing translators with valid solutions to translation problems” (L'Homme 2006: 3). On the other hand, the OQLF is involved with language planning and the promotion of “French in a context where it is spoken by a minority of speakers” (L'Homme 2006: 3).¹⁸ Despite their differing goals, the term records found in both resources (TERMIUM and the GDT, for which the TB and the OQLF are responsible respectively) contain elements and structures that are based on the principles and objectives ascribed to the General Theory of Terminology.

The terminological records found in both TERMIUM and the GDT adhere to the conceptual approach to the structuring of terminology. Making use of a largely onomasiological methodology, most term records are “prescriptive in the sense that one term is preferred if a concept has several different names” (L'Homme 2006: 4). The normalization of terms in both cases is important: for the TB, preferred term selection is done mainly to ensure that the same terminology is used in translations and federal documentation, and at the same time, is mimicked by the GDT in order to regulate and promote preferred French terms (L'Homme 2006: 4).

¹⁸ It is worth noting here, as was done in L'Homme (2006), that despite the differing intended usage of both TERMIUM and the GDT, the GDT is used by translators for information on equivalents. Its usage by professional translators, translator trainers, and translators-in-training is why it is included in this study.

Many changes have occurred in terminology work since the 1990s, especially due to the “implementation of computer methods and the availability of electronic corpora”¹⁹ (L’Homme 2006: 5), making it no longer realistic—or even possible—to strictly adhere to an onomasiological approach. For the TB, this is reflected in the incorporation of important contextual and linguistic information about terms in entries, including phraseology, as translators are “constantly in need of information on how terms behave with other lexical units” (L’Homme 2006: 6). For the OQLF, it also prompted research into “the way terms it has officialized are used in the linguistic community” (L’Homme 2006: 6).²⁰

1.2.2.1 TERMIUM

TERMIUM, like most term banks, contains term records with “information about terms and the concepts they represent” (Bowker 2011: 2), which includes: the creation date, linguistic components, one or more subject fields, entries, parameters, textual supports²¹, key terms, and sources (Government of Canada 2016). As observed by Pavel and Nolet (2001: xix), the information obtained from documentation is “analyzed, filtered, structured, and condensed” to create the terminological records presented on the site. This means that despite its various target user groups (e.g. subject specialists, information management specialists, scientists, language planners, teachers and students, specialized translators), the “degree to which the information is condensed can sometimes be problematic given the wide range of users that a term bank is intended to serve” (Bowker 2011: 3), ultimately being insufficient to “meet all of these [user groups’] needs

¹⁹ Corpora, or large bodies of electronic text, form the basis of most terminology work and will be discussed in greater detail in [section 1.2.4](#).

²⁰ The study of terms’ implantation is often referred to as *terminometrics* following the work of Quirion (2003).

²¹ Textual supports are listed as including the definition, context(s), observation(s), and phraseologisms (term definition, term example in a text fragment, linguistic and/or technical information, or common combination of terms with a noun, adjective or verb).

equally well” (Bowker 2011: 3). An example of an entry in TERMIUM for the term *hazardous* is seen in Figure 3.

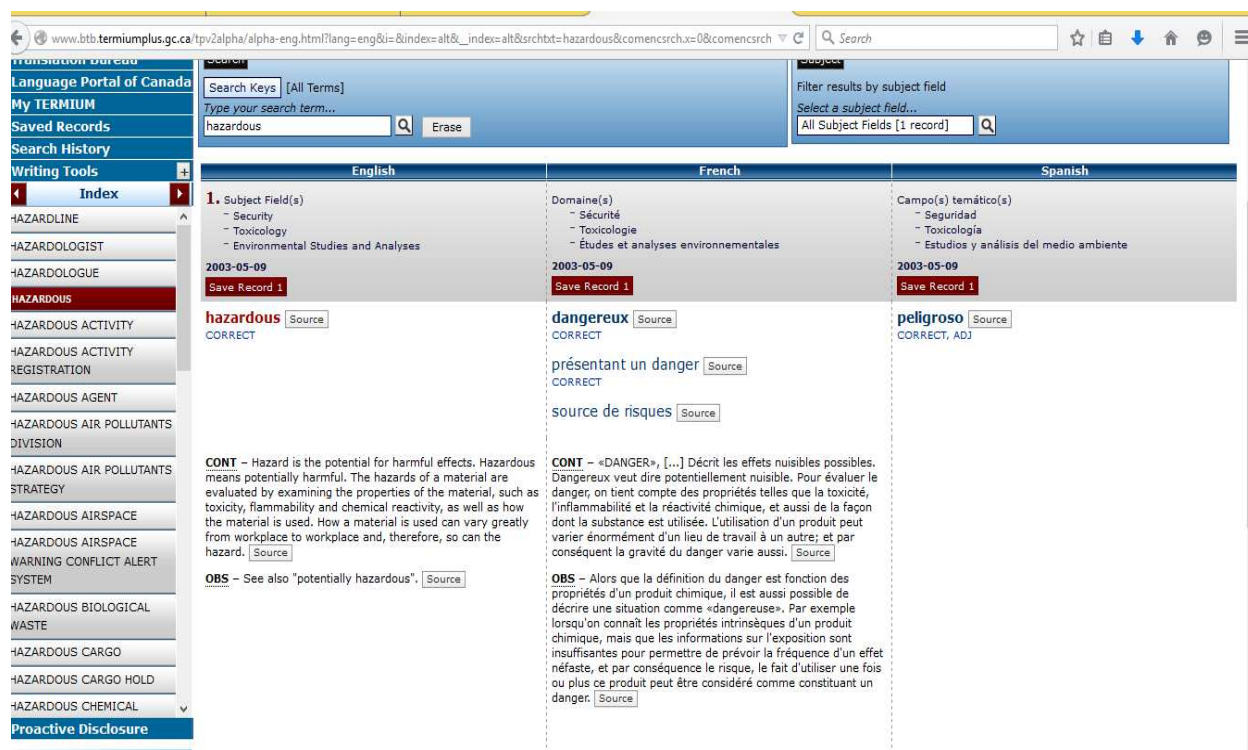


Figure 3 –TERMIUM entry for the term *hazardous*²²

1.2.3 Challenging the traditional approach to terminology

Similar to the field of Terminology itself, “it is extremely difficult to identify a single and unified approach to terminology” (L’Homme 2006: 2) within Canada and elsewhere, too, despite the perhaps overly simplified developments of the field. Beginning in the 1990s, a new-found interest in integrating Terminology “into a wider social, communicative, and linguistic context” (Faber 2009: 112) emerged. This was prompted in large part by the “hegemony of the GTT” (Faber 2009: 113) and the limitations of the theory highlighted in the five sections below.

²² “Hazardous.” TERMIUM Plus, Public Works and Government Services Canada, 2016. <http://www.btb.termiuplus.gc.ca/>. Consulted May 2015. This term was not chosen at random as this is an example of one of the candidate testing terms included in this study. For a complete list of testing terms, see [section 2.1.1.2](#) (Table 5).

1.2.3.1 Standardization in Terminology: does it truly exist?

Standardization, or the normalization of linguistic terms, is highly subjective by nature, as one must identify for whom and for what purpose it serves. As stated by L’Homme (2012: 17), traditional terminology is “based on an implicit and very strong assumption that there is a perfect correspondence between knowledge representation and terms” – but in what context? “Concepts can be considered from different viewpoints and classified differently in different fields of knowledge” (L’Homme 2012: 10), making it difficult, if not impossible, to select one standard term as terms do not reflect knowledge organization perfectly. There is also a wide range of users, including, but not limited to, translators, subject field experts, information management specialists and terminologists, all having “different needs triggered by specific applications [thus] inevitably [having] an impact on the way the notion of ‘relevant term’ is defined” (L’Homme 2012: 9; Bourigault & Sodzian 1999).

The argument against wholesale standardization continues with others (Martínez and Faber 2011: 95; Bourigault & Slodzian; Gaudin 2003) who state that “terms should be studied as they really occur in texts, and not from the perspective of an idealized conceptual structure determined by organizations that must standardize terminology in specialized domains”. It is therefore not enough to state that a particular term is standard, as it depends on who is making use of the term and in what specialized context.²³

²³ It should be noted that standardization (done correctly) often involves a lengthy process of establishing the best terminology in conjunction with many key players in the field. We are not implying that standardization is an arbitrary decision, but rather echoing Cabré in the sense that there tends to be a rather *undue obsession* with the standardization of terminology.

1.2.3.2 Concepts change over time

With the advent of technology, the way in which we view and describe specialized fields is changing at a faster rate as we gain access to more information. This also means that concepts change over time as we learn more information about them (L’Homme 2015: 10). As L’Homme states, “[c]oncepts are not always clear-cut entities which, when defined by a scientific discipline, remain the same once and for all. They can be further specified or completely redefined as knowledge in a scientific area evolves” (L’Homme 2015: 10; Temmerman 2000).

This is especially the case with fields such as the environment and the concepts that are understood and described at both an academic or general level. For example, take the notion of *global warming*, a term that was used to describe a “series of phenomena affecting climate in the world” (L’Homme 2012: 11). As more research was conducted in the field and as more time passed, experts decided on a more general term, *climate change* to refer to the overarching concept of changes in the climate, including, but not limited to, *global warming*.

1.2.3.3 Terms are inherently multidimensional

As L’Homme (2012: 13) states, traditional terminology sees synonyms or variants as merely accidental, when in reality they are a result of a combination of factors: (1) the level of specialization of a term which can be presented in many different forms depending on the text type (reports, conferences, journals, etc.) and the text readership (e.g. layperson, scientist, etc.); (2) regional differences (e.g. French terms used in Québec versus those used in France); (3) historical evolution (e.g. as previously highlighted above, changes in science and technology); (4) attempts at differentiation; and (5) efforts to vary phrasing in a text (*réchauffement climatique*, *réchauffement du climat*, *réchauffement de la planète*, etc.). The combination of these factors

counters the traditional approach to terminology and belief that there is univocity amongst terms, presenting a “limited representation of specialized knowledge concepts without allowing for their multidimensional nature” (Faber 2009: 110; Cabré 2003).

1.2.3.4 Defining the term *term*

Terms are traditionally nominal in nature; however, knowledge is conveyed by different types of linguistic units. In specialized language, events and/or processes can be expressed by verbs (e.g. *pollute*) and properties can be designated by adjectives (e.g. *sustainable*). Therefore, how does one decide whether a linguistic unit is considered a specialized term or not? As observed by L’Homme (2012: 16), “there is no general agreement as to how verbs (or adjectives) should be processed in terminology.” However, there is a growing movement to include other parts of speech in specialized terminology as the absence of other non-nominal terms places limitations on language and its usage for communication specialists.

1.2.3.5 Term entry information limitations

Researchers (Pavel & Nolet 2001; Bowker & Pearson 2002; L’Homme 2004; Bowker & Marshman 2014; Meyer & Mackintosh 1996) have observed that electronic corpora and tools have greatly benefited terminology work, becoming integral and unavoidable in the field. In 2017, terminologists have access to more information – but is this information being featured in new resources? As Bowker (1998: 4) mentions:

...specialized dictionaries are generally easy to find and consult; however, a common drawback is that concepts are often treated in isolation, and it is difficult for the non-expert

(i.e. the translator) to draw out the implicit relations between them in order to get an overview of the subject field as a whole.

Users are therefore limited by the types of information present in these resources. The results of the study conducted by Bowker (1998) further highlight these limitations as students voiced their frustrations with “conventional resources”²⁴, as they felt that, overall, these resources did not meet their information needs (Bowker 1998: 16). This is echoed by L’Homme (2012: 233) and others (Meyer 2001; L’Homme & Marshman 2006), who state that “terminological databases and specialized dictionaries usually limit their focus on definitions and links to regular conceptual relationships such as hyperonymy and meronymy”.

Overall, there are many limitations to the resources which adhere to the standards of the General Theory of Terminology. They are often criticized for being too rigid, for misrepresenting the very nature of specialized terms, for their tendency to evolve over the years (as we learn more about the concepts), and for the type, quality, and amount of information that does not make it into the specialized resource itself. With these shortcomings in mind, the following section explores some of the alternative approaches to the structuring of terminology that emerged in response to these shortcomings.

1.2.4 Alternative approaches to the structuring of terminology

The traditional approach to terminology has been questioned from “many different angles” since terms tend to be analyzed outside their linguistic context, ignoring the fact that “terms appear in running text and behave like other units” (L’Homme 2012: 7). Many theories of terminology therefore surfaced in response to the limitations of the traditional approach, including those that

²⁴ When discussing ‘conventional resources’, we are generally referring to paper resources such as dictionaries and encyclopedias, similar to the resources used in the study conducted by Bowker.

focused on the social and communicative aspects of terminology (e.g. socioterminology²⁵, communicative theory of terminology) and those that were more cognitive-based (e.g. sociocognitive²⁶, frame-based²⁷). Overall, as observed by L’Homme (2004: 1), “methods and practices have changed drastically due mostly to the extensive use of electronic corpora and computer applications”. As it is difficult to conduct terminological work without making use of electronic corpora, the terminological theories and methodologies that have emerged focus on bridging the gap between the information present in corpora and the information that is included (and presented) in specialized resources, as it was argued that it was impossible to separate linguistic form from meaning, leading to a closer analysis of the relationship between syntax and semantics (Faber 2009: 116).

While there are many terminological theories that are more compatible with the data gathered from corpora, the following section will focus on a mere sample of these approaches as they relate to and form the basis of both theoretical and methodological approaches for the resource used for this study – the DiCoEnviro.²⁸ They include the lexico-semantic approach to terminology (with specific reference to Explanatory and Combinatorial Lexicology) and the frame-based approach to terminology (with specific reference to frame semantics).

1.2.4.1 The lexico-semantic approach to terminology

There are several “meaning-based linguistic frameworks” (L’Homme & Faber 2014: 145) that are applied to Terminology, including that of Meaning-Text Theory (MTT), or more

²⁵ E.g. Gaudin (2003).

²⁶ E.g. Temmerman (2000).

²⁷ Faber et al. (2005).

²⁸ For the purposes of this study, it is important to have at least a general understanding of how the DiCoEnviro is created. There are other approaches taken to the structuring of terminology that are not mentioned here. For more information on alternate methodologies, consult Cabré (2003).

specifically, its lexicological component, Explanatory Combinatorial Lexicology (ECL) (Mel'čuk et al. 1995). This particular approach, based on the descriptions presented in the Explanatory and Combinatorial Dictionary (ECD), presents “a wide variety of semantic relations between lexical units” (L’Homme 2004: 2), providing “terminologists with a framework for interpreting data related to terms and the contexts in which they appear” (L’Homme 2004: 7).

1.2.4.2 Frame-based terminology

Another very recent approach to terminology is frame-based and is very similar to both the Communicative Theory of Terminology (CTT) and Sociocognitive Terminology Theory (STT), while also incorporating certain aspects of frame semantics²⁹, chiefly “to structure specialized domains and create non-language-specific representations” (Faber 2009: 2). This theory maintains that terms and their meanings cannot be explored in isolation. In fact, as Faber (2009: 120) states, the frame-based theory “maintains that trying to find a distinction between terms and words is no longer fruitful or even viable, and that the best way to study specialized knowledge units is by studying their behaviour in texts”; this is done by exploring words and their meanings in reference to the conceptual structures that support and motivate them” (Lowe, Baker & Fillmore 1997: 19).

The frame-based approach to terminology “focuses on: (1) conceptual organization; (2) the multidimensional nature of terminological units; and (3) the extraction of semantic and syntactic information through the use of multilingual corpora” (Faber 2009: 123). It also recognizes that “understanding a terminology-rich text requires knowledge of the domain, the concepts within it, the propositional relations within the text, as well as the conceptual relations between concepts

²⁹ The concept of frame semantics stems chiefly from the work of Fillmore, who devised a type of ‘case grammar’ to “account for the deep relation between a predicate and its arguments, thereby capturing generalizations that surface syntax representations can miss and providing a mapping between surface and deep syntactic structures” (L’Homme 2012(a): 235).

within the domain” (Faber 2009: 121). Moreover, “frames have the advantage of making explicit both the potential semantic and syntactic behaviour of specialized language units” (Faber 2009: 123), and therefore offer practical and accessible information to individuals, particularly translators, working in specialized fields.

The FrameNet project, involving the development of an electronic resource, is a great example of the practical application of the frame-based approach in terminology. It functions on the basis that “in order to truly understand the meaning of words in a language, one must first have knowledge of the semantic frames or conceptual structures that underlie their usage” (Faber 2009: 123). It also provides “a very detailed annotation method that shows how [frame elements] are realized in sentences extracted from corpora and how they interact with the [lexical unit] evoking a frame” (L’Homme 2012(a): 236). FrameNet is not the only resource that draws its inspiration from the frame-based approach to the structuring of terminology. In fact, the databases of two online resources, the DiCoInfo³⁰ and the DiCoEnviro, were originally “compiled according to the theoretical and methodological principles of Explanatory Combinatorial Lexicology, ECL” (L’Homme 2012(a): 239) but have been adapted and enriched based on the methodology developed within the context of the FrameNet Project.

1.2.4.3 Alternative resources: The DiCoEnviro

The DiCoEnviro³¹ is a specialized resource that contains terms that are related to the field of the environment (for example, climate change and renewable energy). Initially based on the

³⁰ While we do not describe the DiCoInfo in detail, it is a similar specialized online resource that can be accessed here: <http://olst.ling.umontreal.ca/cgi-bin/dicoinfo/search.cgi>.

³¹ Access to the DiCoEnviro: http://olst.ling.umontreal.ca/cgi-bin/dicoenviro/search_enviro.cgi. The DiCoInfo was the first of its type, and as such, contains many more entries. In 2012, the DiCoEnviro contained approximately 200 French entries with annotations and work was just beginning with regards to the inclusion of other languages (chiefly, English).

theoretical and methodological principles of the Explanatory Combinatorial Lexicology (and later developed to include frame-based elements), terms are defined as lexical units and include entries from different parts of speech (e.g. nouns, verbs, adjectives, and adverbs) (L’Homme 2012(b): 381). This is important, as Estopà (qtd. in L’Homme 2012: 9) states that “experts, translators, and terminologists identified terms that belonged to different parts of speech” as being important to them when conducting terminological research.

The DiCoEnviro may be helpful for a wide variety of users, from those who seek basic information on terms and their combinations to those (e.g. linguists, terminologists, translators) who seek more technical information to help with terminological work (L’Homme 2009: 4). It provides users with descriptions of terms’ linguistic properties: their actantial structure, combinations, and semantic relationships.³² It is unique in that it is the only specialized environmental dictionary which focuses exclusively on the linguistic function of terms (L’Homme 2009: 5).

1.2.5 Corpora

The terminological theories and applications in specialized dictionaries outlined above make use of corpora, or large bodies of electronic text, in order to create specialized resources; however, there has also been a move in recent years to explore raw corpora on their own as both resources and learning tools in the classroom (Zanettin 1998, 2002; Varantola 2003; Bernadini & Castagnoli 2008; Beeby et al. 2009). This is in response to specialized resources and their shortcomings in terms of the information provided in entries, coupled with the discovery that both making and using corpora in terminological research is an excellent way for translators, and

³² Elements of the DiCoEnviro (e.g. actantial structure, combinations, and semantic relationships) are defined in [section 2.1.2](#) (Table 6).

translation students in particular, to become acquainted with specialized terms and how they function within specialized texts, ultimately improving the quality of their translations.

Therefore, the following section intends to highlight: (1) what corpora are (including the different types and compositional elements to consider); (2) the pros and cons of their usage; and (3) their integration into translator education and the translation classroom.

1.2.5.1 Describing corpora

A corpus is not merely a “random collection of texts” (Bowker & Pearson 2002: 10). In fact, texts found within a corpus are selected “according to explicit criteria in order to be used as a representative sample of a particular language or subset of that language” (Bowker & Pearson 2002: 10), dependent on the users’ intentions and purpose of study. As described by Bowker & Pearson (2002:12-3), a corpus can be general or specific, written or spoken, monolingual or multilingual, synchronic or diachronic, or even open or closed.³³

1.2.5.2 Navigating corpora

A corpus is merely a collection of texts without corpus analysis tools to aid in text investigations. As described in Bowker & Pearson (2002), most corpus analysis tools are equipped with two main features: a word list generator and a concordancer.

A word list generator is a tool that allows you to perform “simple statistical analyses on your corpus” (Bowker & Pearson 2002: 13) in two ways: (1) it will calculate the total number of words³⁴ in a corpus, and (2) it will produce a list of words (word forms) that can be organized by

³³ For more information on corpora, consult Bowker & Pearson (2002). This section is intended to provide a general overview of corpora and their usage. For more information on the corpus used in this study, consult [chapter 3](#).

³⁴ As described in Bowker & Pearson (2002), words in a corpus are commonly referred to as *tokens* and each different word is referred to as a *type*. E.g. There are 200 tokens of the type *renewable* in our corpus.

word frequency or alphabetically (Bowker & Pearson 2002: 13). Concordancers, on the other hand, allow “the user to see all the occurrences of a particular word in its immediate contexts” (Bowker & Pearson 2002: 13) and are often used to show co-occurrence patterns or phraseology of the text type (Vaezian 2009: 2).

1.2.5.3 Why use corpora as translation resources?

There are many resources at the disposal of translators; however, corpora have the potential to be more extensive and more practical than other resources (e.g. dictionaries, term banks, printed texts), subject field experts, or even random internet searches, as they provide users with information that is not accessible by these typical means (Bowker & Pearson 2002: 18).

1.2.5.3.1 More accurate and idiomatic information

Corpora are electronic, which means that they are easy to consult and can easily be updated. They contain a “wealth of authentic usage information” (Bowker & Pearson 2002: 19) as they often include texts that are written by subject field experts. They are also more easily updated than specialized dictionaries and other resources; Dias (2004: 24) observes that “new phrases and terms only appear [in dictionaries] once they have been accepted into a language and use has become regular and regulated”. Collocates change with time, and subtle shifts can be incorporated more effectively into a translation once a corpus has been consulted (Rodriguez-Inés 2014: 232).

1.2.5.3.2 Helping to produce more naturally sounding texts (collocational patterns)

As observed by Maia (2003: 43), corpora are very helpful in the domains of terminology and LSP (language for specific purposes) as they allow you to verify “words in context”, which in

turn, makes it easier for users to understand the concepts being used and thus apply them in the most appropriate manner. This is echoed by others (Rodríguez-Inés 2014: 232; Korkas, Pavlides & Rogers 2005: 10; Bowker & Pearson 2002; Krüger 2012: 510), who argue that using collocational information helps to make a text sound more natural. This is especially important for students who are new to specialized fields and who have not yet acquired “the domain knowledge required for high-quality translation” (Krüger 2012: 510). Rodríguez-Inés (2014: 232) also points out that “[w]hile rendering an expression in an unconventional order might not prevent communication, it does highlight non-nativeness and/or a lack of knowledge of a community’s specialized discourse”.

Information extracted from corpora can also help to solve terminological problems such as polysemy, and pseudo-synonymy (Korkas, Pavlides & Rogers 2005) because it provides frequency information that “allows you to analyze the lexical patterns associated with words in a more objective and consistent way” (Bowker & Pearson 2002: 19), or see “regularities of actual behaviour” (Olohan 2004: 20). As Bowker & Pearson (2002) observed, and echoed in Krüger (2012), corpora can “provide students with explanatory contexts for the various concepts of the specialized field” (Krüger 2012: 510) with simple search techniques.

1.2.5.3.3 Ease of use and applicability in learning

Using corpora in terminological research is highly convenient as corpora can function as a one-stop shop in looking up terminological evidence for terms. As Bowker & Pearson (2002: 20) state, “the fewer resources that you are required to consult, the better.” Additionally, corpora have proven to be very effective in teaching research skills, particularly when asking students to compile their own corpora for future use (Bowker & Pearson 2002).

As stated by Bowker (qtd. in Vaezian 2009: 1), “translations produced with the help of corpora were shown to be of a higher quality in terms of subject field understanding, correct term choice and idiomatic expression than translations produced by means of conventional resources available to translators such as dictionaries”. This does not mean, however, that corpus use and corpus building in translation is without its faults, as discussed below.

1.2.5.4 Drawbacks of corpus use

Creating and utilizing corpora have proven to be quite arduous and time-consuming tasks, which some argue outweighs the positive aspects of corpus usage.

1.2.5.4.1 Time constraints

In 2004, Bowker stated that one of the main reasons why “corpora and corpus analysis tools h[ad] not received an enthusiastic welcome into the professional world” was due to the fact that “the design, compilation and exploitation of corpora can be very time-consuming while not providing a tangible immediate increase in productivity” (qtd. in Bernardini 2006: 3).

1.2.5.4.2 Copyright issues

As highlighted by Maia (2003) and Bowker and Pearson (2002), it is difficult to create corpora, either for professional use or in the classroom, especially because it is often difficult to get permission to use texts.

1.2.5.4.3 Lack of comfort with and knowledge of the task

Mona Baker first advocated for the application of corpus linguistic principles and methods in Translation Studies in 1993 and since then, much research has been done on corpora in translation; however, even today, corpora have not been fully integrated into the field. This is echoed by Olohan (2004) and Bowker (1998), who emphasize the fact that while this approach offers many perks for translators and students alike, many individuals still do not feel comfortable with it and therefore avoid integrating it into their work and/or teaching.

1.2.5.5 Corpora and translator education

As observed by Bernardini (2006: 1), “[t]he last decade has seen a growing interest in the uses of corpora in translator education”, and for good reason, since, despite their downfalls, they have proven to be an effective translator aid and learning tool in the classroom. This is the case for both parallel and monolingual corpora.

If we are focusing on developing the translation and instrumental competences of translation students, using corpora in translator training has proven to be effective in this regard (Rodriguez-Inés & Albir 2012: 96). This is because “[c]orpora, among other things, were shown to provide trainee translators with terminological and conceptual information (Zanettin 1998), collocational information (Stewart 2000; Kübler 2003), phraseological information (Machniewski 2006), information on cognates, false friends (Zanettin 2001) and semantic prosody (Bowker 2000) and contrastive knowledge about the two languages involved (Zanettin 2001; Schmied 2002)” (Vaezian 2009: 1). More specifically, “[m]onolingual corpora [...] provide students with information about the idiomatic use of terms and their collocates, syntactic constructions or genre and domain conventions in the target-language environment” (Krüger 2012: 510).

In addition to the use of monolingual corpora, it has also been noted that the actual compilation of corpora in itself can be a useful learning activity, improving the research skills of translators, as they “learn to reflect on texts while acquiring the practical skills they need to build their own documentation resources” (Bernardini 2006: 1).

1.3 Evaluating specialized resources

In this concluding section, we take a closer look at specialized resources through an analytical lens, presenting the research that discusses dictionary criticism and evaluation, as well as product usability. It is intended to provide an overview of the various types of evaluation frameworks that exist, creating a theoretical base from which to develop our own methodology and evaluation framework for both resources: the specialized corpus and the specialized online environmental dictionary, the DiCoEnviro.³⁵

1.3.1 Dictionary criticism and evaluation

According to Swanepoel (2008: 208), dictionary criticism as praxis “is the evaluation, negative or positive, of the design features of a dictionary/dictionaries on the basis of one or more lexicographically relevant evaluation criteria.” Typically, dictionary evaluations are completed by lexicographers who normally include the following elements: a revision of the scope, its intended users, and types of lexical (and other) information included in the resource (Jackson 2002: 175). It is directed at the interested public, intended for them to evaluate its relevancy to their specific

³⁵ This is particularly relevant for this study as neither resource in question falls into a distinct category. While the DiCoEnviro is described as an online dictionary, it is not a typical resource. Similarly, the corpus, while being a specialized resource, is not a dictionary, but offers information similar to a dictionary, and is presented in a web interface. Therefore, it is important to develop a unique set of evaluation criteria for determining their usability.

dictionary needs (ibid. 182). While this process has been generally accepted, it has received much criticism, mainly as a result of there being “no definite theory of dictionary criticism [that] has been established” (ibid. 174). Overall, the assessment of dictionaries tends to be a mostly descriptive and subjective process whereby “no evaluative statements about the efficacy of the defining strategy” (Swanepoel 2008: 213) and approach are given.

Swanepoel (2008: 209) further argues that there is a “lack of objectivity, validity and reliability” in dictionary criticism, citing that reviews are “unfit to perform two of their major goals/functions: (1) to assist readers in their decision-making in acquiring the best dictionaries for their usage needs by presenting them with a well-founded analysis of the positive and negative qualities of a dictionary/dictionaries under review, and (2) to assist lexicographers in optimizing the functionality of their dictionaries”. These are two very important groups who would benefit from a set of “explicitly formulated, generally acceptable, comprehensive, systematic and operationalizable criteria for the evaluation of dictionaries of all types” (ibid.). While much commentary has focused on the lack of dictionary criticism criteria, many proposals have been made, and are highlighted in section 1.3.1.1.

1.3.1.1 Internal and external criteria for criticism

Jackson (2002: 176) describes two criteria for dictionary criticism: internal and external. Internal criteria are described as being “what a dictionary says about itself, or what the editors claim for the dictionary”. On the other hand, external criteria “derive from metalexicography” (ibid.) and analyze the linguistic requirements for a lexical description as well as the dictionary’s overall design and production as factors that are considered either advantages or limitations for the resource.

External criteria for dictionaries are twofold, as there are two overarching concepts to consider: presentation and content. As Jackson (2002: 172) describes, one set of external criteria “relates to the reference function of dictionaries and the user’s perspective, and is largely about presentation and accessibility [while] the other [set of external criteria] relates to the recording function of dictionaries”. Presentation and content are not independent of one another, but in separating them during the process, one can gain a more objective review of the resource.

Elements in the first external criterion, known as presentation, include page layout, entry layout, length of entries, use of abbreviations. These components are evaluated based on their level of accessibility to the public and the public’s overall perceived satisfaction with the product. At the same time, elements in the second external criterion, known as content, include range of vocabulary, word formation, homographs, sense division, and defining beyond denotation, pronunciation, grammar, usage, examples, etymology, and special features.

1.3.1.2 Standardizing an approach

These criteria for dictionary criticism represent a move towards a more standardized approach to dictionary criticism, much like the appropriate standards for evaluation criteria developed by the International Organization for Standardization (ISO), which specify “a number of general guidelines for the design of dictionaries and specifically for the content categories and their structuring” (Swanepoel 2008: 225). As Swanepoel (2008: 225) describes, it could be “used to assess to what extent dictionaries of a specific type in fact include the specified content categories and adhere to other prescribed design guidelines” (ibid.), thus establishing a set of evaluation criterion applications for practical, quantifiable dictionary evaluations.

However, these particular guidelines and their origin are one of the biggest points of contention in dictionary criticism and evaluation. If a resource simply adheres to the set of standardized guidelines for dictionary creation, this does not guarantee that the dictionary will be effective, as Swanepoel (ibid.) maintains that it depends “on whether or not the guidelines themselves have been derived from user research on findability and the structuring of information in dictionaries”. Ultimately, a dictionary is only as effective and as useful as deemed by the users themselves and their overall satisfaction with the product.

1.3.1.3 Considering perspective

It is also important to consider different perspectives when reviewing a dictionary, as noted by Jackson (2002: 181), since different users have different needs. Realizing the difference in opinion concerning a resource between an academic linguist, a metalexigrapher, and an average user is paramount since all users interact with the resource differently. Adapting to the perspective of the target user can be integral to a resource’s success, as it will take into account “the needs, expectations, and prior knowledge and reference skills of the intended group of users” (ibid. 182).

On the other hand, adopting this type of practice, while a step in the right direction, is not representative of the uniform evaluation framework that one would like to apply in dictionary criticism. Instead, when it comes to dictionaries, in order for the functionality of the product and satisfaction of the customer to be achieved, it is suggested that the standards for design guidelines and evaluation criteria be “well motivated by research on product/dictionary use and product design/dictionary structure” (Swanepoel 2008: 225). While these approaches are typically practiced in the business world, this type of model also has potential to be an addition to the

dictionary evaluation framework, as dictionaries are user-based products that can be accessed through the web.

1.3.2 Usability in web interface design

Generally speaking, ergonomics applies to “different domains and seeks to analyze interactions between machine and user” (Hamel & Caws 2010: 492). In computer ergonomics specifically, “development efforts are focused on the users of a system rather than on the system itself” (ibid.). The notion of usability stems from computer ergonomics and is what Nielsen (1993: 26) defines as “the measure of the quality of the user experience when interacting with something – whether a web site, a traditional software application, or any other device the user can operate one way or another”. But how can we measure this?

ISO recommends key metrics for evaluating the usability of a system. ISO Standard 9241-11 stipulates that usability is “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (Mifsud 2015). Effectiveness is defined as the “level of accuracy and completeness with which users of a system achieve their goals”; efficiency is stated as being the “amount of time and effort spent by users with the system”; and satisfaction is described as the “level of ‘contentment’ expressed by the user toward the system” (Hamel & Caws 2010: 492). While these aspects of usability are important, providing “a number of observable and quantifiable metrics that overcome the need to rely on simple intuition” (Mifsud 2015), there are other aspects of usability identified by Nielsen which are of equally great importance. They include learnability, or the ease with which users can accomplish a task when first using the design, error rates, and the analysis of the frequency and severity of errors when completing a task (Nielsen 2012). These facets of usability

are not measured in isolation, and it is integral to mention them as they affect effectiveness, efficiency, and satisfaction scores, and can even be described as sub-components of these usability metrics.

Usability and its elements can be viewed from many different angles as there are many ways in which effectiveness, efficiency, and satisfaction can be measured. The following three sections aim to provide an overview of these metrics. We examine the work of Hornbaek (2010), who conducted a study examining the measures of these three components from 180 studies published in core HCI journals and proceedings.³⁶

1.3.2.1 Measures of effectiveness

Effectiveness is “the completeness and accuracy with which users achieve specified goals. It is determined by looking at whether the user’s goals were met successfully and whether all work is correct” (Nielsen 2012). In Table 1, we see that it can be measured in many ways, including binary task completion, accuracy of responses, completeness, and quality of outcome.

Measure	Description
Binary Task Completion	“measures of whether users’ complete tasks or not” number of correct tasks, number of tasks users failed to finish within set time, where users gave up
Accuracy	“number of errors users make either during the process of completing tasks or in the solution to the tasks”
Completeness	“measures of the extent to which tasks are solved”
Quality of Outcome	“more extensive attempt to measure the outcome of tasks, for example the quality of a work product or of learning” e.g. using a five-point scale to grade the quality of essays

Table 1 – Measures of effectiveness (Hornbaek 2010)

³⁶ It is important to note that Hornbaek is quite critical of usability measures in general, stating that there are many limitations. We recognize the limitations of this particular study, as well as the other studies themselves and while we may not have as many participants to quantify our findings, we believe there is value in highlighting some of the literature surrounding ways and means by which we determine usability.

1.3.2.2 Measures of efficiency

Efficiency is described as being “the speed (with accuracy) in which users can complete the tasks for which they use the product” (Nielsen 2012) and can be measured by examining usage patterns as well as total time spent on task. In Table 2, we see some examples for measuring efficiency, as demonstrated by Hornbaek (2010: 86).

Measure	Description
Input Rate	“text entry speed”
Mental Effort	“mental resources users spend on interaction”
Usage Patterns	“how the interface is used” 1 – “number of times a certain action was performed” 2 – “how much information users access when solving tasks” 3 – “measures of the deviation from the optimal solution, using the relation between the actual behaviour of the user and the optimal efficient solution to a task”
Communication Effort	“measures of the resources users expend in communication, typically employed in studies of groupware”
Learning Measures	“changes in efficiency as an indicator of learning, for example in the time used for completing tasks”
Time Controlled	“users are given a fixed amount of time to complete their tasks”

Table 2 - Measures of efficiency (Hornbaek 2010)

1.3.2.3 Measures of satisfaction

Satisfaction can be measured “through standardized satisfaction questionnaires which can be administered after each task and/or after the usability test sessions” (Mifsud 2015). It can include questions pertaining to users’ preference, perceived ease-of-use, specific attitudes, perception of outcomes, and even perception of interaction, as seen below in Table 3.

Measure	Description
Preference	“captures which interface users prefer using”
Ease-of-use	“measures of general satisfaction with the interface, intended to measure the same construct as the standard questionnaires”
Specific Attitudes	“measures aimed at capturing specific attitudes toward or perceptions of the interface” – or even the content of the interface
Perception of Outcomes	“users’ rating of their perception of the outcomes of the interaction”
Perception of Interaction	“users’ rating of their perception of the process of the interaction”

Table 3 - Measures of satisfaction (Hornbaek 2010)

1.3.2.4 Other considerations

While we have highlighted the ways and means with which we can determine the usability of a web interface, it is important to consider the following limitations of using these metrics. In order to determine the best factors to consider when conducting a study, it is also important to recognize their (potential) constraints.

1.3.2.4.1 Difficulty, cost, number of participants

As Nielsen (2001) stated, it is “easy to specify usability metrics, but hard to collect them”. This is true for several reasons, including, but not limited to, money, time, and the ability to recruit willing participants. With qualitative user testing, Nielsen states that 3-5 users are enough, as “after the fifth user tests, you have all the insight you are likely to get” (ibid.). This is not the case, however, when collecting usability metrics, for “[i]n order to get a reasonably tight confidence on interval results”, it is important to test 20 users (ibid.), rendering the testing more expensive, time consuming, and difficult.

1.3.2.4.2 Scales of measurement: how to compare?

Determining a product's effectiveness, efficiency, and overall user satisfaction is important in determining its usability; however, how does one compare or even combine these measures when each component is "reported individually on a task-by-task basis, with little context for interpreting the relationship among the metrics of a particular task or across a series of tasks" (Sauro & Kindlund 2005: 1)? As Sauro & Kindlund (2005: 1) state, "[u]sability analysts need a method to effectively compare and derive meaning from traditional usability metrics" in a way that is comprehensive and comprehensible, so that we can make sense of the data collectively as a whole.

1.3.2.4.3 Subjectivity versus objectivity

Both subjective and objective factors contribute to usability, and Hornbaek (2010: 92) argues that "both objective and subjective measures of usability [...] may lead to different conclusions regarding the usability of an interface". It is therefore critical to be aware of both factors and how they function together, as "[d]epending on the context, a balanced focus on subjective and objective measures may help improve both the user experience and objective performance" (Hornbaek 2010: 92). For example, if a design is based on objective usability factors and users do not have a high level of satisfaction with the product, then what is the point? It is therefore essential to gauge the satisfaction levels of those using the product and work towards achieving a balance, thus improving the overall usefulness.

Despite the limitations of usability testing presented in the sections above, there have been many successful studies that, while not necessarily the height of perfection, have contributed to research in usability of products such as online language resources. It is paramount to be aware of

the conditions in which you are testing – recognizing the system’s limitations as well as its advantages. Section 1.3.2.5 highlights some of the applicable studies carried out in usability from which we draw further inspiration.

1.3.2.5 Determining usability of online resources: data collecting methodology

Much research has been conducted with regard to “process-oriented studies focusing on the users and their behavior at task using software applications” (Hamel 2012: 341). These studies have examined dictionary use in pedagogical contexts (Humblé 2001; Nesi & Hail: 2002; Hamel 2012: 342) mainly with regard to language learners. Research has shown that, “[w]hen attempting to make word associations, language learners’ behavior differs from that of native speakers” (Hamel 2012: 339). It is therefore essential that “language learners [...] have access to lexical resources that provide an explicit focus on word associations: paradigmatic (e.g. synonyms, antonyms and derivatives) and syntagmatic (e.g. collocations” (Hamel 2012: 339). This is also the case with translation students as they are often translating into their L2 from their L1 and subsequently tend to experience similar types of issues, especially when working in a specialized field.³⁷

The following three sections outline the prominent approaches to data collection when determining the usability of online dictionaries, and online resources, generally speaking.³⁸

³⁷ As illustrated in [section 1.1](#).

³⁸ It is worth noting that these approaches can be applied to other areas of study, with the most relevant being those with a focus on analyzing the translation process. As this study focuses mainly on terminological comprehension and usage – specific translation competences – we chose to highlight the methods as they apply to the study of resources.

1.3.2.5.1 Think-aloud protocols

Think-aloud protocols offer “a more direct insight on the learner cognitive processes while using dictionaries” (Hamel 2012: 342) as it is a process whereby study participants describe their actions. While they help us to better understand the reasoning behind the choices made by users, they are not an entirely accurate representation of what users actually do, but instead offer insight into what users *think* they do.

1.3.2.5.2 Screen-capture technology

Screen-capture technology offers arguably the most effective way to “measure the ‘quality’ of interaction” between user and interface, as it allows one to collect behavioural and performance data. Focused on learner-task-tool interaction, the work of Hamel (2012) and Hamel and Caws (2012) used screen-capture technology to measure “the quality of the learner’s experience while interacting with a CALL³⁹ application [in order to determine ways] to improve not only the application itself but also the learning experience” (Hamel & Caws 2010: 491). Based on usability measures, Hamel and Caws (2010: 491) analyzed “the time and effort spent on task as well as the quantity and quality of learners’ output”.

1.3.2.5.3 Questionnaires and surveys

When determining users’ overall satisfaction with resources, many researchers conduct questionnaires and/or surveys pre-, post- or during an experiment in order to gather information with regards to their preferences and overall perception of the resource. This was the case with the work done by Hamel & Caws (2010: 495), which included pre- and post-experiment

³⁹ Where CALL is an acronym for Computer Assisted Language Learning.

questionnaires that “collect[ed] information on participants’ profile (e.g. ethnographic and linguistic), information technology experience (e.g. internet searches and e-dictionaries), and dictionary preferences (e.g. searches, functions and lexical information)”. Additionally, others like Désilets et al. (2009: 2) used contextual inquiry – a “well-known technique in Human Computer Interaction [HCI], where researchers observe and interview potential end-users while they are involved in their normal day to day work.”

1.4 Concluding remarks

Overall, as stressed by Bernardini (2006: 1), “[i]f corpora are to play a role in the translation professions of tomorrow, it is important that they impact on the education of the students today”. This is, of course, applicable to all topics covered in this chapter with reference to this study. If we focus our attention on (1) what constitutes translation competence, (2) what resources are best suited for translation students in particular, (3) what ways and means can serve to ensure terminological comprehension and understanding of specialized terms when translating in a specialized context, and (4) how resources are evaluated, we will be working towards ensuring the success of translation students in their professional futures as translators. Chapter 2 outlines the methodology and approach taken to structuring this thesis project.

CHAPTER 2: METHODOLOGY

Students must have terminological competence in order to be successful as professional translators, as highlighted in [Chapter 1](#). With this in mind, we aim to explore corpus-based resources that could potentially help students to resolve certain terminological issues, mainly as a premise on which to base further exploration.

Students tend to experience difficulties with terminological items presenting instances of polysemy and pseudo-synonymy, and so specific terms which fell into either category were selected as candidate testing terms. Additionally, two cognitive processes in Bloom's Revised Taxonomy: understanding and applying (Airasian, Engemann & Gallagher 2012: 37). Terminological understanding (i.e. in this case, comprehension and thus ability to explain specialized concepts denoted by terms⁴⁰) and application (i.e. choice of appropriate terms for a given context) in translation are two very important elements that were tested separately and analyzed to explore the usability of both the corpus and the DiCoEnviro.⁴¹

In this chapter we describe the approach and procedure undertaken to assess the usability of both resources in helping translation students to understand and apply correct specialized terminology in the field of the environment (e.g. terminology that is accurate, precise, and idiomatic – depending on the context). It is comprised of three sections: section 2.1 describes the process of selecting the terminology for the study in addition to developing - or in some cases

⁴⁰ It is important to note that while this is an indirect measure of comprehension, it does add a certain level of complexity; however, it is an accessible indicator of comprehension that we believed could be realistically and productively assessed.

⁴¹ We recognize that there are other cognitive processes at play; however, in this study, we evaluate 'terminological understanding' through participants' ability to select the most accurate term in a series of exercises, depending on the context. Application, or in this case, 'terminological usage' refers to the ability of participants to accurately apply the specialized term in a given translation context, i.e. select the most appropriate equivalent English term when translating. A detailed description of these notions will be provided in this chapter.

enriching – both resources; section 2.2 summarizes the development of the study material; and finally, section 2.3 presents the global approach taken in analyzing the data collected.⁴²

2.1 Terminology selection and resource development

The first step in this process was the selection of candidate terms that met the criteria for the two problematic phenomena targeted in this project: polysemy or pseudo-synonymy. An effort was put in to maintain a balance of both types of terms. Secondly, we present a brief overview of the measures taken to create and/or enrich term entries in the DiCoEnviro and create a corpus.

2.1.1 Candidate term selection

It was integral to begin our candidate term search in the DiCoEnviro, as it is a relatively new resource that has a relatively restricted nomenclature.⁴³ We first set out to establish and study the use of a term in a specialized sense in the field of the environment to evaluate its nature and the difficulties it involves and then decided whether to choose it for use in this project using a set of criteria to meet, e.g. evidence of variation of term usage (i.e. the presence of polysemy or pseudo-synonymy in the field based on observation of multiple meanings or closely related concepts) in addition to a complete and well-developed entry in the DiCoEnviro to ensure a good basis for comparison.

⁴² This section is designed to present the procedure for data analysis and does not discuss the details of the data. Instead, it is intended as an introduction to the framework used in the data analysis which is further discussed in detail in [Chapter 3](#).

⁴³ This is important to note, but does not impact the study as we looked at specific terms.

2.1.1.1 The case of *collect*

As an example, we examine the term *collect*, which presents as an interesting case, as it is a verb – a type of term that is viewed far less frequently than nouns as specialized in conceptually based resources. In this case – and as we will discover with other terms – *collect* is also a term that is part of the general lexicon: one can collect rocks, cheques, evidence, etc., but how does it fit into and how is it used in the field of renewable energies? If we are concerned with the harvesting of energy, can we *collect* it from the tides or the wind? Is it more appropriate to write about *extracting* energy from these sources?

Table 4 offers a glimpse into the type and amount of information related to the term *collect* from a variety of sources, both online and in print.⁴⁴ From this, we intend to further illustrate some of the limitations associated with these types of resources.

⁴⁴ This is merely a sampling of the resources that exist. We wanted to present a balance in order to understand the type and amount of information available to translation students. As such, we have included samples from: term banks (e.g. TERMIUM), general online/print lexical resources (e.g. WordReference, Webster's New Universal Unabridged Dictionary), and online bilingual concordancers (e.g. Linguee). All the information for each term is not shown in Table 4; however, it gives us a sample of the information included. In cases where there is specific reference made to an environmental context within these resources, an excerpt pertaining to that case is included.

Resource Type	Example	Sample Information
Term Banks (Online)	<i>TERMIUM</i> ⁴⁵	Subject fields: general vocabulary; mine ventilation, heating and lighting; dust removal; trade, taxation, insurance; geology; trade; museums; private law
General Lexical Resources (Online)	<i>WordReference</i> ⁴⁶	collect [sth] <i>vtr</i> (gather objects as a hobby) He collects model cars. collect [sth] <i>vtr</i> (receive payment) The paperboy collected the money due to him. collect [sth] <i>vtr</i> (accumulate [sth]) The furniture collects dust.
General Lexical Resources (Print)	<i>Webster's Universal Unabridged Dictionary</i> ⁴⁷	1. to gather together; to assemble or bring together; as to <i>collect</i> men into an army; to <i>collect</i> ideas 2. to gain by observation or information; as to <i>collect</i> news 3. to gather from premises; to infer. [Rare] Which sequence, I conceive, is very ill <i>collected</i>
Bilingual Concordancers (Online)	<i>Linguee</i> ⁴⁸	New political groups can only stand for election if they can <i>collect</i> enough signatures and are prepared for police intimidation. It is a taxation issue, a question of predictable, own-source revenues the provinces can <i>collect</i> in order to provide their citizens with the appropriate services. It is also possible to <i>collect</i> data on the number and nature of actual innovations.

Table 4 - Sample resource information for the term *collect*

⁴⁵ This offers insight into the subject fields TERMIUM covers. Complete entry can be found here: http://www.btb.termiumplus.gc.ca/tpv2alpha/alpha-eng.html?lang=eng&i=1&srchtxt=collect&index=alt&codom2nd_wet=1#resultrecs (TERMIUM 2016). Additionally, an example of a complete term entry in TERMIUM is found in Figure 3 in [section 1.2.2.1](#).

⁴⁶ Complete entry can be found here: <http://www.wordreference.com/enfr/collect> (Word Reference 2016).

⁴⁷ Webster's New Universal Unabridged Dictionary 1979: 355.

⁴⁸ This sample shows merely the contexts as they are displayed in English. This source also includes other language equivalents (e.g. French) and the sentence translations (parallel texts). The complete entry can be found here: <http://www.linguee.com/english-french/search?source=auto&query=collect> (Linguee 2016).

2.1.1.2 Candidate terms

Six groups containing a total of 15 terms/acceptations were selected for this study. They include 3 groups that present cases of pseudo-synonymy (each group containing 3 terms) and 3 groups that present cases of polysemy (2 terms each), as seen in Table 5.⁴⁹

Group	Candidate Terms
GROUP 1	<i>capture 3*</i> <i>collect 2*</i> <i>extract*</i>
GROUP 2	<i>sequester</i> <i>separate</i> <i>sort</i>
GROUP 3	<i>harmful</i> <i>hazardous</i> <i>toxic*</i>
GROUP 4	<i>environmental 1^</i> <i>environmental 2^</i>
GROUP 5	<i>level 1^</i> <i>level 2^</i>
GROUP 6	<i>emission 2.1^</i> <i>emission 2.2^</i>

Table 5 - Candidate terms

2.1.2 The DiCoEnviro

The DiCoEnviro, a specialized online environmental dictionary, lists and explains the vast number of links that exist between terms (from various parts of speech) related to the field of the environment and contains entries in four languages: French, English, Spanish, and Portuguese

⁴⁹ Term entries in the DiCoEnviro created by myself for testing are those in Table 5 indicated with an asterisk (*) and those marked with (^) are entries for which contexts were added. All term entry creations and changes were approved by Marie-Claude L'Homme, Director of the DiCoEnviro project.

(L'Homme 2012(a): 240).⁵⁰ As outlined by L'Homme (2012), entries may contain some or all of the following elements, as illustrated in Table 6.⁵¹

⁵⁰ Due to the nature of this study, we focus on the English term entries in this resource; however, it is important to note that there are links which direct the user seeking bilingual or multilingual information to equivalents in other languages.

⁵¹ For the terms included in this study, not every element was included in each entry; however, to qualify for use in the study, each entry was required to contain at least the following: headword, grammatical information, status, actantial structure, contexts, and lexical relations. Table 6 illustrates all informational categories considered relevant in this type of resource for the purposes of this study.

Category	Description
Headword	Lemma accompanied by a number identifying a specific meaning (<i>acception</i>), e.g. <i>emission 2.1</i>
Grammatical Information	Part of speech, gender (French/Spanish), transitivity (verbs)
Status	Indicates partial (2, 1) or complete entries (0)
Subject Field Label	Sub-field of the environment in which the term is used, e.g. climate change, renewable energy, waste management
Actantial Structure	The number of actants and the semantic structure in which they appear
Linguistic Realizations of Actants	Forms in which actants can appear (i.e. be realized) in running text.
Synonyms and Variants	As stated.
Equivalents in Other Languages⁵²	In the form of links to the corresponding term and acception (if available) in English, French, Spanish, Portuguese
Contexts	A sample of 15 – 20 contexts (sentences) chosen by the entry creator from the corpus texts, some of which are annotated. ⁵³
Lexical relations	A list of terms that are semantically related to the headword (including by paradigmatic relationships such as near synonymy, antonymy, and semantic equivalence in the form of other parts of speech, and by syntagmatic relationships, e.g. collocation).

Table 6 - Term entry information categories adapted from L'Homme (2012)

⁵² When entries are available, the equivalents are hyperlinked to the corresponding entries in the online version of the DiCoEnviro. However, even when these links are available in the standard online version, a special version of the DiCoEnviro where equivalents were excluded was used for this study as a control factor, as we were looking strictly at the comprehension and usage of specialized terminology when using monolingual resources.

⁵³ It is not atypical for entries to include a mix of annotated and unannotated contexts; however, as this study focused on the impact of contexts and their annotations on students' understanding and subsequent usage of specialized environmental terminology, all contexts in candidate term entries were annotated.

The term entry creation process for the DiCoEnviro begins with the collection of 15-20 relevant contexts from the environment corpus specifically designed for this project. These are contexts that the entry author feels best represent the typical usage, collocational patterns, and linguistic function, etc. of the term in question, as observed in the corpus data. Following the principles and methodology of ECL and frame semantics, the contexts are then annotated in an XML editor (*Oxygène*) and other relevant information is added (examples seen in Table 6). The annotated contexts are subsequently transformed into HTML when posted on the web, as illustrated in Figures 3 and 4 with the example candidate term, *collect*.⁵⁴

collect 2 Statut : 2

Domaine : renewable energy

to collect: receiver @ - energy 1 @

Contextes

Contextes annotés

- Concentrating solar power (CSP) technologies use mirrors to reflect and concentrate sunlight onto receivers that collect solar energy and convert it to heat. (Source : EERE)
- Accordingly, energy has to be collected from individual collectors before it can be dispatched to the user. (Source : RAHMAN)
- Positive and negative charges are separated by radiation energy in the solar cell and collected for use at the two poles of the cell in the same way as in a battery. (Source : FNET)

Liens lexicaux

Explication	Lexie reliée
Autres parties du discours et dérivés	
Noun	collection

Rédacteur(s) : AS MCLH
Date de mise à jour : 15/05/2015

Figure 3⁵⁵ - Term *collect*₂ the DiCoEnviro

⁵⁴ The process of term entry creation here is merely a summary of the process. For more detailed information, see L’Homme (2012).

⁵⁵ In this example, we see the domain (*domaine*), status (statut), actantial structure, contexts (*contextes*), and lexical relations (*liens lexicaux*). We are presented with three contexts; however, when clicking the hyperlink *contextes annotées*, we are brought to a list of annotated contexts, as shown in Figure 4.

Concentrating solar power (CSP) technologies use mirrors to reflect and concentrate sunlight onto receivers that COLLECT solar energy and convert it to heat. [EERE 0 AS MCLH 08/05/2015]

Accordingly, energy has to BE COLLECTED from individual collectors before it can be dispatched to the user. [RAHMAN 0 AS MCLH 15/05/2015]

Both of these systems COLLECT and absorb solar radiation, then transfer the solar heat directly to the interior space or to a storage system, from which the heat is distributed. [EERE 0 AS MCLH 06/05/2015]

The central receiver COLLECTS and concentrates reflected sunlight from a large field of suntracking collectors (known as heliostats) at the top of a tower as seen in Figure 8. [RAHMAN 0 AS MCLH 06/05/2015]

Since an integral-collector storage system already stores hot water in addition to COLLECTING solar heat. It may be packaged with a demand (tankless or instantaneous) water heater for backup. [EERE 0 AS MCLH 08/05/2015]

From towers to dishes to linear mirrors to troughs, concentrating solar power (CSP) technologies reflect and COLLECT solar heat to generate electricity. [EERE 0 AS MCLH 08/05/2015]

The solar concentrator, or dish, gathers the solar energy coming directly from the sun. The resulting beam of concentrated sunlight is reflected onto a thermal receiver that COLLECTS the solar heat. The dish is mounted on a structure that tracks the sun continuously throughout the day to reflect the highest percentage of sunlight possible onto the thermal receiver. [EERE 0 AS MCLH 08/05/2015]

The heat pump then extracts the heat COLLECTED in the heat transfer fluid in this case, and distributes it throughout the building. [RENEWABLE_ENERGY 0 AS MCLH 06/05/2015]

Heating is best done using wood, hydrocarbons such as propane or diesel, or other solar technologies specifically designed to COLLECT heat. [CANMETENERGY 0 AS MCLH 08/05/2015]

Furthermore, when the heat pump operates in heating mode, it COLLECTS heat from the ground, which reduces the ground temperature near the borehole. In turn, the lower ground temperature decreases the Coefficient of Performance (COP) of the heat pump. [NEJAD 0 AS MCLH 08/05/2015]

COLLECT 2		
Actants		
Destination	Subject (NP) (4) Indirect link (NP) (3) Subject (Pro)	system (2) technology (2) it (the heat pump) receiver that (a thermal receiver) that (receivers)
Patient	Object (NP) (9) Subject (NP)	heat (6) energy (2) radiation sunlight
Autres		
Source	Complement (PP -from) (2)	collector ground
Purpose	Complement (PP -to)	generate electricity
Location	Object (NP)	fluid

Figure 4⁵⁶ - Annotated contexts for *collect₂*

2.1.3 Corpus

The corpus designed for this study is composed of text samples from the field of the environment, with an emphasis on climate change, renewable energies, and waste management. While an effort was made to balance the corpus and represent the specialized field, the process of creating the corpus itself is somewhat different than the typical process outlined in e.g. Bowker and Pearson (2002).⁵⁷ The concern of this study is with the usability and utility of each type of resource; therefore, when creating the testing corpus, we included the excerpts of text from which the DiCoEnviro contexts were extracted. Normally, if students were to use the full corpus that is

⁵⁶ The annotated contexts present in Figure 4 are accessible through the hyperlink *contextes annotées* displayed in Figure 3. In these contexts, the actants are highlighted in various colours. For example, destination is displayed in purple, patient in blue, and source in orange. They are organized in the table at the bottom of the page.

⁵⁷ This is mainly due to the fact that the texts included in our corpus are samples from larger texts taken from the specialized corpus created for the DiCoEnviro project as a whole. The files contained in the corpus were a mix of popularized and semi-popularized texts written by various authors (mainly subject field experts) intended for the public.

queried for contexts to include in the DiCoEnviro, they would see the DiCoEnviro examples in addition to other contexts. This is useful, and of course typical of a corpus; however, in order to ensure that participants did not spend an inordinate amount of time querying countless examples, the corpus contained mainly text excerpts that contained the same contexts found in the DiCoEnviro.⁵⁸

2.1.3.1 InterCorpus

A corpus is nothing without a tool with which to navigate it. In this case, we used InterCorpus, an online concordancer, pictured below in Figure 5. Here, we can see that the interface is in French and that the interface offers many different ways in which to navigate the corpus. One can search for specific types of search terms (e.g. lemma, phrase) (*Type de recherche*) and restrict the search further by using parts of speech (*En tant que*). Additionally, the search can be targeted to show a specific number of occurrences or exclusively occurrences of a certain number of tokens either before or after the *lexie de recherche*.

⁵⁸ As the excerpts included in the corpus were authentic, unedited samples of texts, some contained additional examples of the key term from the corpus, but for the most part, the only text included in the corpus is what users would find in the DiCoEnviro, just in a different format. This served as a control factor in the study and its limitations are discussed in [section 4.3](#).

INTERCORPUS

Langue de travail : Anglais

Corpus : Allison

Type de recherche : Linguistique : par lemme

Lexie L recherchée : collect

En tant que : Verbe

Tri du résultat : Par occurrence, puis par contexte gauche

Nombre maximal d'occurrences : (laissez ce champ vide si vous souhaitez rechercher toutes les occurrences)

Champs optionnels : à au plus mots avant ou après la lexie de référence

© 2008 **OLST** Direction du projet : **Alain Polguère**
 Conception : **Alain Polguère** et **Emmanuel Chieze**
 Réalisation : **Emmanuel Chieze**
 Intercorpus utilise l'outil de traitement linguistique de corpus **Unitex 3.0** réalisé à l'Université Paris-Est Marne-la-Vallée

Figure 5 - InterCorpus interface

As we can see in Figure 6, when we perform a search in InterCorpus, the term searched appears in KWIC (keyword in context) format, highlighting the number of occurrences of the term and the source, in addition to the contexts found in the corpus, allowing individuals to see authentic examples of the term in use. The occurrence of the term appears in the centre of each concordance line.

2.2.1 Part I: Profile questionnaire

The profile questionnaire consisted of 10 questions designed to elicit information related to each participant's educational and professional experience (particularly as it relates to translation) and their self-perceived translation habits, with questions targeting: (1) educational and/or professional translation experience (e.g. previous degrees, previous translation courses completed, etc.); (2) knowledge of and/or usage of a corpus and/or the DiCoEnviro in conducting terminological research; (3) interest in and knowledge of current events and environmental issues; and (4) resources and their usage during a typical translation process.

2.2.2 Part II: Translation Exercise I

Part II was a translation exercise designed to help us to understand each participant's typical translation process for translating specialized environmental texts from French into English, with access to all the resources they would normally use.⁶⁰ It consisted of 15 sentences in total: a collection of short contexts which included examples of all candidate terms. Due to time constraints, participants were divided into two groups, so not all participants translated all 15 sentences. Each participant translated sentences corresponding to one pseudo-synonymous term group and two polysemous term groups.⁶¹

⁶⁰ (A) It is worth noting that participants were also given the option of using paper resources; however, none were requested. Additionally, participants were provided with paper and pencil in case they desired to make notes, etc. While these options were available to students, it was not necessarily encouraged as we made use of screen recording software to observe students' research habits and approaches to the translation process.

(B) Originally, it was thought that students would perform this exercise without having access to any resources; however, it was determined that this was not an accurate representation of the translation process as a whole. Instead of having a non-representational component of the study, it was decided that we would observe what students normally do in order to compare this to what they *said* they would normally do (data collected from the profile questionnaire), what they *actually* do (Translation Exercise I) and subsequently, if either or both of these data points changed after using either the specialized corpus or the DiCoEnviro.

⁶¹ At this point in the study, students have not been exposed to either resource – the corpus or the DiCoEnviro. Therefore, the *terms* (Table 5) with which they work in this exercise do not matter, as the main goal is to observe their usage of resources used in translating (cross checking with the information they provided in the profile questionnaire), and also to observe the natural progression of the translation process as well.

2.2.3 Part III: Comprehension Exercise

Part III of this study consisted of a set of exercises designed to assess participants' comprehension of specialized terminology with relation to their use of both the corpus and the DiCoEnviro. It included three types of exercises, both passive (multiple choice, sense matching) and active (example writing), developed to observe how students conducted research using the resources and subsequently how they developed an understanding of the specialized terms in question. Students were asked to interact with both the corpus and the DiCoEnviro, but never at the same time and always with the corpus first. This was to ensure that students were not “primed” with the type of information that is deemed important in the DiCoEnviro and its annotated contexts before conducting research using the corpus.⁶²

2.2.3.1 Multiple choice

Section I consisted of a series of multiple choice questions where participants were instructed to fill in the blanks with the most appropriate term from the dropdown menu. It featured terms from pseudo-synonymous groupings, as seen in Figure 7.

To _____ viable power from tidal energy, in most cases, the difference in high tide and low tide height must be at least five meters (16 feet). Only 20 to 40 locations on earth have this potential, most of which are located in the Bay of Fundy by Nova Scotia.

- A. capture
- B. collect
- C. extract

Figure 7 - Sample multiple choice question⁶³

⁶² Participants were divided into two groups due to low participation rates (as described [in section 3.1](#)) and as such, dealt with different term groupings with different resources, depending on which group they were in. Even though the terms in question may have been different, the exercises described in this section were of the same type.

⁶³ For complete reference, see [Appendix B \[7\]](#).

In this particular case, we would be looking for the most appropriate term – *capture*. Hypothetically, participants would see this question and the corresponding terminological choices and conduct a search for each one in either the corpus or the DiCoEnviro (depending on which stage of the testing they were at), examine the contexts (whether annotated or not, depending on the resource being used) and subsequently determine which term would be most appropriate given the context with reference to its typical usage as seen in the data presented in both resources.

If participants were using the corpus and conducted a simple search for the term *capture*⁶⁴, they would get 178 results, as seen in Figure 8. The document source would be listed on the left-hand side, the *lexie de recherche* indicated in blue in the middle⁶⁵, surrounded by the rest of the context. If we look halfway down the list of contexts, we see that there are a couple of examples which illustrate contexts similar to the question, e.g. *capture energy from tides*.

⁶⁴ Hopefully avoiding simple errors, e.g. forgetting to change the part of speech to ‘verb’.

⁶⁵ Also indicated in bold and underlined, in the case where copies do not display colour.

Recherche de capture dans le corpus English.Allison : 178 occurrence(s) de la lexie capture et de ses variantes flexionnelles.

13IPCC_sample.txt
 Solar_Energy_Perspectives_2011.txt
 Solar_Energy_Perspectives_2011.txt
 SOURCE INCONNUE
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 SOURCE INCONNUE
 SOURCE INCONNUE
 SOURCE INCONNUE
 SOURCE INCONNUE
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 SOURCE INCONNUE
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 Carbon_dioxide_capture_and_storage.txt
 Carbon_dioxide_capture_and_storage.txt
 5IPCCDYDYDE_sample.txt
 Methane_Climate_change_and_waste_management.txt
 Carbon_dioxide_capture_and_storage.txt
 FEMP_extract.txt
 20pc_Wind_Energy_by_2030_2008.txt
 FEMP_extract.txt
 Renewables_2013.txt
 Renewable_Energy_Sources_2011.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 Climate_change_2013_book_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 ARGYRIADIS_extract.txt
 Ocean_Wind_and_Wave_Energy.txt
 Methane_Climate_change_and_waste_management.txt
 Municipal_Solid_Waste_Organics_Processing.txt
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 Methane_Climate_change_and_waste_management.txt
 SOURCE INCONNUE
 5IPCCDYDYDE_sample.txt
 5IPCCDYDYDE_sample.txt
 Climate_change_2013_book_sample.txt
 20pc_Wind_Energy_by_2030_2008.txt
 SOURCE INCONNUE
 Climate_change_2013_book_sample.txt
 5IPCCDYDYDE_sample.txt

models, which by necessity simplify the energy-economic system, ld represent more than 6 000 years of total energy consumption. ld represent more than 6 000 years of total energy consumption. eral hundred megawatts (or several MtCO₂). Demonstration of CO₂ ase CO₂ on the sea floor or in the deep ocean. The costs of CO₂ Overview of CO₂

Table TS.3. Summary of CO₂

mid-2005, there have been three commercial projects linking CO₂ important when dealing with cross-border projects involving CO₂ fificant sources of CO₂ but have little or no experience with CO₂ to large coal-based and natural gas-based power plants with CO₂

Why the interest in CO₂

ourses and storage opportunities of CO₂ Why the interest in CO₂ imately 50 - 100 US \$ /tCO₂ net mineralized (in addition to CO₂ knowledge of emerging concepts and enabling technologies for CO₂ ibility of CCS on a global scale. Technological options for CO₂ en from natural gas). These sources would be suitable for CO₂ s of applying CCS. These scenarios only take into account CO₂ TS.1 illustrates the three main components of the CCS process: ro Toronto s current landfill, Keele Valley, is equipped with a o a processing plant receiving a concentrated CO₂ stream from a CO₂ emissions in 2020 and 2050, respectively. The emission and ury from all directions. Terminators restrain wave motion and ure. These improvements will allow the rotor to grow larger and urrent energy conversion devices are submerged in sea water and al barrages are essentially dams that cross tidal estuaries and e moved by the wind; these blades would turn the generators and OP) 1. Introduction and framework of this report Carbon dioxide today, although mostly not for the purpose of CO₂ storage. The e CO₂ stream is produced by capturing CO₂ from ambient air. The carbonation process energy required would be 30 to 50 % of the ources in many different countries. Fugitive emissions from the Technologies for the

output. Considering the additional energy requirements for the pured CO₂ gas is typically compressed to a high density at the flow smoothed by accumulators. Model tests have shown that the flow smoothed by accumulators. Model tests have shown that the bustion. Disposal of organic waste in a landfill with a methane ermeable surfaces should be constructed for runoff and leachate geological storage of captured CO₂. However, the integration of re that have the potential to significantly reduce the costs of ewer than 30 in Canada overall. As well, many of the sites with ironmental performance of different types of power systems with assess or compare total plant costs for different systems with on approximately 400-800 MW without capture and 300-700 MW with equestered. 6.5.2.4 Carbon Dioxide Removal by Direct Industrial speed creates a 33% increase in available energy. A turbine can ld mines or former oil fields. This technology is called carbon e Removal Methods Large-scale industrial methods such as carbon e Geoscience Australia). Figure TS.4. (a) CO₂ post-combustion

capture the full complexity of capital stock, its interlinkages and other sou capture and distribute one tenth of one percent of solar energy, and the ener capture and distribute one tenth of one percent of solar energy, and the ener capture on this scale is needed to establish the reliability and environmenta capture and storage will be treated as reductions in emissions or as removals capture and transport to the shoreline (e.g. via pipelines) are not included capture and storage CO₂ is emitted principally from the burning of fossil fue capture costs for new power plants based on current technology. Because these capture and geological storage; the offshore Sleipner natural gas processing capture in an ??Annex B country that is party to the Kyoto Protocol but store capture. With regard to mineral carbonation technology, a major question is h capture on the order of several hundred megawatts (or several MtCO₂). Demonst capture and storage? In 1992, international concern about climate change led capture and storage? In 1992, international concern about climate change led capture and transport costs, but taking into account the additional energy re capture that have the potential to significantly reduce the costs of capture capture are then discussed in Section 3, while Section 4 focuses on methods o capture. Such applications of CCS could reduce dispersed CO₂ emissions from t capture from fossil fuels, and not from biomass sources. However, emissions f capture, transport and storage. All three components are found in industrial capture system as is one of its future sites (Arbor Hill, Mi.). This suggests capture plant (see Figure TS.10). The carbonation process energy required wou capture ranges reflect the inherent uncertainties of scenario and modelling a capture energy through long arms. OWC terminators capture water from an open capture more energy without changing the balance of the system. They will als capture energy from the ocean similar to the way wind tu capture energy as tides flow in and out. POWER. The rate at which energy is c capture the energy of the water flow (Wellinghoff et al., 2008). -- (STOP)let capture and storage (CCS), the subject of this Special Report, is considered capture step involves separating CO₂ from other gaseous products. For fuelbur capture CO₂ could be sequestered in geological reservoirs or the deep ocean. capture plant output. Considering the additional energy requirements for the capture, transport and injection of CO₂ to storage can largely be estimated w capture of CO₂ are relatively well understood today based on industrial exper capture of CO₂, a CCS system with mineral carbonation would require 60 to 180 capture facility. Potential storage methods include injection into underground capture width is up to four times the diameter of the tube. -- (STOP)-- (STOP capture width is up to four times the diameter of the tube. -- (STOP)-- (STOP capture system (as opposed to one without) is a solution from a GHG managemen capture, confinement, and treatment. In some cases, sites located ovpert nat capture, transport and storage in full-scale projects is needed to gain the k capture for new and existing facilities. More specifically, there are knowled capture systems are in place no longer receive waste. In terms of directing o capture to reduce the costs of CCS, and to improve confidence in the cost es capture. The full costs of CCS plants are reported in Section 8. -- (STOP) En capture. Capacity factors vary from 65-85 % for coal plants and 50-95 % for g Capture of Atmospheric Carbon Dioxide capture only a portion of this cubic increase in energy, though, because powe capture and storage and reduces CO₂ emissions into the atmosphere. Another pr capture and storage (CCS), biofuel energy production (without CCS) and reduci capture at a plant in Malaysia. This plant employs a chemical absorption proc

Figure 8 - Intercorpus results for capture₃

Participants would continue with the other two terms, *collect* and *extract*, yielding 72 and 278 results, respectively, as seen in Figures 9 and 10.

Recherche de collect dans le corpus English.Allison : 72 occurrence(s) de la lexie collect et de ses variantes flexionnelles.

Waste_generation_and_management.txt	n minor volumes and is therefore more difficult to separate and	collect. Until now waste management has mainly concentrated on waste streams in the
Energy_101.txt	oughs, concentrating solar power (CSP) technologies reflect and	collect solar heat to generate electricity. A single CSP plant can generate enough
ERE_collect.txt	oughs, concentrating solar power (CSP) technologies reflect and	collect solar heat to generate electricity. A single CSP plant can generate enough
Concentrating_Solar_Power_Basics_collect.txt	oughs, concentrating solar power (CSP) technologies reflect and	collect solar heat to generate electricity. A single CSP plant can generate enough
Energy_gov_2013.txt	or diesel, or other solar technologies specifically designed to	collect heat. Q. Can I use PV modules on my house to reduce my power bill? A. Come
Solar_PhotoVoltaic_Energy.txt	SP. Active solar needs equipment like panels, pumps and fans to	collect and distribute the energy. Passive solar is based on structural design and
Renewable_Energy_Sources_2011.txt	part of recycling chain. This is a major responsibility of us to	collect the e-waste and scrap material for every source such as individual, corpora
Green_Recycling_recycling_chain.txt	distributed sources. CCS involves the use of technology, first to	collect and concentrate the CO2 produced in industrial and energy-related sources,
51PCDCVDDYDE_sample.txt	Both of these systems	collect and absorb solar radiation, then transfer the solar heat directly to the in
Space_Heating_and_Cooling_2011.txt	Active solar space heating systems	collect and absorb solar energy and use electric fans or pumps to transfer and dist
ERE_collect.txt	mirrors to reflect and concentrate sunlight onto receivers that	collect solar energy and convert it to heat. This thermal energy can then be used t
Concentrating_Solar_Power_Basics_collect.txt	mirrors to reflect and concentrate sunlight onto receivers that	collect solar energy and convert it to heat. This thermal energy can then be used t
Energy_gov_2013.txt	mirrors to reflect and concentrate sunlight onto receivers that	collect solar energy and convert it to heat. This thermal energy can then be used t
A_Word_of_Science_sample.txt	external bladder, they rise to the surface. On the way up, they	collect information on temperature and salinity (some also measure oxygen), which t
English.Allison/ERE_	collect.txt#4	OP)-- (STOP)Borehole length by using a supplementary source of energy. Most recent
English.Allison/Concentrating_Solar_Power_Basics_	collect.txt#4	ale, firm, dispatchable renewable energy option that can help meet our nation's dem
English.Allison/Concentrating_Solar_Power_Basics_	collect.txt#4	and a quarter from 1995 levels h
Waste_Management_Guide_Dalhousie_University.txt	aper in an ICI organization. Paper is ordered, delivered, used,	able energy option that can help meet our nation's demand for electricity. CSP pla
Ency_sample.txt	ave had to turn to the chemical and physical properties of ice,	collected, stored, and transported all at ICI organizations. Every time a piece of
Hazardous_Waste_Management_Def.txt	leachate trapped in the fill, and the lower serves as a backup,	collected from ice cores drilled in Greenland and Antarctica. As snow is laid down
MSW_Organics_Processing.txt	that has been accumulated and pressurized by the generator, and	Collected leachate is pumped to a treatment plant. In order to reduce the amount of
Incineration_Issues.txt	cluding relatively fine materials passing through the grate and	collected separately from household hazardous material and non-combustible material
Space_Heating_and_Cooling_2011.txt	ee energy. The water is circulated through insulated piping and	collected at the bottom of the combustion chamber. Grate siftings are usually combi
Green_Power.txt	lite TV receiver) is used to focus the light from the sun to be	collected in hot water storage tanks. This water is then distributed to radiators i
Green_Power.txt	d throughout the collector field. Accordingly, energy has to be	collected. The parabolic dish solar thermal system employs a point-focusingReflecto
Green_Recycling_recycling_chain.txt	ies is lacking and a recycling chain cannot be established. The	collected from individual collectors before it can be disp
From_e_waste_to_resources.txt	ies is lacking and a recycling chain cannot be established. The	collected equipment is sorted and then enters a pre-treatment step. 2. Dismantling
Ency_sample.txt	with predominantly morning draw because they lose most of the	collected equipment is sorted and then enters a pre-treatment step. The aim of dias
Solar_Water_Heater_Basics.txt	stem; and (2) a control device capable of reducing NMOCs in the	collected water and the effects of wind. Time series can be constructed and analysi
Methane_Climate_change_and_waste_management.txt	l energy. A good thermal conductivity is needed to transfer the	collected energy overnight. Thermosyphon systems -- (STOP)Thermosyphon systems Eng
Solar_Energy_Perspectives_2011.txt	occurring radioactive elements found in uranium ore. These are	collected gas by 98 weight-percent. If an enclosed combustor is used, the device mu
Nuclear_Waste_Management.txt	radioactive elements naturally found in uranium ore. These are	collected heat from the absorber sheet to the absorber pipes, where the heat is tra
Radioactive_Waste_Management.txt	nd to keep our environment clean and green. When no devices are	collected in engineered tailings dams and finally covered with a layer of clay and
Green_Recycling_recycling_chain.txt	innovative recycling technologies/systems. When no devices are	collected, the feed material is dismantling, preprocessing and end-processing facili
From_e_waste_to_resources.txt	f about 3. With such a COP, in heating, two units of energy are	collected from the ground and three are delivered in the house with one unit provid
NEJAD_extract.txt	. Point of service reports can include average weights of waste	collected from individual locations over extended periods of time. It may also be w
Waste_Management_Guide_Dalhousie_University.txt	ste collection and recycling system which diverts 85 percent of	collected waste and employs 40,000 people. -- (STOP) English.Allison/Waste
Waste_Incineration_A_dying_Technology.txt	ats have been able to construct evidence of climate change from	collected information on temperature, rainfall and other weather variables from mea
Ency_sample.txt	a recently, observations of surface ocean temperature have been	collected to provide a more accurate picture of the global average surface temperat
Ency_sample.txt	construct climates thousands of years ago. Ice cores have been	collected from Antarctica in the Southern Hemisphere and Greenland in the Northern
Ency_sample.txt	ot-used and wasted. The valuable help. Other updates have been	collected from binary plants on the reinjection stream could be a very valuable of
BETANI_extract.txt	a measured most simply by noting periodically how much has been	collected in an exposed vessel since the time of the last observation. Care must be
Ency_sample.txt	of coarse non-combustible materials and unburned organic matter	collected at the outlet of the combustion chamber in a quenching/cooling tank. Gra
Incineration_Issues.txt	a function of cell area and light intensity. The electricity is	collected and transported by metallic contacts placed on both surfaces of the cell.
Green_Power.txt	r a particular period of time. Such records of climate elements	collected over time are known as time series . The most commonly measured element i
Ency_sample.txt	a linear focus. If used for electricity production, the heat	collected in the distributed receivers is sent to a central location where the ener
Green_Power.txt	sunlight on fluid-filled metal tubes enclosed in glass. The heat	collected drives steam generators similar to those that run coal-fired power plants
Why_not_the_sun_2008.txt	circulated to a heat pump. The heat pump then extracts the heat	collected in the heat transfer fluid in this case, and distributes it throughout th
Geothermal_Basics.txt		

Figure 9 - Intercorpus results for collect

NEJAD_extract.txt	sults, including cumulative heat pump energy consumption (W),	extracted energy hp from the ground (q), and injected solar energy to the borehole (q) for
NEJAD_extract.txt	hole length (H), cumulative heat pump energy consumption (W),	extracted energy from the ground (q), and injected solar energy to the borehole (q) are hp
NEJAD_extract.txt	a small portion of solar energy injected into the ground can be	extracted after a month from the first injection. They injected solar energy to a shallow sin
NEJAD_extract.txt	a small portion of solar energy injected into the ground can be	extracted after a month from the first injection. They injected solar energy to a shallow sin
Geothermal_Heat_Pumps.txt	be that 10% of the raw energy I_{raw} produced by the tide can be	extracted without causing undue modification to the flow characteristics. Tidal currents repr
BRVDN_extract.txt	be that 10% of the raw energy flux produced by the tide can be	extracted without causing undue modification to the flow characteristics. Tidal currents repr
Marine_Energy_Extraction.txt	rd through time. Information concerning these conditions can be	extracted from ice that has survived the summer melt by physical and chemical means. Paleoc
Ency_sample.txt	e. Due to the limited size of the device, the power that can be	extracted for longer wave periods is much smaller than the former bound. Budal and Falnes (19
ARGYRIADIS_extract.txt	Figure 7. Two upper bounds for the power that can be	extracted from a sinusoidal wave of height H and period T by means of an immersed body of vol
ARGYRIADIS_extract.txt	07) presents an upper bound to the amount of energy that can be	extracted by an oscillating system (line PA in the graph of Figure 7). Optimum wave interfere
ARGYRIADIS_extract.txt	; however, there are limits to the amount of energy that can be	extracted from the waves. Considering optimal wave interference, English.Allison/ARGYRIADIS
Ocean_Kind_and_Wave_Energy.txt	e plate as the wave passes through the plate. The energy can be	extracted with a water turbine. The concept was re-examined by Ozer and Ozdamar (2007) who ca
ARGYRIADIS_extract.txt	e plate as the wave passes through the plate. The energy can be	extracted with a water turbine. The concept was re-examined by Ozer and Ozdamar (2007) who ca
NEJAD_extract.txt	the total accumulated energy could eventually be	extracted due to the heat dissipation into the ground and heat losses to the surface. -- (STO
Geothermal_Heat_Pumps.txt	h. Only 32% of the total accumulated energy could eventually be	extracted due to the heat dissipation into the ground and heat losses to the surface. In orde
BETANI_extract.txt	G members and Affiliated Organizations, and we energy from the	extracted fluid is lost, being reinjected at would like to acknowledge all IGA friends for th
NEJAD_extract.txt	p Laplace transform operator q	extracted energy from the ground (kWh) b
NEJAD_extract.txt	represented by the node P at the center (shown in Figure 5-2) q	extracted energy from the ground (kWh) b
ARGYRIADIS_extract.txt	est; it is known that there is a relationship between the power	extracted energy from the ground (kWh) b
NEJAD_extract.txt	e parallel arrangement. In all three cases, the amount of power	extracted from the heat pump -- (STOP) leg is fixed at
ERIKSSON_extract.txt	Power control It is imperative to control the amount of power	extracted from the wind and to be able to stop the turbine at high wind speeds. Most HAWTs us
Turbine_Concepts_for_Wind_Power.txt	Power control It is imperative to control the amount of power	extracted from the wind and to be able to stop the turbine at high wind speeds. Most HAWTs us
ScanadaICC_sample.txt	after 2 - Enhancing the greenhouse effect Analyses of ice cores	extracted from the polar ice caps provide some important clues about the past relationship be
51PCDCVDDYDE_sample.txt	nufacture of fertilizers and other products. Some of the CO2 is	extracted from natural wells, and some originates from industrial sources - mainly high-conce
Space_Heating_and_Cooling_2011.txt	ages over conventional methods of central heating. Hot water is	extracted year round from an award winning evacuated tube system on your roof, capitalizing o
NEJAD_extract.txt	ion of saturated porous media in a cylindrical capsule. Heat is	extracted from the outer surface of the capsule using a copper heat exchanger wrapped and sol
NEJAD_extract.txt	ration. As shown in the left portion of Table 4-2, more heat is	extracted from the ground for Case 2 (3.04 kWh/year) for Case 3 and 2.
NEJAD_extract.txt	ity of the borehole decreases over the years since more heat is	extracted from the ground than the amount rejected during the cooling season. Bernier (2000)
NEJAD_extract.txt	gradually over time. This is due to the fact that more heat is	extracted from the ground than the amount rejected during the cooling season (if the heat pu
NEJAD_extract.txt	gradually over time. This is due to the fact that more heat is	extracted from the ground than the amount rejected during the cooling season. For example, Be
NEJAD_extract.txt	67 that more heat is	extracted from the ground than the amount rejected during the cooling season. Thus, the grou
NEJAD_extract.txt	e 5-15(a)), the values of T and T decrease over time as heat is	extracted for b lnhp heat pump operation. At about t=1800 hours, T reaches the freezing point
NEJAD_extract.txt	ls as the heat required by the 1-3,2-4 parallel arrangement is	extracted from the ground, while the hp leg of the double U-tube with two independent circuit
BRVDN_extract.txt	variation when 10% of the cross channel kinetic energy I_{raw} is	extracted 2000 m from the channel entrance by application of Eq. (7). In this English.Allison
ARGYRIADIS_extract.txt	needed by one degree of freedom articulation and the energy is	extracted from the waves and the horizontal drift forces. Retzler (2006) presented the result
ARGYRIADIS_extract.txt	fuel averaged flow rate, it can be shown that as more energy is	extracted, the flow rate decreases; and at some stage, increasing the number/size of tidal
21PCBCIODIVERSITE_sample.txt	is Fuelwood in many regions is traditionally the dominant biomass	extracted from forests, with significant implications for biodiversity. The fuel wood used fr
NEJAD_extract.txt	such as length, spacing and buried depth on the amount of heat	extracted from the ground and on the ground temperature was evaluated. Results indicated th
Waste_Incineration.txt	. In the linear model of the human economy, materials are first	extracted from nature, then processed into goods, then consumed, and finally discarded. When
NEJAD_extract.txt	ergy is injected into the borehole, thereby reducing the energy	extracted from the ground by 67% compared to case 1 (8.62 MWh/year in Case 1 to 2.85 MWh/year
NEJAD_extract.txt	ide the heating requirements. Results indicated that the energy	extracted from the ground in winter is 75.5% of the heat injected into the ground in summer.
NEJAD_extract.txt	heat pump system, reduces by 15% and 19% the amount of energy	extracted from the ground by the heat pump. It is also shown that, for a ground thermal condu
NEJAD_extract.txt	s flow rates and specific heats are equal, the amount of energy	extracted from the hp-circuit and rejected by the hc-circuit is the same and there is no heat
NEJAD_extract.txt	the heat pump. The amount of energy	extracted from the ground in Case 1 is, respectively, 194% and 168% higher than in Cases 2 an
NEJAD_extract.txt	s injected into the borehole which reduces the amount of energy	extracted from the ground by 66% compared to Case 1a (from 8350 down to 28 10 kWh). Furtherm
NEJAD_extract.txt	g using the proposed configuration reduces the amount of energy	extracted from the ground significantly. However, the decreases in the required borehole leng
Double_U_tube_geothermal_borehole.txt	g using the proposed configuration reduces the amount of energy	extracted from the ground significantly. However, the decreases in the required borehole leng
NEJAD_extract.txt	g using the proposed configuration reduces the amount of energy	extracted from the ground significantly. ----- Page 155-----
NEJAD_extract.txt	rehole wall temperature of zero (i.e., the net amount of energy	extracted from the ground is equal to zero). Results show that heat transfer between the hot
NEJAD_extract.txt	ature, I_{raw} , of zero. This implies that the net amount of energy	extracted from the ground is b equal to zero since the borehole wall temperature is equal to
NEJAD_extract.txt	is much lower than the ground freezing point, the total energy	extracted from the ground comes mainly from the latent heat of fusion of the water in the gro
NEJAD_extract.txt	is much lower than the ground freezing point, the total energy	extracted from the ground comes mainly from the latent heat of fusion of the water in the gro
BRVDN_extract.txt	to be counter intuitive as almost 54 MW is being artificially	extracted in the case presented. The answer to this paradox lies in the realization that the

Figure 10 - Intercorpus results for extract

When conducting a simple search in the DiCoEnviro for the term *capture*, participants would see a term entry (Figure 11) in addition to annotated contexts, illustrating the numerous actants at play (Figure 12). In this case, we are presented with the same contexts as were seen in InterCorpus; however, the main difference is in terms of presentation, layout, and annotations. The contexts have been annotated to highlight the actantial structure for the specific term to highlight elements of a phrase that are of importance in addition to collocations.

capture ₃, vt

Statut : 2

Domaine : renewable energy

capture: **system** @ ~ **energy** ₁ @ from **sun** @

Contextes

Contextes annotés

- Concentrating solar power (CSP) systems use either lenses or mirrors to capture large amounts of solar energy and focus it down to a smaller region of space. (Source : Renewable Energy Sources 2011)
- Chapter 2 considers the huge solar resource and its distribution over time and space. It briefly introduces the technologies that capture and use energy from the sun. (Source : Solar Energy Perspectives 2011)
- Novel thin-film cells are layered to capture more of the sun's energy. (Source : DEO Solar Technologies Program 2006)

Rédacteur(s) : AS MCLH
Date de mise à jour : 13/06/2015

Figure 11 - Term entry in DiCoEnviro for *capture*₃

Concentrating solar power (CSP) systems use either lenses or mirrors to CAPTURE large amounts of solar energy and focus it down to a smaller region of space. [Renewable Energy Sources 2011 0 AS MCLH 07/06/2015]

Chapter 2 considers the huge solar resource and its distribution over time and space. It briefly introduces the technologies that CAPTURE and use energy from the sun. [Solar Energy Perspectives 2011 0 AS MCLH 07/06/2015]

Novel thin-film cells are layered to CAPTURE more of the sun's energy. [DEO Solar Technologies Program 2006 0 AS MCLH 07/06/2015]

Figure TS.3.1 illustrates the types of passive and active solar technologies currently in use to CAPTURE the Sun's energy to provide both residential energy services and direct electricity. In this summary, only technologies for active heating and electricity are treated in depth. [Renewable Energy Sources 2011 0 AS MCLH 07/06/2015]

Hydrokinetic devices being developed to CAPTURE energy from tides and currents may also be deployed inland in both free-flowing rivers and in engineered waterways. [Renewable Energy Sources 2011 0 AS MCLH 07/06/2015]

One type of these systems relies on underwater turbines, either horizontal or vertical. Large turbine blades would be driven by the moving water, just as windmill blades are moved by the wind; these blades would turn the generators and CAPTURE the energy of the water flow. [Renewable Energy Sources 2011 0 AS 01/06/2015]

While proven fossil reserves represent 46 years (oil), 58 years (natural gas) and almost 150 years (coal) of consumption at current rates (IEA, 2010b), the energy received by the sun in one single year, if entirely CAPTURED and stored, would represent more than 6 000 years of total energy consumption. Capture and distribute one tenth of one percent of, and the energy supply problem disappears. [Solar Energy Perspectives 2011 0 AS MCLH 13/06/2015]

This refers to the absorption of photons at three different energy levels, corresponding to three different band gaps. In practical terms, this enables the system to CAPTURE low energy photons that would otherwise pass through a conventional solar cell and be lost. [Photovoltaic Solar Energy 2009 0 AS 01/06/2015]

An alternative to polysilicon solar cells is thin film, which uses metallic compounds to CAPTURE the sun's energy. [Why Not the Sun 2008 0 AS 01/06/2015]

Turbines are also rising higher and being outfitted with longer blades to CAPTURE more energy. [Renewables 2013 0 AS 01/06/2015]

Energy CAPTURED from ocean waves (generated by wind passing over the surface), tides, salinity gradients, and ocean temperature differences. [Renewables 2013 0 AS 01/06/2015]

Wave energy converters CAPTURE the energy of surface waves to generate electricity; [Renewables 2013 0 AS MCLH 13/06/2015]

These improvements will allow the rotor to grow larger and CAPTURE more energy without changing the balance of the system. They will also improve energy capture for a given capacity, thereby increasing the capacity factor. [20% wind energy by 2030 2008 0 AS MCLH 07/06/2015]

A turbine can CAPTURE only a portion of this cubic increase in energy, though, because power above the level for which the electrical system has been designed, referred to as the rated power, is allowed to pass through the rotor. [20% wind energy by 2030 2008 0 AS MCLH 07/06/2015]

Like old-fashioned windmills, today's wind turbines use blades to CAPTURE the wind's kinetic energy. Wind turbines work because they slow down the speed of the wind. [The NEED Project 2012 0 AS MCLH 07/06/2015]

Figure 12 - Annotated contexts in DiCoEnviro for *capture*₃

This is seen in contrast to both entries in the DiCoEnviro for *collect* and *extract*, which yield the following entries, as seen in Figures 13 and 14.

collect ₂ ,

Statut : 2

Domaine : renewable energy

to collect: [receiver](#) @ ~ [energy](#) ₁ @

Contextes

Contextes annotés

- Concentrating solar power (CSP) technologies use mirrors to reflect and concentrate sunlight onto receivers that collect solar energy and convert it to heat. (Source : EERE)
- Accordingly, energy has to be collected from individual collectors before it can be dispatched to the user. (Source : RAHMAN)
- Positive and negative charges are separated by radiation energy in the solar cell and collected for use at the two poles of the cell in the same way as in a battery. (Source : FMET)

Liens lexicaux

Explication	Lexie reliée
Autres parties du discours et dérivés	
Noun	collection

Rédacteur(s) : AS MCLH
Date de mise à jour : 15/05/2015

Figure 13 - Term entry in DiCoEnviro for *collect*₂

extract ₁ , vt

Statut : 2

Domaine : renewable energy

to extract: [human](#) ₁ , [heat pump](#) @ ~ [heat](#) ₁ @ from [ground](#) @

Contextes

Contextes annotés

- Research focuses on two types of OTEC technologies to extract thermal energy and convert it to electric power: closed cycle and open cycle. (Source : FEMP)
- A system is adapted to extract energy from flowing liquid. It includes at least one vertically-extending vane adapted to move in response to the flowing liquid. (Source : BLANCO)
- Based on a series of experiments, Georgiev et al. (2006) indicated that only a small portion of solar energy injected into the ground can be extracted after a month from the first injection (Source : NEJAD)

Liens lexicaux

Explication	Lexie reliée
Voisins	
≈	mine ₁
Autres parties du discours et dérivés	
Noun	extraction

Rédacteur(s) : AS MCLH
Date de mise à jour : 15/05/2015

Figure 14 - Term entry in DiCoEnviro for *extract*₁

With the contexts (InterCorpus) and term entries/annotated contexts (DiCoEnviro), differences in term usage begin to emerge as we see that solar heat/radiation/sunlight are typically *collected* from a receiver/heat pump/technology passively and heat/liquid/power/energy is typically actively *extracted* from a source (e.g. ground/wind).

In this case, the selection of the most appropriate term was assigned a value of 1 mark which then contributed to each participant's total score used to help illustrate the effectiveness of each resource, as described in [section 2.2.1](#).

2.2.3.2 Sense Matching

Section II comprised of a series of sense matching exercises, targeting the polysemous terminological groupings. Students were given examples of the various senses in question and then were given four contexts, which they had to match with the correct sense as seen in the example, Figure 15.

<p>SENSE A: <i>Positive environmental impacts can include reduced emission of atmospheric pollutants, reclamation of degraded land, and potentially a reduction of pressure on forests to the extent that fuelwood derived from such sources is replaced by other energy sources.</i></p> <p>SENSE B: <i>Many respondents looked into the e-bike specifically so that they could meet their goals that were motivated by their environmental values to drive their cars less frequently.</i></p>
<p>However, other ENVIRONMENTAL impacts such as effects on acid rain production, ozone depletion, ecosystem destruction, release of carcinogens, etc. are often overlooked in studies and popular media coverage.</p>
<p>Businesses are expected to lead in the area of ENVIRONMENTAL sustainability as they are considered to be the biggest contributors and are also in a position where they can make a significant difference.</p>
<p>An analysis of current ENVIRONMENTAL goals and targets shows that the successful ones are built on general support from society and a scientific consensus that the problem exists and is urgent.</p>
<p>The use of fossil energy is the main contributor to many ENVIRONMENTAL pressures and the fuels will ultimately be depleted.</p>

Figure 15 - Sense matching exercise sample⁶⁶

The anticipated process for these particular exercises is similar to that described in section 2.2.3.1 with regard to the multiple choice style questions. The main difference is that in this case,

⁶⁶ For complete reference, see [Appendix B \[1, 2, 4, 5, 6\]](#).

participants are given two different senses and it is up to them, based on the contexts presented, to match the senses with their corresponding acceptions.

When participants use the corpus to conduct a search for a specific term, the results do not display the distinctions made between senses. As a result, students are forced to rely on other elements of the contexts in order to determine the difference between the senses. This exercise therefore had potential to be more challenging for participants.

On the other hand, when participants use the DiCoEnviro, sense distinctions are made explicit and are separated in different entries. Accordingly, it becomes the participant's job to 'match' each use with its proper acception, or rather with the particular sense (A or B) listed in the actual exercise.

For this series of exercises, students were assigned one point for each correct sense identification, contributing to their total effectiveness scores.

2.2.3.3 Example creation

In section III, the final component of Part II, students were asked to create an example showing the term as it would typically appear in a sentence found in a text from the field of the environment. It focused mainly on pseudo-synonymous terms. It is assumed that students would have developed an understanding of the terms in question at this point in the study, or could reference the resources for inspiration, drawing on common actants displayed in each context.

In this case, the assignment of points was different than the process outlined in section 2.2.3.1 and 2.2.3.2. Results were evaluated on a two-point system: 1 point for demonstrating

knowledge of the correct sense of the term and another point for ensuring the presence of key actants within the example that corresponded to those found in the contexts.

For example, participants were asked to create an example showing the typical use of the pseudo-synonymous verb, *sequester*. Figure 16 illustrates the results displayed in the DiCoEnviro if one were to conduct a simple search for this term.

sequester ₁, vt

sequester: **human** ₁ ~ **carbon dioxide** ₁ in **reservoir** ₂

Statut : 2

Contextes

Contextes annotés

- Forest management activities that can be used to sequester carbon in above- and below-ground biomass and soil organic carbon may also have positive or negative effects on biodiversity. ([Source](#) : 2IPCCBIODIVERSITE)
- One variant is to harvest biomass for energy production and sequester the emitted CO2 (BECCS). ([Source](#) : WG1AR5GB)
- The IPCC SAR estimated that about 60 to 87GtC could be conserved or sequestered in forests by the year 2050 and another 23 to 44GtC could be sequestered in agricultural soils. ([Source](#) : 8IPCCATTENUATION)

Liens lexicaux

[Réacteur\(s\)](#) : ALS SB MCLH AMG
[Date de mise à jour](#) : 29/03/2015

Figure 16 - Term entry in DiCoEnviro for *sequester*₁

In this example, we can see that there are three main actants at play: agent, patient, and location. This is further illustrated in Figure 17, where we see examples of the annotated contexts and the three actants.

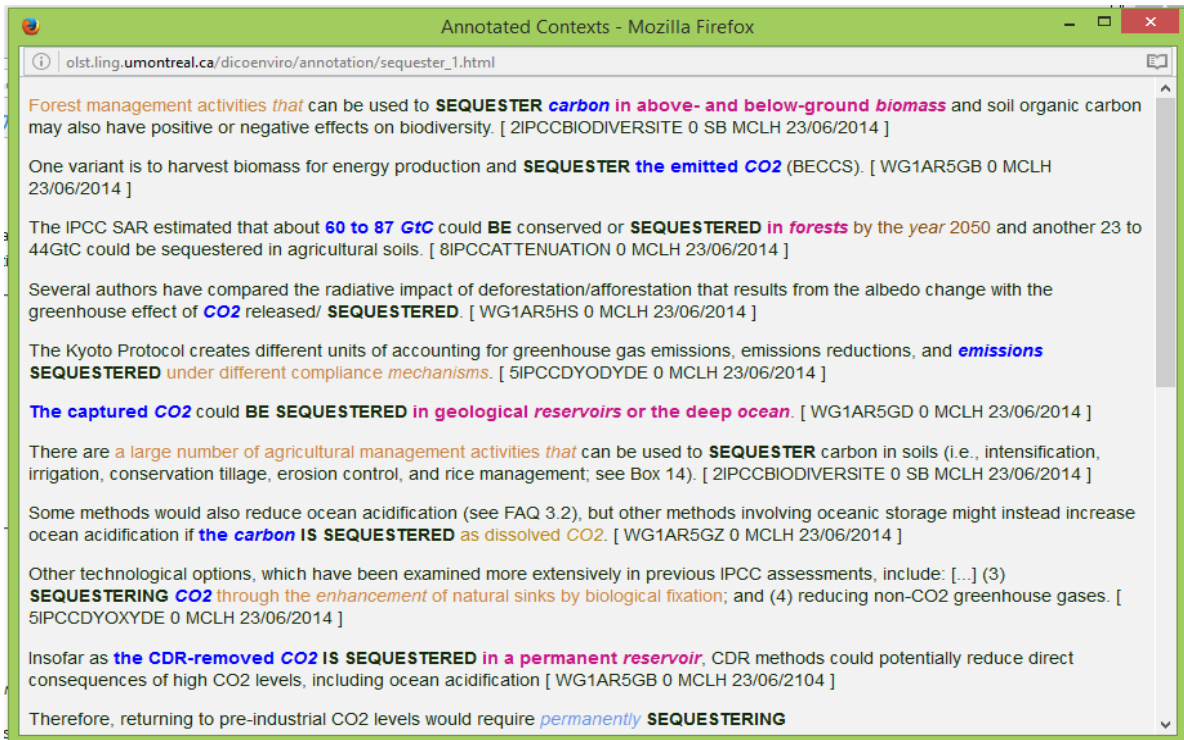


Figure 17 - Annotated contexts for sequester1 in DiCoEnviro

The example below (Figure 18) shows a complete understanding of these elements and would be assigned in order to achieve the maximum number of points.⁶⁷

Fossil fuel extraction releases CO₂ that had been sequestered in the soil for thousands of years.

Figure 18 - Sample example creation using the term *sequester₁*

2.2.4 Part IV: Usage exercise

Part IV was deemed the “usage exercise” (and is referred to as Translation Exercise II throughout) as it was designed to have participants revisit a series of translation exercises similar

⁶⁷ While the actantial structure indicates that there is an agent, it is not necessary, however, for it to be explicitly stated in an example. Therefore, participants would receive full marks for comprehension of the term in this case as they demonstrated their knowledge of carbon dioxide being *sequestered from* the soil.

to those seen in Part I, with the added expectation that students were encouraged to make use of the other resources – the corpus and the DiCoEnviro – in addition to those they regularly used when translating. This exercise offered information on how participants interacted with all resources, how they processed information, and how they translated the contexts in question.

To simplify the assessment of correct terminological usage, each sentence was evaluated on a 3-point scale: 1 point was assigned for a correct usage of the term, 1 point was assigned for the correct collocation, and 1 point was assigned for overall sentence cohesion and transfer of meaning.⁶⁸

2.2.5 Part V: Follow-up questionnaire

As a final component of the study, participants were asked to fill out a brief questionnaire where they described their overall impressions of both resources in terms of usability factors (e.g. satisfaction, learnability). It consisted of 7 questions, where participants were asked to rate: (1) their confidence with both resources; (2) their overall impressions of each resource with respect to layout, ease of navigation, and search controls; and (3) their response to elements of each resource with regard to comprehension and usage of terms specifically. Additionally, participants were encouraged to share their thoughts on whether or not either resource would be beneficial to them in the future.

⁶⁸ This is, of course, a very simplified assessment of translation. This was done on purpose in order to focus on the element in question – correct terminological usage in a translation context. It is worth noting as well that I (as the principal researcher) evaluated participants’ translation performance personally, rather than calling upon evaluators for more neutrality. This is in part due to time limitations associated with this project and partly due to the fact that this is just one of several components of the study that was examined.

2.2.6 Layout, intention, and tools

Both quantitative and qualitative data were collected by means of the FluidSurveys online survey tool, in addition to Camtasia Studio computer screen video-capture. The type of tool, its purpose, as well as the type of data collected are summarized in Table 7.

Tool	Purpose	Data type
FluidSurveys Survey Tool	Participants completed parts I-V online, on a laptop, from the link provided.	Quantitative and qualitative
Camtasia Studio Screen Recording	Screen recording gave us the ability to track participant efficiency and learnability statistics.	Observational Quantitative and qualitative

Table 7 - Data Collection Methods

In the following section, we describe the ways in which the data obtained from these two data sources were analyzed, as per the main three elements of usability – effectiveness, efficiency, and satisfaction.

2.3 Results analysis

Data collected from parts I through V of the study enable us to offer insight into common trends in the activity of the translation students.⁶⁹ As highlighted in Chapter 1, our analysis is more suitable for initial exploration and qualitative analysis, which will include a description of the types of problems participants encountered and their effects, their patterns of use (e.g. referring back to the resources), and the variability of these patterns between individuals and within each individual’s experience. Six participants were recruited for this study, which does limit the extent to which we can analyze the results quantitatively; however, enough data was gathered from the screen recordings, questionnaires, and survey data to allow us to describe apparent trends

⁶⁹ A full detailed account of the data collected is found in [Chapter 3](#). These trends are phenomena encountered by the participants of this study, which we expect will reflect students’ broader experiences with the resources.

qualitatively.⁷⁰ Overall, the analysis of the data contributes to our understanding of how we can work towards improving the creation and development of specialized resources for translation students, and subsequently deliberate its potential for translator training.

As we were looking at specialized resources and how they contribute to participants' comprehension and usage of specialized terminology, we used usability factors (e.g. effectiveness, efficiency, and satisfaction) to pinpoint trends in the data, as described in the following sections.

2.3.1 Effectiveness

The data collected from the exercises in Part II and Part III (comprehension and usage exercises respectively) were tabulated to give participants a final score based on their ability to select the most appropriate term as described above, i.e. the term that best reflects common specialized usage as it is represented in the corpus and other resources, in each case.

The scores for each participant for each section were determined in the form of a percentage and were accompanied by group averages (A and B) and all-participant averages to provide a basis for comparison. This was done separately for comprehension exercises with both the corpus and the DiCoEnviro and subsequently for the usage exercises (Translation exercise I and Translation exercise II).

These results could not be viewed in isolation, however, as time efficiency is an important component of a translator's job, as described below.

⁷⁰ This can be done with the help of the usability studies described in [section 1.3.2.5](#).

2.3.2 Efficiency

The time it took for participants to complete each task was very important in determining the usability of each resource. Time taken to complete each section of the study was measured, in addition to time spent using each resource (as measured using the screen capture videos).

The data presented in this section followed the same pattern as described above in section 2.3.1 in that the efficiency of participants was organized into two sections: (1) comprehension and (2) usage. For example, the total time a participant spent on the comprehension exercises completed with the corpus was tabulated. From that, we determined the percentage of time the participant spent interacting with the resource. We could then compare the efficiency scores of each participant individually, as a particular unit or as an entire group. This process was repeated for the data obtained from the comprehension exercises completed with the DiCoEnviro. We could then compare both data sets to determine which resource helped students to complete the exercises the fastest. In addition to total times and times spent interacting with each resource, we also determined participants' error rates, including additional time spent on a task as a result of a search which produced no results. This was also linked to an analysis and discussion of common search strategies observed when using both resources.

As for translation exercises I and II, we presented the total time spent on task for each participant (also highlighting group A, B, and whole group averages). As determined in the profile questionnaire, participants admitted to using term banks, bilingual concordancers, and online general lexical resources the most during the translation process and this was also observed in the screen recordings. We highlighted the differences in times each participant spent interacting with samples of these types of resources (e.g. TERMIUM, Linguee, and WordReference) in translation exercises I and II. For Translation exercise II, we added the efficiency scores of both the corpus

and the DiCoEnviro for comparison as participants were encouraged to use both resources for this final selection of translation exercises.

2.2.3 Satisfaction

Participants' satisfaction with the resources was measured in different ways, but mainly focused on the data collected from the follow-up questionnaire. Satisfaction scores were based on a series of questions in which participants rated their perceptions on a scale from 1 to 4.⁷¹ The questions were focused on the presentation and content of each resource, in addition to their overall confidence that participants felt with their responses when using the resources, and their final thoughts.

In Part III, as participants had the option of using the resources with which they normally work, in addition to the corpus or the DiCoEnviro, we observed which resource they chose to access first (if at all), as well as the time spent with each resource, contributing to the resource satisfaction scores as well.⁷²

Analyzing the data obtained for this study through three lenses – effectiveness, efficiency, and satisfaction – enables us to get a real sense of how students interact with both resources and their impact on students' comprehension and usage of specialized terms. It provides us with an

⁷¹ In order to determine coherent and consistent satisfaction scores from the 4-point scale assigned to these particular questions, we multiplied the number of participants in each 'confidence category' (i.e. the number of participants who indicated their feeling on a scale from 1-4) to give each question a total 'satisfaction score'. Based on the number of participants and the highest achievable rating, a 100% confidence rate with either resource would be indicated by a score of 24. If all participants indicated high levels of confidence, etc. this would be represented by a numerical score of 3 or 4. Therefore, a high satisfaction score would equate to at least 18 (6 participants x value rating of 3) out of a possible 24, or 75%.

For example, if 3 participants indicated 'extremely confident' (a numerical value of 4) in their responses when using the DiCoEnviro, this would equate to 12 points. Additionally, if the other 3 participants indicated 'not at all confident' (a numerical value of 1), then this would add up to 3 points. The total would therefore be 15/24, or a satisfaction score of 63%, indicating that participants, on average, were somewhat satisfied.

⁷² Both selection of and time spent with each resource are indirect measures of satisfaction. When participants willingly choose to use a resource, this choice, coupled with frequency of use, can help to deduce satisfaction levels.

organized framework through which to describe the data, and in Chapter 3, we describe the data collected for this study and analyze the trends presented.

	Evaluation	Metrics
Effectiveness	Were the corpus and/or the DiCoEnviro effective in helping students to select the most appropriate terminology in both comprehension and usage circumstances?	Multiple Choice Sense Matching Term Example Creation Translation Exercises
Efficiency	How efficient were students when using the corpus and/or the DiCoEnviro?	Screen Recorded Times
Satisfaction	Were students confident when using the corpus and/or the DiCoEnviro? Would they use these resources in the future?	Follow-Up Questionnaire

Table 8 - Usability sub-components summary chart

CHAPTER 3: RESULTS ANALYSIS AND DISCUSSION

As outlined in Chapter 2: Methodology, analyzing the data obtained for this study through three lenses – effectiveness, efficiency, and satisfaction – enables us to develop a sense of how translation students interact with resources and the level of impact that their employment has on students’ comprehension and usage of specialized terminology. While the low number of participants severely restricts our ability to make any generalizable, substantial quantitative assessments of the data, its richness, however, lends itself well to qualitative analysis. The data obtained from participants’ screen recordings, questionnaires, and translation exercise results contribute to a much broader reflection on students’ experiences with terminology, research tools, and their development.

The following section is divided into six parts. In section 3.1, we describe the participants’ relevant experience, knowledge of both resources, level of interest in current events and environmental issues, and research habits throughout the translation process. Section 3.2 focuses on the effectiveness of the tools, as we highlight the data obtained from all comprehension and usage exercises. We compare and contrast the response rate (in terms of accurate terminological usage) of participants when using the corpus versus the DiCoEnviro in the comprehension exercises, and subsequently compare the results of participants from both translation exercises and the types of resources that they used. From this, we discuss research strategies observed and their overall effectiveness in helping participants to select the most appropriate responses in each case. In section 3.3, we further the discussion surrounding resource usability with regard to participants’ efficiency. We illustrate the overall efficiency of participants with an analysis of time spent on task in both types of exercises (comprehension and usage), while also taking into account

participants' error rates experienced with both resources. In section 3.4, we explore the concept of user satisfaction and discuss the results obtained from the follow-up questionnaires. Section 3.5 furthers the discourse on resource usability with a special discussion of the qualitative trends observed in the study. Lastly, section 3.6 offers some concluding remarks with regards to the overall results analysis.

3.1 Overview of the data

Six undergraduate and graduate students from the University of Ottawa School of Translation and Interpretation (UO-STI) participated in this study. There were 4 students enrolled in the Ph.D. program in Translation Studies, 1 student from the M.A. program in Translation Studies, and 1 student from the Bachelor of Arts program (with specialization in French-to-English translation). All participants had completed at least two courses from UO-STI related to terminology, translation technologies, or computers and translation.⁷³ Additionally, one Ph.D. student also had an M.A. in Translation Studies, another had a B.A. in Translation (specialized with French/Spanish-to-English translation), and another student specified having a Bachelor's degree in French.⁷⁴

Due to the low number of participants, in order to maximize the richness of the data collected and reduce the effort/time commitment of each participant, they were divided into two groups. While it is impossible to predict participants' overall performance, efforts were made to balance each group based on their program of study, prior translation experience, and mother tongue. One group consisted of two Ph.D. students (one Anglophone, one Francophone) and one

⁷³ As described in [section 1.1.4](#).

⁷⁴ While it is assumed that the graduate students hold previous degrees, these participants were the only ones who indicated prior experience relating to translation.

M.A. student (Anglophone) and the other group consisted of two Ph.D. students (one Anglophone, one Francophone) and one B.A. student (Anglophone).

3.1.1 Knowledge and use of testing resources

Participants were asked to indicate their familiarity with corpora (generally speaking) and the DiCoEnviro in conducting specialized terminological research, and subsequently, their typical usage of both resources when translating. Table 9 indicates the results from this survey with regards to participants' knowledge and usage of both resources. As will be the case with most of the data presented throughout this chapter, the percentage indicates the degree to which they agree with the statements in the profile questionnaire. As they were asked to rate the extent to which they agree on a scale of 1-4 with 4 being "strongly agree", the maximum achievable points per question is 24 (4 x 6 participants). Therefore, a percentage score of 75% or higher would indicate a high level of knowledge.

On average, participants tended to be more knowledgeable with respect to corpus usage,⁷⁵ as 4 participants indicated that they agreed with the following statement: "I know how to use corpora to help me to conduct terminological research". Interestingly enough, however, even though 67% of the participants indicated that they knew how to use corpora when researching, they did not tend to apply this knowledge themselves when conducting their own terminological research. This was indicated by the fact that participants were split 50/50 when rating this statement on a scale of 1-4: "I use corpora to conduct terminological research when translating". Unsurprisingly, all participants indicated that they do not use the DiCoEnviro to conduct terminological research.

⁷⁵ This should come as no surprise as the DiCoEnviro is still a relatively new resource and is not considered 'mainstream'. It therefore offers a unique opportunity to observe how student interact organically with new resources.

		1	2	3	4	Average	
Knowledge	Corpora	1	1	4	0	15	63%
	DiCoEnviro	3	2	0	1	11	46%
Usage	Corpora	1	2	2	1	15	63%
	DiCoEnviro	5	1	0	0	7	29%

Table 9⁷⁶ - Knowledge and usage of corpora and the DiCoEnviro

3.1.2 Interest in and knowledge of current events and environmental issues

In terms of level of interest in and knowledge of current events and environmental issues, participants felt that their interest levels in both were much higher than their self-perceived knowledge of both categories, with 83% of participants (5/6) indicating a high level (3 or 4) of interest in current events and 67% (4/6) of participants indicating a high level of interest in environmental issues. Overall, 67% of students indicated a high level of knowledge of current events, in contrast with 33% who felt they had a high level of knowledge with regard to environmental issues, as shown in Table 11.

		1	2	3	4	Average	
Interest	Current Events	0	1	3	2	19	79%
	Environmental Issues	0	2	3	1	17	71%

Table 10⁷⁷ - Interest in current events and environmental issues

		1	2	3	4	Average	
Knowledge	Current Events	1	1	3	1	16	67%
	Environmental Issues	1	3	2	0	13	54%

Table 11⁷⁸ - Knowledge of current events and environmental issues

⁷⁶ Where 1 represents “strongly disagree” and 4 represents “strongly agree”.

⁷⁷ Where 1 represents “not at all interested” and 4 represents “very interested”.

⁷⁸ Where 1 represents “not at all knowledgeable” and 4 represents “very knowledgeable”.

3.1.3 Resource usage

Participants were asked to select which resources they referenced at three points during the translation process: (1) initially, to gain a better understanding of the text; (2) to conduct specific terminological research; and (3) to help during the revision process. Looking at Figure 19, we see that terminology banks (e.g. TERMIUM, GDT, IATE), online bilingual concordancers (e.g. TradooIT, Linguee), and general lexical online resources (e.g. dictionaries, glossaries) were used the most during the translation process, while monolingual concordancers (e.g. Le Migou), specialized lexical print resources (e.g. dictionaries, field-specific glossaries), and encyclopedias were used the least. It was hypothesized that print resources would be called upon the least and this prediction held true when we examined the results.

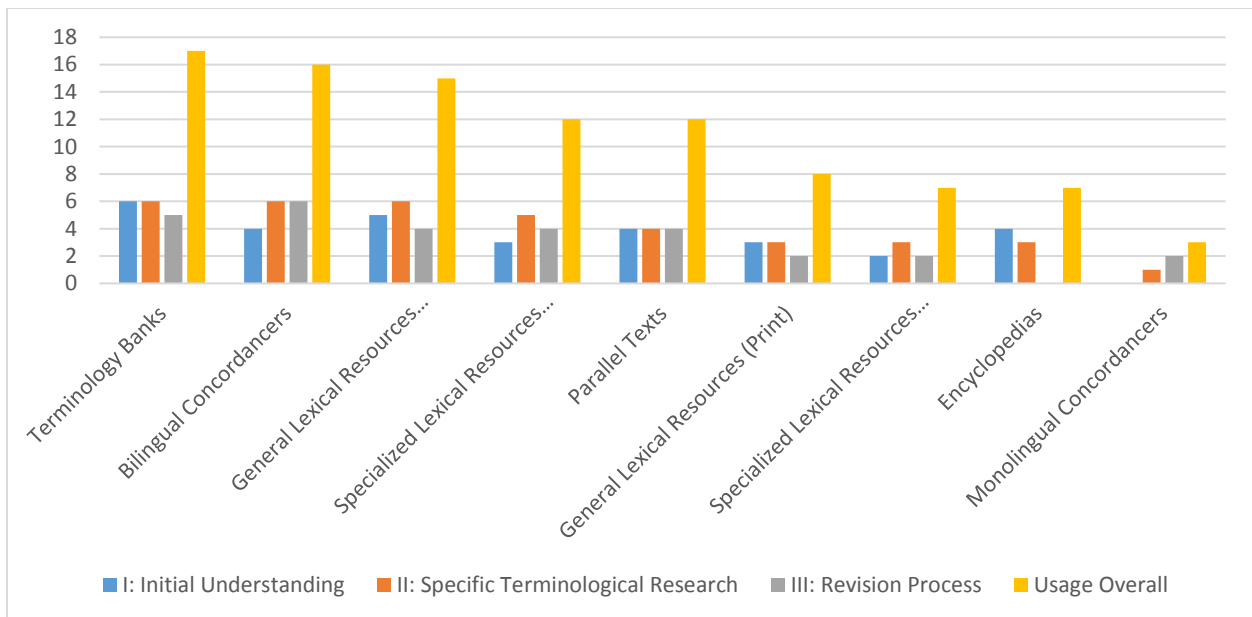


Figure 19 - Resource usage during translation process

Overall, as noted above, participants tended to have a strong sense of how to use corpora and, to a lesser extent, the DiCoEnviro when conducting terminological research, but did not apply this knowledge when translating. Participants also had a strong interest in both current events and environmental issues but were less confident in their knowledge of both. The majority of

participants preferred using online resources more than those in print, and tended to make use of bilingual concordancers as opposed to monolingual concordancers throughout the translation process. It is with these details in mind that we further explore the data and examine the first aspect of participants' performance: their effectiveness, or rather, their ability to select the most appropriate terminology when using either the corpus or the DiCoEnviro.

3.2 Effectiveness

The following section focuses on the data obtained from the terminological comprehension and usage exercises. Participants were asked to complete a series of multiple choice fill-in-the-blanks, sense matching, and example creation exercises first with the corpus. Next, participants were asked to complete another series of the same exercises with the DiCoEnviro. In both cases, participants were dealing with different terms; however, all were cases of either pseudo-synonymy or polysemy (as outlined in [Chapter 2](#)). Participants were assigned a score based on the responses given.

3.2.1 Terminological comprehension

When assessing terminological comprehension, we looked at the final score of each participant, the overall score of each group and strategies observed throughout the process. All six participants completed their first comprehension exercise with the corpus; however, each group dealt with different terms.⁷⁹

⁷⁹ Participants in Group A first dealt with candidate terms from groups 1, 4 and 6, while participants in Group B first dealt with candidate terms from groups 2, 3 and 5. Table 5 with the list of candidate terms is seen in [section 2.1.1.2](#).

For the multiple choice/fill-in-the-blank questions, each correct terminological choice was assigned one point, for a total of 6 or 12 (depending on which test set was completed). The selection of the correct terminological sense for the sense matching exercises was also valued at 1 point, for a total of 8 or 4 (once again, dependent on which test set was completed). The example creation exercises were scored differently from the previous two: 1 point was assigned for association with the term's correct sense and another point was assigned based on the example given (e.g. typical collocation, actants, relevance to the context at hand, etc.).

3.2.1.1 Corpus

The total achievable points from the comprehension exercise for Group A was 22. The results ranged from 9 to 20, with a group average of 14.7 points, or 67%. As a group, participants scored an average of 61% on the multiple choice questions, 67% on the sense-matching exercises, and 71% on example creation exercises.

For Group B, the total achievable points from the comprehension exercise was 26. The results ranged from 19 to 24, with a group average of 21.7 (83%), considerably better than Group A. Students outperformed Group A where all participants achieved a score of 69% on multiple choice questions, 100% on sense-matching exercises, and 93% on example creation exercises.

Intercorpus	#	Multiple Choice	Sense Matching	Example Creation	Total Points	Total (Average)
GROUP A	1	2/6	5/8	8/8	15	68%
	2	5/6	3/8	1/8	9	41%
	3	4/6	8/8	8/8	20	91%
	AA⁸⁰	61%	67%	71%	44 (/66)	67%
GROUP B	4	8/12	4/4	10/10	22	85%
	5	10/12	4/4	10/10	24	92%
	6	7/12	4/4	8/10	19	73%
	BA⁸¹	69%	100%	93%	65 (/78)	83%
Total Average⁸²		65%	84%	82%	109	75%

Table 12 - Comprehension exercise scores (with corpus)

Overall, when using the corpus for this section, participants' scores ranged from 41% to 91%, with a group average of 75%, which is fairly similar to the results with the DiCoEnviro, as described in the next section.

3.2.1.2 DiCoEnviro

When using the DiCoEnviro, participants in Group A scored better, on average, than when using the corpus. Participant scores ranged from 81% to 92% and on average they performed the best on sense matching exercises (every participant responded with 100% accuracy), 93% on term creation exercises and 78% on multiple choice.

This is in contrast with Group B, as participants scored worse overall when using the DiCoEnviro as a resource than when using the corpus. Participant scores ranged from 59% to 73%, with a group average of 68%. They performed best on sense matching exercises, with a score of 88%. The group average for the term creation exercises was 83% and 33% for multiple choice exercises.

⁸⁰ Group A Average (terminology to continue as such in other tables).

⁸¹ Group B Average (terminology to continue as such in other tables).

⁸² Where *total average* refers to average of all participants (both groups A and B).

DiCoEnviro	#	Multiple Choice	Sense Matching	Example Creation	Total Points	Total (Average)
GROUP A	1	9/12	4/4	10/10	23	88%
	2	9/12	4/4	8/10	21	81%
	3	10/12	4/4	10/10	24	92%
	AA	78%	100%	93%	68 (/78)	87%
GROUP B	4	0/6	8/8	8/8	16	73%
	5	2/6	6/8	8/8	16	73%
	6	2/6	7/8	4/8	13	59%
	BA	33%	88%	83%	45 (/66)	68%
Total Average		56%	94%	88%	181	78%

Table 13 - Comprehension exercise scores (with the DiCoEnviro)

Overall, when using the DiCoEnviro for this series of exercises, participants scored between 59% and 92%, with a participant average of 78%. The range of scores was much smaller than when using the corpus, and the difference in averages was rather negligible when comparing with the corpus results.

3.2.2 Terminological usage in a translation context

Participants completed two translation exercises: one at the beginning of the study and one at the end. Translation Exercise I was designed to gain an understanding of participants' research habits (e.g. resources used, research strategies, etc.) and translation abilities when translating from French into English. All participants translated 7 sentences where each sentence contained a specialized term. Participants in Group A translated sentences A1-A7 and Group B translated sentences B1-B7.⁸³ Translation Exercise II, on the other hand, contained 14 sentences to translate, highlighting all 14 testing terms. Participants were allowed to access resources they would normally use, with the option of utilizing the corpus and/or the DiCoEnviro as well.

⁸³ For a complete list of the assigned questions, see [Appendix C](#).

For Group A, participants' average score for Translation Exercise I was 99%, with 2 participants receiving 100% and 1 participant receiving 98%. This was in high contrast to their performance in Translation Exercise II, as 2 participants did not complete all of the translation exercises, bringing down the group average to 48% (as marked by an asterisk in Table 14).

Although participants in Group B did not receive scores as high as Group A in Translation Exercise I, their performance was the most consistent overall. They had a group average of 87% on Translation Exercise I and 80% on Translation Exercise II. Two thirds of participants scored better on Translation Exercise II than on Translation Exercise I.

	#	Translation I		Translation II	
GROUP A	1	21	100%	8*	19%
	2	21	100%	13*	31%
	3	20.5	98%	40	95%
	AA	62.5 (/63)	99%	61 (/126)	48%
GROUP B	4	19	90%	23	55%
	5	17	81%	39.5	94%
	6	19	90%	39	93%
	BA	55 (/63)	87%	101.5 (/126)	80%
Total Average		117.5	93%	162.5	64%

Table 14 - Usage exercise scores

Overall, scores on Translation Exercise I ranged from 81% to 100% and 19% to 95% on Translation Exercise II. The overall group average was 93% for Translation Exercise I and 64% for Translation Exercise II, as seen in Table 14 above. While the scores are relatively consistent from one exercise to another when looking at individuals who performed all translation tasks, the fact that half of the participants did not complete half, if not most, of all of the assigned tasks in Translation Exercise II does not allow us to make any group observations. It does, however, contribute to the discussion on some of the limitations of this study: some participants exceeded the suggested times intended for this study, mainly because excessive time was spent editing (as discussed in [section 4.3.5](#)), while others experienced network connectivity issues and as a result,

ran out of time due to other commitments ([section 4.3.6](#)). At the same time, there was a slight to moderate increase in scores for the two participants (B5 and B6) who did manage to complete all the assigned tasks in Translation Exercise I and Translation Exercise II, as participant B5 increased by 13% and participant B6 increased by 3%.

Looking at Tables 12 and 13, we can see that participants in Group A achieved higher scores than their group counterpart (and vice versa with Group B) when working with a specific set of terms, regardless of the resource they were using. This was also the case when looking at specific types of questions. For example, pseudo-synonymous terms were treated in the multiple choice questions, where the difference in performance scores was much higher than when looking at the sense-matching exercises which contained examples of polysemous term groupings. The pseudo-synonymous term groups presented more challenges for students as there were finer distinctions between terms. Additionally, some terms, while specialized in this case, may also have been influenced by general language usage. For example, the term *sequester* in this case refers to the sequestering of *carbon dioxide* (patient) from *the soil* (location), where there are two (and sometimes three) actants at play. This is in contrast to its usage and understanding of the term in general language where it is most often used in the context of *being sequestered for jury duty* which requires only one actant.

3.3 Efficiency

Effectiveness is an important component of resource usability; however, it needs to be accompanied by an efficiency score in order to fully contribute to our understanding of resource usability. This is essential when studying resources and their usability in translation, for there

needs to be a balance between the amount of time it takes to acquire information from a resource and the accuracy of the information that it yields.

In this section, we describe trends observed in the data related to the amount of time it took for participants to complete various sections of the study. We compare the efficiency rates of participants, including frequency of errors, when using both resources. For the analysis of efficiency with regard to usage, we compare and contrast the time participants spent using other resources.

3.3.1 Task times: An overview

Table 15 highlights the amount of time taken by each participant to complete each section of the study⁸⁴, excluding the time taken to complete the profile and follow-up questionnaires.⁸⁵ The amount of time taken to complete all four sections for each participant ranged from 5585 s (B5) to 12696 s (B4), with an average time of 2h 20 m 44 s.⁸⁶ It took groups A and B approximately the same amount of time, on average, to complete all four exercises, as the group average for Group A was 8390 s and Group B's average was 8497 s, or 1m 47 s slower than Group A.

Relative times were different in each individual section, however, as Group A on average took longer than Group B in both comprehension exercises (with the corpus and the DiCoEnviro) and Translation exercise I. The only time that Group A performed faster than Group B was in

⁸⁴ In Table 15, the column heading marked 'corpus' corresponds to participants' time taken to complete the comprehension exercises using the corpus, and that marked 'DiCoEnviro' corresponds to the comprehension exercises completed by participants when using the DiCoEnviro as a resource.

⁸⁵ Time spent completing the profile and follow-up questionnaire was not included in the analysis as these times were not explicitly linked to efficiency when dealing with resources and comprehension and usage exercises. The profile times are relatively significant, however, as it indicates to a certain degree, the relative speed of participants. Generally speaking, it took participants an average of 3m 54 s to complete the profile questionnaire. Times ranged from 3m 02 s (182s)(B5) to 4m 49 s (289s)(A2). Participant B5 was an outlier in this case as the rest of the participants took >208 seconds to complete this section.

⁸⁶ It is worth noting here that this total time exceeded the originally planned duration, and is discussed further in [section 4.3](#).

Translation Exercise II, which is simply a result of Group A having two members who did not complete all 14 translation exercises, thus skewing the data for the group.

	#	Corpus	DiCoEnviro	Translation I	Translation II	Total
GROUP A	1	1853	1267	3435	3161	9761
	2	1898	1478	2545	1765	7686
	3	1769	1247	1185	3521	7722
	AA	1840	1331	2388	2816	8390
GROUP B	4	1498	1786	3064	6348	12696
	5	1116	1082	1189	2198	5585
	6	1053	940	1235	3973	7210
	BA	1222	1269	5488	4173	8497
Total Average		1531	1300	3938	3495	8444

Table 15 - Total (and average) task times

Interestingly enough, Group A spent more time than Group B on comprehension exercises when using the corpus, while Group B spent more time, on average, on comprehension exercises when using the DiCoEnviro; however, overall, participants took less time to complete Comprehension Exercise II when using the DiCoEnviro, as they averaged 1300 seconds⁸⁷ on this particular exercise in comparison with the 1531 seconds⁸⁸ spent on the exercise when using the corpus.

3.3.2 Corpus

Table 16 illustrates the amount of time participants spent on the comprehension exercise (corpus), time spent interacting with the corpus interface, the percentage of time spent researching, number of times participants viewed the corpus interface, and finally, the average time spent with the corpus per visit.

⁸⁷ 21m 40s

⁸⁸ 25m 31s

Participants on average spent 35% of their time using the corpus, making an average of 9.8 visits lasting an average of 56 seconds each time. Overall, Group A tended to spend more time interacting with the corpus interface, as they spent a total of 695 s on average with the corpus, or 38% of the total time. They also interacted with the interface more times and for longer periods of time during those visits, for an average of 30.7 s longer.⁸⁹

	#	Comprehension Exercise	Corpus		Number of visits	Average time per visit
GROUP A	1	1853	597	32%	8	74.6
	2	1898	736	39%	13	56.6
	3	1769	752	43%	9	83.6
	A	1840	695	38%	10	71.6
GROUP B	4	1498	526	35%	14	37.6
	5	1116	236	21%	8	29.5
	6	1053	389	37%	7	55.6
	A	1222	384	31%	9.7	40.9
Average		1531	539	35%	9.8	56.3

Table 16 - Corpus efficiency

Knowing how long participants spent using the resource is just a part of the efficiency equation. The following section describes the research strategies observed and the efficiency of participants' research strategies.

3.3.2.1 Corpus search strategies

Participants interacted with the corpus interface, InterCorpus, in many different ways; however, observations indicated that they used three main research strategies when using the resource to complete the first comprehension exercise.

⁸⁹ Total times participants spent interacting with the corpus will be compared to the DiCoEnviro in [section 3.3.3](#).

3.3.2.1.1 Simple terminological searches

The first strategy observed – and used by most participants the vast majority of the time – was a simple search for a specific term in question with examination of the keyword in context.

When looking specifically at the first section in Comprehension Exercise I, participants were asked to select the most appropriate term for each context. In each question, students were given options from the same terminological group, as seen in the example below. In this typical scenario, participants conducted 3 separate searches for the three key terms — *sort*, *sequester*, and *separate* — and examined the results of each term in context.

B-5. While such fossil fuels offer high energy density, the combustion required to release their energy releases to the atmosphere carbon _____ millions of years ago and thus contributes to climate change.

- sorted
- sequestered
- separated

Figure 20 - Comprehension Exercise I: sample⁹⁰

While this is a basic strategy, it is used quite often, especially with beginner and intermediate users, as shown in the data collected from this study.⁹¹ It is not, however, the only or the most efficient technique with these types of exercises, as described in the next section.

3.3.2.1.2 Collocational pattern searches

Some participants chose to take the basic terminological search a step further and make use of the collocational search option, which allows the user to search for term combinations where another word can be found within a specified number of words before or after the key term.

⁹⁰ For complete reference, see [Appendix B \[3\]](#).

⁹¹ With the distinction being made between beginner and intermediate users based on those who said that they had no versus little experience with or knowledge of corpora or the DiCoEnviro.

In the example below, participants conducted a search for *extract* and *power*, specifying *power* to be found at a maximum of two words away from the term, *extract*. Finding few or no results, a participant continued this process with the other two key terms and *power* in order to discover which term was most appropriate for this context.

A-1. To _____ viable power from tidal energy, in most cases, the difference in high tide and low tide height must be at least five meters (16 feet). Only 20 to 40 locations on earth have this potential, most of which are located in the Bay of Fundy by Nova Scotia.

- extract
- capture
- collect

Figure 21 - Exercise sample

This was a technique explored by half of the participants for combinations such as *wind turbine* and *collect*, *sequester* and *carbon*, and *hazardous* and *waste*.

3.3.2.1.3 Simple search and collocational search adaptation

When observing beginner and intermediate users interact with a relatively new resource, it is interesting to note the use of adapted search techniques to fulfill their needs. The particular strategy of searching for a key term within the corpus and then conducting a separate search using keyboard shortcuts (CTRL + F) not specific to the resource itself was a popular option, combining elements of the search approaches described in the previous two sections.

For example, in the question shown in section 3.3.2.1.2, participants would conduct simple searches for the terms *extract*, *capture*, and *collect* and conduct a search within the web interface using the specific CTRL + F keyboard shortcut technique for combinations with each term within the keyword in context results. While this adds a separate step not specific to the interface itself, it is an adaptation that proves to be just as useful in yielding accurate results efficiently.

While these three strategies proved to be effective in producing accurate results with relative efficiency, it was a case of trial and error sometimes. The following section examines a specific case of participants' efficiency: error frequency.

3.3.2.2 Efficiency measure: Error rating with corpus

A user-friendly resource is one that is relatively easy and intuitive for beginner or seasoned users alike to yield accurate results efficiently. Table 17 illustrates the error rating of each participant, with specific reference to the number of times InterCorpus produced no results for their search, and the time wasted on that particular endeavour.⁹² For the most part, this was because individuals were conducting searches for terms that were found within the contexts of the exercises, but were not candidate testing terms. The likelihood that these searches yielded results was therefore much lower as the corpus was designed to target the candidate testing terms. Another issue pertained to the search settings selected by participants. On occasion, individuals did not change the part of speech targeted to match the term that they were searching, which did not yield any results. For example, when searching the specialized term *collect*, individuals left the search controls on default (part of speech being a noun) and did not actively choose verb from the dropdown menu. As a result, participants experienced an average of 5.2 errors, or instances where the search yielded "0 results", as seen in Table 17.

⁹² In this case, we viewed 'error' to equate with 'no results' when conducting a search within InterCorpus. This technically includes the results pertaining to two types of error: one where the required information is not available in the corpus and a second where information is available but the user did not go about conducting a search effectively. The specialized corpus was created with the intention of including the same type of information as the DiCoEnviro (i.e. the selected specialized testing terminology and larger sample contexts of the ones found in the DiCoEnviro), and so this error rating is more of a reflection of user-specific efficiency.

	#	# times no results	Time
GROUP A	1	6	69
	2	3	23
	3	11	137
	AA	6.7	76.3
GROUP B	4	2	27
	5	4	28
	6	5	66
	BA	3.6	40.3
	TA⁹³	5.2	58.3

Table 17 - Error rating with corpus

3.3.3 DiCoEnviro

Table 18, much like that described in section 3.3.2 describes the search patterns of all participants when completing the comprehension exercise while using the DiCoEnviro. On average, Group A spent 62 more seconds overall completing the exercise; however, both groups spent the same amount of time (34%) interacting with the DiCoEnviro. The range of times spent researching in the DiCoEnviro was from 237 seconds (B6) to 839 seconds (B4), with an average interaction time of 7m 41 s, just over a minute under the time participants spent interacting with the corpus. In this time, participants referenced the DiCoEnviro an average of 10.5 times, spending approximately 52 seconds with the resource during each visit.

⁹³ Where TA is total average.

	#	Comprehension Exercise	DiCoEnviro		Number of visits	Average time per visit
GROUP A	1	1267	456	36%	16	29
	2	1478	465	31%	4	117
	3	1247	449	36%	9	50
	AA	1331	457	34%	9.7	65
GROUP B	4	1786	839	47%	17	49
	5	1082	318	29%	11	29
	6	940	237	25%	6	40
	BA	1269	465	34%	11.3	39
Total Average		1300	461	34%	10.5	52

Table 18 - DiCoEnviro efficiency

While there was no substantial time difference between the resources, the real differences are highlighted in terms of how they interacted with the resource and the frequency and/or type of error they experienced. The following sections explore these notions with reference to the DiCoEnviro.

3.3.3.1 DiCoEnviro strategies

Researching methods and strategies within the DiCoEnviro were much less organic than those observed in the corpus as, similar to an online dictionary, its role and function is much more straightforward. The research strategies in this case focus more on the types of information that students spent time studying (as per observations of drop-down menu selections, buttons clicked, etc.).

Sixty-seven percent of participants adopted the same type of strategy when completing the exercises with the DiCoEnviro: they would first read the question, conduct a simple search in the DiCoEnviro for the specialized term in question, examine the terms' actantial structure, lexical relations, and contexts, and then returning to answer the questions in the study. These particular

terms were those indicated in the multiple choice, sense matching, and example creation questions, generally speaking; however, 33% of participants completed both sense matching and example creation exercises with little to no reference to the DiCoEnviro, indicating that participants possibly: (1) felt they had developed a sufficient level of comprehension of the specialized terms; (2) were tired and rushing through the exercises; or (3) felt that the resource did not help them in answering the questions; or (4) felt that they had sufficiently knowledge already.

Due to the fact that the majority of participants adopted this strategy with the key specialized terms, there was a low error rate, as we discuss in section 3.3.2.2.

3.3.3.2 Efficiency measure: error rating with DiCoEnviro

Only two participants experienced any type of error when interacting with the DiCoEnviro, or rather, a display of “no results”. This was due to the fact that the terms included in the study were most certainly included in the DiCoEnviro.⁹⁴ As it is a relatively new resource, the number of term entries included is limited; however, as previously mentioned, it is constantly being updated.

In this study, two participants ventured off the weary path, conducting searches for terms that were found within the questions of the study but were not terms which we were studying specifically, such as *atmospheric pressure*. This did not happen often, however, for after the second occurrence, both users changed strategies, opting to search for only key terms within the DiCoEnviro.

⁹⁴ Since it was still possible to search other items, we could hypothesize that participants had likely “learned” from the corpus, or even expected less coverage of other terms from a dictionary.

3.3.4 Translation efficiency

In this section, we examine the efficiency of participants when translating the specialized terms in context. As was noted in [Section 3.1.3](#), participants stated that they used terminology banks, bilingual concordancers, and general online lexical resources the most throughout the translation process. This was proven to be true when examining the screen recordings, as TERMIUM was used by 5 users, WordReference was called upon by 4 users, and Linguee was consulted by 3 participants.⁹⁵ We therefore included an analysis of these resources in addition to the corpus and DiCoEnviro with reference to Translation Exercise II.

3.3.4.1 Translation Exercise I resource analysis

Table 19 highlights one element of the efficiency data from Translation exercise I, specifically the amount of time that participants spent interacting with the three most popular resources: TERMIUM, WordReference, and Linguee. This is presented alongside the total times that participants spent on the exercise individually, as a sub-group, and as a full group (averages) in order to calculate the percentage of time that was spent within each resource.

Five participants used TERMIUM to complete this exercise and spent 35% of the total time using this resource; three participants used Linguee to help them complete the exercise 35% of the time; and lastly, 4 participants used WordReference, but for a mere 4% of the time, on average. Despite the fact that we did not look into the research habits of participants in interacting with each resource, this serves as a valuable reference for examining the data from Translation Exercise II, explored in section 3.3.3.2.

⁹⁵ Participants called upon other sites, including, but not limited to search engines (e.g. Yahoo, Google), and one participant relied heavily on Google Translate, choosing to take the post-editing approach to translation for these exercises. Including an analysis of the usage of these resources is outside the scope of this project, but is relevant in a discussion on [future work](#).

		Translation I	TERMIUM		WordReference		Linguee	
GROUP A	1	3435	505	15%			775	23%
	2	2545	324	13%			510	20%
	3	1185	89	8%	128	10%		
	A	2388	306	12%	128	10%	428	14%
GROUP B	4	3064	341	11%	317	10%		
	5	1189			9	1%		
	6	1235	232	19%	53	4%	155	13%
	A	1829	191	10%	126	7%	155	13%
Total Average		2109	249	11	127	9%	291	13.5%

Table 19 - Resource times during Translation Exercise I

3.3.4.2 Translation Exercise II resource analysis

Translation Exercise II, although an exercise designed to assess participants' usage of specialized environmental terms, was different from Translation Exercise I as participants had twice as many sentences to translate (14 in comparison with 7 in Translation Exercise I) and were permitted, and even encouraged, to make use of the corpus and the DiCoEnviro after having used it for the comprehension exercises.⁹⁶

3.3.4.2.1 Translation Exercise I and Translation Exercise II

Looking at the data in Table 19 and Table 20, we see the same types of patterns. Users who called upon any of the three resources in Translation Exercise I remained consistent in their research habits in Translation Exercise II, except for participant A2, who did not use TERMIUM in Translation Exercise II, and participant B5, who did not use WordReference in Translation Exercise II. All other participants remained consistent.

⁹⁶ For this exercise, participants used many resources other than those discussed in this section. For the sake of consistency and comparison, we discuss and analyze the times spent interacting with the same resources as were used in Translation Exercise I (TERMIUM, WordReference, and Linguee) in addition to the corpus and the DiCoEnviro. As in Translation Exercise I, these three resources were also called upon the most.

		Translation II	TERMIUM		WordReference		Linguee	
GROUP A	1	3161	99	3%			544	17%
	2	1765					128	7%
	3	3521	432	12%	207	6%		
		2816	177	5%	207	6%	224	8%
GROUP B	4	6348	477	8%	193	3%		
	5	2198						
	6	3973	475	12%	118	3%	263	7%
		4173	317	7%	163	4.5%	263	7%
		3495	247	6.5%	185	5%	244	7.5%

Table 20 - Translation II resource usage

The principal difference between the two sets of data is that participants spent significantly less time using each resource: on average, they used TERMIUM 6.5% of the time (28.5% less time); WordReference 5% of the time (1% less time); and Linguee 7.5% of the time (26.5% less time). This could be due to several factors, but it could be best explained by the fact that participants opted to use the corpus and DiCoEnviro as well, as discussed in the next section.

3.4.3.3 Corpus and DiCoEnviro use in Translation Exercise II

Table 21 shows the times that each participant spent researching in both the corpus and the DiCoEnviro when completing Translation Exercise II. We also highlight the percentage of time each participant spent with each resource. On average, all users spent approximately the same amount of time using the corpus and the DiCoEnviro (approximately 5% of the total time) when completing translation exercise II. It is interesting to see that there was only one participant (B5) who only used one of the resources (the DiCoEnviro), while all other participants referenced each resource at least once. Additionally, in all cases, users called upon the DiCoEnviro before the corpus, perhaps indicating a higher level of perceived satisfaction with this particular resource.

		Translation II	Corpus		DiCoEnviro	
GROUP A	1	3161	151	5%	165	5%
	2	1765	78	4%	156	9%
	3	3521	199	6%	437	12%
	AA	2816	143	5%	253	9%
GROUP B	4	6348	523	8%	147	2%
	5	2198			24	1%
	6	3973	294	7%	72	2%
	BA	4173	272	5%	81	2%
Total Average		3495	208	5%	167	5.5%

Table 21 - Search times for corpus and DiCoEnviro in Translation Exercise II

This higher perceived satisfaction is also reflected in the data displayed in Table 22, indicating the number of times that each resource was used throughout the exercise.

		Corpus	DiCoEnviro	TERMIUM	WordReference	Linguee
GROUP A	1	8	7	3		23
	2	3	8			4
	3	7	20	19	12	3
	AA	6	12	7	12	10
GROUP B	4	17	4	14	8	
	5		1			
	6	11	5	15	4	6
	BA	9	3	10	4	6
Total Average		7.5	7.5	8.5	8	8

Table 22 - Number of times each resource was used during Translation Exercise II

The amount of time spent with each resource on average is relatively the same, and interestingly enough, the number of times each resource was referenced was about the same as well, with a range from 7.5 to 8.5 times each resource was referenced. Two participants made use of all resources, two participants used 4/5 of the resources, one participant used 3/5 of the resources, and only one made use of the DiCoEnviro only.

Overall, these efficiency results show that participants do not have an overwhelming preference for either resource. Instead, it serves to indicate that students are open to using different types of resources to the same extent that they make use of their regularly called upon resources

when translating. This is a quantitative representation of the qualitative analysis provided by the data obtained from the follow-up questionnaire, as discussed in the following section on a major component of usability: satisfaction.

3.4 Satisfaction

Satisfaction can be measured in a number of ways (as described in [section 1.2.2](#)) including but not limited to the data obtained from observational data of user habits. In this case, we obtained the most information pertaining to user resource satisfaction from the brief follow-up questionnaire completed by all participants at the end of the study. The following section describes users' confidence in both resources, their resource component preferences, and their opinions concerning future use of resources for translation.

3.4.1 Confidence

Participants felt more confident in their responses when using the DiCoEnviro, as 83% of participants (5/6) indicated so on the questionnaire. On the other hand, only 50% indicated the same level of confidence in the corpus as in the DiCoEnviro. On average, participants indicated a 71% confidence rate for the DiCoEnviro and a 58% confidence rate for the corpus – a 13% difference, as seen in Table 23.⁹⁷

⁹⁷ Refer to [section 2.2.2](#) for a detailed description of how these numbers were generated.

	1	2	3	4	Average	
Corpus	1	2	3	0	14	58%
DiCoEnviro	0	1	5	0	17	71%

Table 23⁹⁸ - Confidence ratings of resources

3.4.2 Component ratings

In terms of layout, ease of navigation, and search controls of both resources, participants indicated relative satisfaction, as seen in Table 24. Participants preferred the layout and ease of navigation of the DiCoEnviro to InterCorpus but preferred the search controls of InterCorpus to those of the DiCoEnviro.

	InterCorpus		DiCoEnviro	
Layout	13	54%	16	67%
Ease of navigation	10	42%	14	58%
Search controls	16	67%	10	42%
		54%		56%

Table 24 - Resource component ratings

When using the InterCorpus interface to navigate the corpus, participants saw the layout features (i.e. the ability to see keywords in context and subsequently the ability to view larger contexts) as being relatively equal contributors to their overall comprehension and usage of specialized terminology. Both KWIC and longer contexts scored 13 points, or an average satisfaction rate of 54%. Similarly, participants recognized the importance of longer contexts and KWIC in helping them to use specialized terminology. It seems that participants made little to no distinction between the components of InterCorpus and their apparent aid in comprehension and usage (Table 25).

⁹⁸ Where 1 represents “not at all confident” and 4 represents “very confident”.

InterCorpus	Comprehension		Usage	
KWIC	13	54%	14	58%
Longer Contexts	13	54%	13	54%
		54%		56%

Table 25 - InterCorpus component ratings

Participants tended to prefer the features of the DiCoEnviro to those of InterCorpus, and there seemed to be no substantial perceived distinction in terms of how each feature aided with comprehension and usage of specialized terminology (as was also the case with the corpus). In fact, as seen in Table 26 below, participants felt that the annotated contexts in the DiCoEnviro were equally useful for helping to understand and use specialized terminology. This was also the case for the lexical relations. The only real distinction was made in terms of the actantial structure, as participants viewed this feature as being more beneficial for understanding how specialized terminology is used as opposed to actually learning how to apply it in a translation context.

DiCoEnviro	Comprehension		Usage	
Annotated contexts	20	83%	20	83%
Lexical relations	14	58%	14	58%
Actantial structure	16	67%	13	54%
		69%		65%

Table 26 - DiCoEnviro component ratings

3.4.3 User experiences

When asked to rate their satisfaction with each resource's layout, ease of navigation and search controls, participants preferred the DiCoEnviro. Participants also preferred the DiCoEnviro when asked to rate their satisfaction with specific components of each resource, i.e. annotated contexts, lexical relations and actantial structures of the DiCoEnviro and KWIC and longer contexts of the corpus.

When comparing the data for each resource separately, it is interesting to note that participants felt that the corpus was better overall for looking at using specialized terms in a translation context versus using the corpus to simply understand a specialized term. This is in contrast with the results for the DiCoEnviro, as participants felt that this resource was more helpful for understanding specialized terms than for applying them accurately in a translation context.

Eighty-three percent of participants felt that both the corpus and the DiCoEnviro would be valuable resources to use when working on future projects in the field of the environment. Positive feedback with regards to both resources is summarized in Table 27 below. All in all, participants felt that both resources were helpful in conducting research, inspiring confidence in the work that they were doing.

Corpus	DiCoEnviro
<p>“It inspires confidence to know that a translator’s choice of expression is found in specialized target-language literature.”</p> <p>“It helps to quickly identify usage of terms in specialized contexts, confirming research done elsewhere or personal intuitions.”</p>	<p>“User-friendly layout; uncomplicated visual display; brief but useful definitions; precision of the domain was useful for searches within that domain.”</p> <p>“Actantial structure and lexical relations were incredibly useful to help differentiate between usages of a term.”</p> <p>“Contexts were often helpful.”</p> <p>“Provides some helpful definitions and usages in context.”</p>

Table 27 - Participant views of resource advantages

While the positive aspects of both resources described above are informative, it is important to address the disadvantages or suggested improvements as well, since perceived shortcomings lower satisfaction ratings and may impact future usage.

Some individuals expressed skepticism with the corpus, indicating that the lack of context was limiting, while another participant addressed the concept of monolingual concordancers more

generally, stating that they did not find them particularly useful in a translation context. A similar type of comment was made with regard to the DiCoEnviro: it would be much more helpful for translation if the terms were linked across languages⁹⁹

Even with these expressions of skepticism with regard to both resources, perhaps the most important result concerns the attitude of participants. Users indicated that they would be open to incorporating new resources such as these into their work. One participant wrote, “the more resources the better”. Another individual stated that while they were not necessarily familiar with corpora or corpus-based resources in general, they would be willing to do more research to explore these types of resources. This was also echoed by another participant who stated that they felt they needed to learn more about lexical relations and actantial structures in order to get the most use out of the DiCoEnviro, but could still appreciate the advantages that this type of resource has to offer.

3.5 Resource usability: are these resources helpful?

Usability testing of products, specifically resources in this context, is important as it shows us how users *actually* feel and interact with resources as opposed to how creators theoretically *intended* the resources to be used.

When looking at both resources through all three lenses – effectiveness, efficiency, and satisfaction – we can see that the DiCoEnviro has better scores, on average, than the corpus but that the differences are negligible, as seen in Table 28.

⁹⁹ Both of these statements are valuable observations; however, it is worth noting that these shortcomings were intentional when designing the study and are further discussed in [section 2.1.2](#).

	Effectiveness	Efficiency ¹⁰⁰	Satisfaction ¹⁰¹
Corpus	76%	35%	58%
DiCoEnviro	78%	34%	71%

Table 28 - Summary of usability results

Both resources proved to be somewhat effective in helping participants to achieve the comprehension and usage goals. While the results show no real substantial difference from these perspectives, the fact that a new, unfamiliar resource like the DiCoEnviro was helpful as compared to a better-known resource is positive, as there is often a learning curve associated with the introduction to new resources.¹⁰²

It is important to note that the results pertaining to the corpus represent a very specific case in that it is not a “set” resource like the DiCoEnviro. Corpora can exist in a myriad of different ways, and in this study, we highlighted a very specific (and somewhat limiting¹⁰³) form of a corpus. Additionally, it is worth mentioning that a corpus is only as good as its concordancer and in this case, one could hypothesize that the satisfaction results were more a reflection on the InterCorpus interface than the corpus itself.

Moreover, both resources had more of a *perceived* improvement in helping students, despite the fact that the differences in overall effectiveness were not substantial. Participants felt that using corpora in translation research was more effective for understanding specialized terminological *usage*, while resources like the DiCoEnviro, in particular, were more effective in

¹⁰⁰ It is important to note here that a lower percentage indicates higher efficiency as it means that participants spent less time interacting with the resource, on average, to achieve a higher accuracy of responses (as seen in the effectiveness category).

¹⁰¹ This, of course, does not represent the satisfaction of participants as a whole, as the qualitative data obtained from the follow-up questionnaire is significant as well, as was discussed in [section 3.4](#). This is merely the numerical representation, on average, of participants’ expressed satisfaction with both resources’ layout, ease of navigation, and search controls, generally speaking.

¹⁰² As was indicated in [section 3.1](#) where, on average, participants showed low knowledge of the DiCoEnviro (46% on average) and low usage of the DiCoEnviro (29% on average).

¹⁰³ This was due to the nature of the study and the control factors put in place, as was described in [Chapter 2](#).

helping individuals gain an *understanding* of specialized terminology. These observations are relevant, as they can contribute to the discourse surrounding resource usage and experimentation in the translation classroom. The following three sections further these observations in three main conclusive points.

3.5.1 Observation 1: Students are creative and open to new things

In [section 3.1](#), we learned that participants use term banks, online concordancers, and general online resources the most when working on translation projects, as was apparent in their responses from the profile questionnaire and observations made when participants were completing Translation Exercise I and Translation Exercise II. While we did not focus on an analysis of their habits with regard to these resources, it is noteworthy that participants expressed interest and satisfaction when using corpora and corpus-based resources, indicating that they are more likely to be interested in exploring these when conducting research in the future.

Being open to new resources and willing to experiment with a variety of resources is quite important, especially for those who are still in the learning phases of the occupation. Although participants expressed relatively high degrees of knowledge in terms of how corpora and the DiCoEnviro work, they did not, apply this knowledge in practice. In light of this, it is fair to say that participants displayed a relatively high degree of creativity when conducting research in both resources, as we saw in [section 3.2.2.1](#) and [3.2.3.1](#).

3.5.2 Observation 2: Translators do not need to fully understand specialized terms to apply them correctly

Although we cannot make conclusive statements with this data sample, it is interesting to note that the findings in this study support a major conclusion in the research literature: translators do not necessarily need to have the knowledge of a specialist to be able to write like one.

Participants scored higher on specialized terminology usage than on comprehension. While the criteria for the translation assessment was terminology-focused, it was apparent in the results from the comprehension exercises that participants struggled with selecting the most appropriate term in a fill-in-the-blanks multiple choice context when looking at pseudo-synonymous terminology. There are many possible hypotheses that could help explain this struggle; however, as discussed in [section 3.4.3](#), despite the clarity of information present in the DiCoEnviro, some participants were unfamiliar with actants, lexical structures, etc., and it is this lack of knowledge that could ultimately hinder their potential to select the most appropriate responses.

3.5.3 Observation 3: Usable resources require clarity and the right balance of content

Perhaps the most obvious observation made with regard to resource development and participants' usage of such resources is linked with the importance of maximizing the information provided to users and minimizing the level of effort required for them to successfully use the resource. This stresses the importance of layout and user-friendly qualities that help users to work effectively and efficiently, as seen in [section 3.4.3](#).

This observation pertains to both resources, but mostly the corpus. One can have a great, balanced corpus, but the information is only as useful as the interface/concordancer that is used to

display the information. This study highlighted the importance of using a user-friendly interface with which to conduct searches within the corpus.

3.6 Concluding remarks

Due to the nature of this study and the number of participants, we were unable to make any conclusive statements with regard to translation students' comprehensive understanding and usage of specialized terminology within the field of the environment. What we were able to do instead was present and analyze the data obtained from questionnaires, comprehension/usage exercises, and screen-recording data through three lenses: participants' effectiveness, efficiency, and satisfaction when interacting with both the corpus and the DiCoEnviro. The presentation of these results, in tandem with participants' observed habits with relation to both resources, combine to form the basis for the observational statements described in [section 3.5](#) and will further contribute to the next and final chapter, where we discuss the potential contribution of these results and the strengths and limitations of our methodology.

CONCLUSION

Possessing the ability to understand terminology in a specialized field and subsequently apply it accurately when translating is part of the competence that students must acquire in order to achieve success as professional translators. It is therefore essential for translation students to have access to – in addition to the basic knowledge required to use – specialized resources that meet their research needs, while also having the necessary research skills to be able to comprehend and apply specialized terminology.

In Chapter 1: Literature Review, we examined the importance of terminological competence in translation; the evolution of terminology and its significance in specialized translation; corpora and corpus-based resources; and methods for evaluating specialized resources through various usability frameworks. This provided us with the appropriate background to set the scene for this study.

In Chapter 2: Methodology, we outlined the approach and procedure developed and tested to help us to further the discourse pertaining to the major research questions outlined in the introduction, stated as follows:

1. What resources do students typically use to resolve terminological challenges and are these research methods effective?
2. How do students use corpora and corpus-based specialized resources to resolve the same types of terminological challenges?
3. How effective are these methods and what are the potential future implications for translator training and the development of specialized resources?

These questions guided our research and provided the necessary plan for presenting our results and analysis. Guided by the concept of usability and its three major components – effectiveness, efficiency, and satisfaction – we discussed the data obtained from six participants who used a corpus and concordancer (Intercorpus) and a specialized dictionary (the DiCoEnviro) and were able to offer insight into the translation process, with specific reference to specialized terminology, students’ research habits, and their preferences with regard to specialized resources.

In order to resolve terminological challenges, students use terminology banks, bilingual concordancers, and online general lexical resources (Figure 19), as indicated by their responses in the initial questionnaire. We gained further knowledge in this regard (see section 3.3.4.1) by observing (via screen recordings) participants’ use of and interaction with these resources, and more specifically, TERMIUM, WordReference, and Linguee (in addition to search engines). Students performed well on average on Translation Exercise I and Translation Exercise II, indicating a high level of effectiveness of typical resources in helping them to resolve terminological issues, as described in [section 3.2.2](#).

The responses obtained from a series of comprehension exercises (e.g. multiple choice, sense matching, example creation), in addition to the screen recordings, showed us *how* students use corpora and the DiCoEnviro to help them resolve terminological challenges, as was described in [section 3.3.2.1](#) and [section 3.3.3.1](#).

Finally, in [section 3.5](#), we discussed the notion of usability and how it relates to both resources, describing the overall perceived effectiveness of both resources.

In this concluding section, we wish to further the discussion introduced in Chapter 3 by describing the potential that these results could have on: (1) students in the translation classroom; and (2) resource development (with particular reference to students). We will also briefly discuss

the limitations of this study, and subsequently propose ideas for future work in this area of Translation Studies.

4.1 Implications for translation pedagogy

Translation students who participated in this study showed us that they are

- open to experimenting with new and innovative resources,
- willing to learn, and
- equipped with a strong knowledge of corpora, corpus analysis tools, corpus-based resources and how they work,

but are not necessarily encouraged to explore such avenues outside terminology and/or translation technology classes within their respective translation programs.

If there is substantial evidence that these resources could be beneficial to translation student learning¹⁰⁴, then we must determine simple, cost-efficient, and beneficial ways to integrate corpora and corpus-based resources into the translator-training program in order to help students to increase their competency in the areas of comprehension and usage. In the following sections, we explore some of the ways which this can be done in translator training programs today.

4.1.1 Demonstrations

We are unable to fault students entirely for their lack of confidence and ability in using corpora and corpus-based resources outside a required context within a translator training program. If a student does not feel confident in their own ability to properly navigate a resource or effectively determine a solution for a translation problem AND their professor does not demonstrate their own

¹⁰⁴ As described in [section 1.2.5.3](#) and observed in [section 3.5](#).

confidence and ability in using such a resource, then students will more than likely avoid such a “risky” option, returning to their dictionaries – or other typically called upon resources – with blind faith (Bowker 1999: 166).¹⁰⁵

4.1.1.1 Resource awareness

In order to promote resource awareness, it would be helpful to provide students with a list of resources to explore on their own time. At present, there seems to be little acknowledgement of corpora, corpus analysis tools, or even corpus-based resources outside a translation technologies setting.¹⁰⁶ Mentioning these types of tools on a course syllabus (of a specialized translation course, for example) could make a world of difference, for then students would at least be aware of what exists. Providing this information to students outside a technology-related setting would legitimize the knowledge they have acquired in other courses and would further encourage students to engage with these resources. This is of course very basic but still a necessary step in moving forward; once students and professors become more and more comfortable with these types of resources, then more can be done and additional options can be explored.

4.1.1.2 Workshops

Knowledge, understanding and practical applications of corpora, corpus analysis tools, and corpus-based resources are areas in which both professors and students can improve. One solution

¹⁰⁵ The importance of user confidence was also observed in [sections 3.4.1](#) and [3.4.3](#).

¹⁰⁶ As it stands, this hypothesis is based on a combination of factors: (1) personal experience in observing and/or participating in undergraduate translation classes; (2) relatively low student knowledge and/or usage of corpora ([section 3.1.1](#)); (3) the indication of low corpus usage in translation classes outside of translation technologies and terminology classes, as per a corpus usage survey conducted at UO-STI in 2014 as part of a class project for TRA6985: Developments in Terminology, Lexicology and Technologies; and (4) an analysis of course syllabi offered at UO-STI.

would be to create a workshop series which introduces students to corpora and corpus-based resources, offering them a chance to work with them through guided experimentation. Since corpora and corpus analysis tools tend to present more of a steep learning curve, specific workshops could be offered on: (1) different corpus types and functions; (2) how to build your own corpus; and (3) how to query corpora to solve translation problems (i.e. understanding the source text, selecting appropriate specialized terminology, etc.). With corpus-based resources, the approach would be different, for if students were being introduced to the DiCoEnviro, for example, an introduction to actantial structure and actants would have to be included. These workshops could be offered as a series throughout the semester outside of designated class time or even offered during the first week of selected translation classes within the classroom setting.¹⁰⁷

4.1.2 Open communication and collaboration

In any translator training program setting, it is crucial to foster an atmosphere of open communication and collaboration. As academics and professors, we must remain open to new ideas and concepts that could potentially improve translation student learning and growth. Translator trainers may have different areas of interest and different comfort levels with various aspects of the field; however, by openly communicating with one's peers, professors can easily start to develop a program-based approach to the training of translation students from the ground

¹⁰⁷ There are many factors to consider here, as this type of endeavour requires the cooperation of many individuals. Workshops held outside of class time would be much easier to coordinate than in-class sessions, as these require permission and collaboration of the professors involved. It does mean, however, that there is a danger in workshops being ineffective, as it requires students to participate outside of required class time. Additionally, this could also be a worthwhile project to explore as a 'pro-corpora/corpus-based resources initiative' in the future for graduate students.

It is also worth noting that since the inception of this thesis project, UO-STI has made progress with regards to technology and terminology inclusion projects at the undergraduate level. For example, initiative was taken to employ a graduate student at UO-STI to function as a 'technology/terminology specialist' for undergraduate students. This is an important and worthwhile endeavour; however, it is one that needs to be further developed and enhanced, and made more systematic.

level. The following is an example that has potential to be integrated into the program at UO-STI.¹⁰⁸

4.1.2.1 Course collaboration

There is potential to explore course collaboration if students are enrolled simultaneously in courses similar to those offered at UO-STI, like Documentation and Lexicology, and Specialized Translation, for example¹⁰⁹. In ‘Documentation and Lexicology’, students are introduced to technologies and methods that help translators and terminologists find and process information, including a section on corpora and corpus analysis tools. In ‘Specialized Translation I’, students could be introduced to the translation of specialized texts of various subject fields (e.g. economics, law, medicine, etc.).

In a specific module of Documentation and Lexicology, students gain knowledge and understanding of the basic types, components and functions of corpora and corpus analysis tools. Students are expected to understand the process of developing their own corpus and are also given the chance to apply their understanding by creating their own mini corpus in a group.¹¹⁰ At the same time, Specialized Translation I introduces students to the translation of specialized texts pertaining to the environment where they are expected to produce accurate and idiomatic translations in this particular subject field. If both professors were to work together, students could create a corpus related to the environment for Documentation and Lexicology that could then be

¹⁰⁸ Although both courses do technically exist at UO-STI, the example is completely hypothetical. Based on the brief course description, the general and specific learning objectives and subsequent classroom activity are merely propositional.

¹⁰⁹ While this is not always the case, and often depends on which program a student is enrolled, this combination of courses was simply selected to illustrate the workings of course collaboration.

¹¹⁰ Creating a corpus is both time-consuming and at times quite difficult. Mini corpora would be created in groups of 4-5 (depending on the class size). Subject to the approval of the professor, accepted corpora could then be merged together, acting as a ‘class corpus’ that could be used in other translation activities and in future courses.

used as a resource in the production of TL specialized texts in Specialized Translation I. In this way, students can potentially increase their overall translation competency level and further develop their understanding in terms of how all components function together.¹¹¹

This same process could be applied for corpus-based resources as well, where students are asked to complete translations and/or translation exercises using other resources.¹¹² This is merely one example of the possibilities that could be applied in practice. Linking together the various components of the translator-training program can help students understand how all the pieces fit together in order to apply knowledge from one class to another, ultimately better preparing them for a career in translation.

Essentially, translation students need to be armed with the knowledge and skills to be able to translate effectively and efficiently in any field of specialization throughout their careers. The field, the resources, and the methodology are all developing as the world progresses, and the future of translation is rather uncertain. Therefore, we need to be training students, not for the now, but for the future. They will always need to be adaptable in their field and will need to develop a high competency in research skills with the ability to determine the legitimacy of resources, the accuracy of the information, etc. This will not change, but perhaps the development of resources to aid in this process will.

¹¹¹ In this case, we are inevitably working within practical constraints as well as pedagogical ideals, which will always be the case, no matter the program. It is therefore essential to be able to identify where the value lies and work towards those objectives.

¹¹² This could be, for example, resources specific to a given subject field that are unlikely to be familiar to or commonly used by students already. This could potentially introduce some relevant, transferable skills-building in evaluating and familiarizing oneself with new resources.

4.2 Implications for resource development

While the data did not offer us enough information to make substantial, conclusive statements concerning resource development, we can offer some suggestions based on the feedback from participants in addition to screen-recording observations.

4.2.1 Translation-specific resources

There are many resources that exist to help language professionals in general; however, there are not many resources that are created for translators specifically. Outside of this study, it has been theorized and proven that corpora and corpus analysis tools can help translators to produce more idiomatic texts, akin to what a specialist in the field would write, when referring specifically to specialized translation (Bowker & Pearson 2002; Maia 2003; Rodríguez-Inés 2014; Korkas, Pavlides & Rogers 2005).

At the same time, corpus-based resources like the DiCoEnviro have been shown (see [section 3.5](#)) to have potential in being effective tools for translators when they become accustomed to the layout, the type of information they are viewing, the actantial structure, etc. There are also elements of these types of resources that are not necessarily relevant to translators as well, for they were not developed exclusively with translators in mind.

If anything, we have learned that real-life examples of specialized text are beneficial to translators, which was both a measurable observation with regard to effectiveness and efficiency ([section 3.5](#)), and a perceived observation, as highlighted by participant feedback described in [section 3.4.3](#).. Perhaps the greatest problem lies in how this information is presented to best suit their needs.

4.2.2 Importance of usability

While it is important to recognize that corpora and corpus-based resources have the potential to improve the quality of student translations, the information presented in such resources has little to no value if it is not presented in a way that is both appealing and user-friendly. As was previously discussed in [section 1.3.2.4.3](#), what good is a resource that helps individuals to work effectively and efficiently if the users are dissatisfied with the product, and thus have no intention of using such a resource outside of a testing context? Therefore, it is important to have a balance between all three usability metrics, as was described in [section 3.5](#).

While this study aimed to explore the notions of usability in both a specialized corpus and a corpus-based resource, it did not come without its limitations, as is discussed in the following section.

4.3 Analysis of limitations

There were several components of this study that were either a direct result of either imposed limitations (in order to test specific elements) or uncontrollable limitations. These limitations include, but are not limited to: (1) time with resources; (2) group differences; (3) testing corpus; (4) participant numbers; (5) time frame; and (6) network connectivity issues. They are discussed in the sections below.

4.3.1 Time spent with resources

Some might argue that students were not given the opportunity to truly familiarize themselves with the resources, and as such, the data obtained from the study is not as beneficial as it would be had this occurred.

The other side of this is that this approach gave us the opportunity to observe students interact with resources at the very beginning – and while it did not necessarily lend itself well to high effectiveness, efficiency, and perhaps satisfaction rates, it did, however, offer us insight into how students first react to new resources organically and through trial and error, begin to understand the presentation of resources and the type information present in the resources.

4.3.2 Group differences

While attempts were made to ensure that both groups were balanced based on program of study, prior translation experience, and mother tongue, there were some substantial discrepancies between the groups with regards to overall performance. Ideally, all participants would have completed the very same group of exercises and we would not have had to divide the group into two; however, that is also a limitation discussed in section 4.3.4.

4.3.3 Testing corpus

As a control factor, the corpus was made in a unique way in that the text excerpts included in the corpus included the same contexts that were found in the DiCoEnviro. Typically, a corpus would not be as limiting, as it would normally contain full texts when used for terminological or terminographical purposes (Meyer & Mackintosh 1996). We, however, removed this step from the process as the contexts found within the DiCoEnviro were deemed to be the most representative of the specific term and its acceptions within the field of the environment. This meant that when participants conducted a specific search for one of the specialized terms, they yielded a list of occurrences that could be perceived as somewhat limiting, when in fact, they were getting the most representative examples. This therefore posed a limitation in the analysis of participants’

satisfaction as they did not feel as confident with the results of the corpus as they believed the corpus itself to be limited in the amount of information it contained. On the other hand, this could also be interpreted as biasing the results of corpus searching to some extent, as the results are likely to be richer than they would typically be.

4.3.4 Participant numbers

The low number and varied experience and/or background of participants posed certain limitations. Ideally, participants would have been recruited from the B.A. program, training specifically for one language direction, preferably from French into English. Graduate students in Translation Studies tend to have varied backgrounds and differing experiences with translation, and do not necessarily possess professional translation experience. Participant numbers and participant experience was a direct result of the time frame of this study.¹¹³

4.3.5 Time frame

In a perfect world with all the time one can imagine, the process of recruiting translation students for this study would have been more intense and enticing. This, however, was not the case, and as such, we worked with those individuals who so graciously volunteered to participate.

Additionally, some participants far exceeded the suggested completion times in various components of the study. In some cases, by the time participants reached Translation II, they had already exhausted themselves and were either unable or unwilling to continue with this section.

¹¹³ This was also a limitation in terms of the level of qualitative and quantitative analysis that could be done, as was discussed previously in [section 1.3.2.4.1](#).

In some cases, this skewed the data. Ideally, we would have hoped to compare the results obtained from Translation I with those obtained from Translation II in order to evaluate students' satisfaction with the corpus and/or the DiCoEnviro, in addition to their effectiveness and efficiency when translating. Ideally, it would be best to track participants' progress over time in order to determine whether or not students actually felt that the corpus and/or the DiCoEnviro were useful in helping them to translate when working on their own translation projects, independent of this study.

4.3.6 Network connectivity issues

In some cases, participants experienced network connectivity issues. Measures were taken in order to attempt to avoid such problems (i.e. participants worked on a laptop computer with a wired connection to the Internet); however, as participants completed the study on campus, network connectivity issues were outside of our control.

Some participants experienced slow website loading times and were forced to restart the computer in order to continue. While this time was not factored into the total time spent on task, it meant that some participants had to spend extra time waiting for the website to load, the computer to reboot, etc. and as such, did not contribute to a positive mood and/or love for technology. If anything, it rendered the data obtained more realistic and representative of real life occurrences and interactions with these types of resources.

4.3.7 Evaluator reliability

The evaluation of both the comprehension and translation exercises was carried out by the principal investigator. This was mainly due to time constraints. With this in mind, specific

measures were carried out to maximize rater reliability. For example, an assessment strategy was established with a point system, as described in [section 3.2](#) (effectiveness).

4.4 Ideas for future work

This M.A. thesis study offers a mere glimpse into the potential that corpora and corpus-based resources have in helping students to better understand and use specialized terminology, particularly in the field of the environment. Due to reasons of space, the number of suggestions has been reduced; however, some of the shortcomings identified in [section 4.3](#) (limitations) could serve as excellent targets for follow-up work if we were to continue studies in this area. Additionally, future work or research could focus on better testing of the resources through trial and error with more participants in order to paint a more accurate picture of resource usability.

The data obtained from participants' screen-recording could also be used in a myriad of ways. Many observations were made that are outside of the scope of this study, more specifically, the ways in which participants manipulated search engines (e.g. Google, Yahoo!) when conducting terminological research. This is quite an interesting approach and worth examining more in depth as one of the main arguments against corpus creation is that it is too time consuming and the effort put into the process does not always transpire in the results. If students were given the training in research skills, techniques, and methods that could be transferable, then could we help students to manipulate corpus-based search engines in order to help them to yield the information they need?

4.5 Concluding remarks

It is clear that both terminological and instrumental competence are integral to the success of translators. These skills should to be integrated into program-based translation programs to better ensure that students are prepared for a life in their profession.

This study has highlighted the fact that corpora and corpus-based resources like the DiCoEnviro are the types of tools that can help students to better understand and use specialized terminology in a field such as the environment. While there were limitations imposed based on the number of participants in the study, the data obtained and analyzed introduced us to the potential that these types of resources have in helping to improve the overall performance of translation students.

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APPENDIX A

File Number: 09-14-17

Date (mm/dd/yyyy): 11/18/2014



Université d'Ottawa **University of Ottawa**
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Ethics Approval Notice Social Sciences and Humanities REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

<u>First Name</u>	<u>Last Name</u>	<u>Affiliation</u>	<u>Role</u>
Elizabeth	Marshman	Arts / Translation	Supervisor
Allison	Stentaford	Arts / Translation	Student Researcher

File Number: 09-14-17

Type of Project: Master's Thesis

Title: The DiCoEnviro, Specialized Terminology and Renewable Energies: Assessing student translators' comprehension and usage of specialized terms

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)	Approval Type
11/18/2014	11/17/2015	Ia

(Ia: Approval, Ib: Approval for initial stage only)

Special Conditions / Comments:

N/A



Université d'Ottawa **University of Ottawa**
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

This is to confirm that the University of Ottawa Research Ethics Board identified above, which operates in accordance with the Tri-Council Policy Statement (2010) and other applicable laws and regulations in Ontario, has examined and approved the ethics application for the above named research project. Ethics approval is valid for the period indicated above and subject to the conditions listed in the section entitled "Special Conditions / Comments".

During the course of the project, the protocol may not be modified without prior written approval from the REB except when necessary to remove participants from immediate endangerment or when the modification(s) pertain to only administrative or logistical components of the project (e.g., change of telephone number). Investigators must also promptly alert the REB of any changes which increase the risk to participant(s), any changes which considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project and safety of the participant(s). Modifications to the project, including consent and recruitment documentation, should be submitted to the Ethics Office for approval using the "Modification to research project" form available at: <http://www.research.uottawa.ca/ethics/forms.html>.

Please submit an annual report to the Ethics Office four weeks before the above-referenced expiry date to request a renewal of this ethics approval. To close the file, a final report must be submitted. These documents can be found at: <http://www.research.uottawa.ca/ethics/forms.html>.

If you have any questions, please do not hesitate to contact the Ethics Office at extension 5387 or by e-mail at: ethics@uOttawa.ca.

Signature:

[Empty signature box]

Riana Marcotte
Protocol Officer for Ethics in Research
For Barbara Graves, Chair of the Social Sciences and Humanities REB

APPENDIX B

TESTING MATERIAL REFERENCES

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APPENDIX C



Part I: Profile Questionnaire

Please complete the following 10 questions.

Estimated time: 5 mins

Please enter your assigned identifier: _____

1. Please select your current program:

- Honours B.A. (Specialization French to English), year 3 of 4 or 1 of 2
- Honours B.A. (Specialization French to English), year 4 of 4 or 2 of 2
- M.A. Translation Studies
- PhD. Translation Studies
- Other (please specify) _____

2. Which of the following courses have you completed? Please select all that apply.

- TRA 2988: Lexicology and Documentation
- TRA 3155/3555: Introduction to Terminology and Terminotics
- TRA 3956: Translation Technologies
- TRA 5903: Computers and Translation
- TRA 5905: Lexicology, Terminology and Translation
- TRA 6985: Developments in Translation Studies II
- Other with a focus on corpora or terminology (please specify): _____

3. On a scale of 1-4, to what extent do you agree with the following statements:

1 (Strongly disagree) 2 3 4 (Strongly agree)

I know how to use corpora to help me conduct terminological research.

I know how to use the DiCoEnviro to help me conduct terminological research.

4. On a scale of 1-4, to what extent do you do the following:

1 2 3 4 (Very
(Never) often)

I use corpora to conduct terminological research when translating.

I use the DiCoEnviro to conduct terminological research when translating in the field of the environment.

5. On a scale of 1-4, to what extent are you interested in the following areas:

1 (Not at all interested) 2 3 4 (Very interested)

Current events

Environmental issues

6. On a scale of 1-4, please rate your knowledge of the following areas:

1 (Not very knowledgeable) 2 3 4 (Very knowledgeable)

Current events

Environmental issues

7. If you have completed any other degrees or have any other experience related to the environment, terminology or corpora, please indicate in the box below. If this does not apply to you, you may leave it blank.

8. In order to gain an initial understanding of an environmental text, please indicate which resource(s) you would typically consult (select all that apply):

- Monolingual concordancers (e.g. Le Migou)
- Bilingual concordancers (e.g. Linguee, TradooIT)
- Terminology banks (e.g. TERMIUM, GDT, IATE)
- General lexical resources in print (e.g. dictionaries, glossaries)
- Specialized lexical resources in print (e.g. specialized dictionaries, field-specific glossaries)

- Online general lexical resources (e.g. dictionaries, glossaries)
- Online specialized lexical resources (e.g. specialized dictionaries, field-specific glossaries)
- Encyclopedias
- Parallel texts
- Other (please specify) _____

9. When faced with an unfamiliar term in an environmental text, please indicate which resource(s) you would typically consult when conducting specific terminological research:

- Monolingual concordancers (e.g. Le Migou)
- Bilingual concordancers (e.g. Linguee, TradooIT)
- Terminology banks (e.g. TERMIUM, GDT, IATE)
- General lexical resources in print (e.g. dictionaries, glossaries)
- Specialized lexical resources in print (e.g. specialized dictionaries, field-specific glossaries)
- Online general lexical resources (e.g. dictionaries, glossaries)
- Online specialized lexical resources (e.g. specialized dictionaries, field-specific glossaries)
- Encyclopedias
- Parallel texts
- Other (please specify) _____

10. During the revision process of your translation in the field of the environment, please indicate which resource(s) you would typically consult (select all that apply):

- Monolingual concordancers (e.g. Le Migou)
- Bilingual concordancers (e.g. Linguee, TradooIT)
- Terminology banks (e.g. TERMIUM, GDT, IATE)
- General lexical resources in print (e.g. dictionaries, glossaries)
- Specialized lexical resources in print (e.g. specialized dictionaries, field-specific glossaries)
- Online general lexical resources (e.g. dictionaries, glossaries)
- Online specialized lexical resources (e.g. specialized dictionaries, field-specific glossaries)
- Encyclopedias
- Parallel texts

Other (please specify) _____

Part II: Translation Exercise I

Please select your assigned group:

- Group A
- Group B

Translate the following seven (7) sentences from French into English. N.B. For this section, you may consult any resource you would typically make use of when translating in the domain of the environment.

Estimated time: 20 mins

A-1. Pour capter l'énergie induite par des vagues et la convertir en électricité, il existe de nombreux dispositifs qui sont actuellement mis au point.

A-2. Le principe consiste à recueillir l'énergie émise par le soleil par le biais d'un système de panneaux réfléchissants, puis de la restituer sous forme de chaleur ou de courant électrique au sein de la structure sur laquelle ils sont installés.

A-3. L'invention concerne un procédé et un dispositif permettant d'extraire l'énergie provenant de fluides en écoulement au moyen d'un diffuseur.

A-4. Au total, l'effet environnemental de la réforme de la politique agricole commune s'était révélé légèrement négatif, ce qui illustre bien la difficulté de prendre des mesures tenant compte de tous les paramètres.

A-5. Un autre fait intéressant est qu'il n'y a pas de lien direct entre l'évolution des émissions et la réputation "écologique" des pays.

A-6. Le principal objectif du protocole de Kyoto consiste à obtenir une réduction de l'émission de gaz à effet de serre.

A-7. Par exemple, les émissions de gaz à effet de serre d'un scénario et les émissions de SO₂ d'un autre, ou la population d'un scénario et la voie de développement économique d'un autre ne devraient pas être combinées.

B-1. La conservation, la restauration et la gestion durable des forêts, des sols, des marécages d'eau douce et des autres écosystèmes sont des moyens éprouvés, sûrs et immédiatement disponibles de séquestrer le dioxyde de carbone et de prévenir la perte d'autres gaz à effet de serre.

B-2. Cette description doit comprendre la procédure employée pour classer et séparer les flux de déchets et pour manipuler et entreposer les déchets au site.

B-3. Lorsque les produits ne présentent aucune valeur de réemploi, ils sont démontés et triés par catégories, telles que les cartes de circuits imprimés, les composants de métal et de plastique et les câbles.

B-4. La hausse de la température de l'air à la surface et l'évolution des précipitations en Asie auront des effets nocifs sur la santé humaine.

B-5. Ensuite, les dirigeants des entreprises à valorisation résiduelle primaire qui utilisent les indicateurs de mesure des performances environnementales ont la perception que les matières résiduelles introduites dans leurs procédés sont toxiques ou encore dangereuses.

B-6. L'élévation du niveau de la mer devrait être de l'ordre de 0,09 à 0,88 m.

B-7. Mais l'accroissement de la concentration d'aérosols dans la stratosphère freinerait le réchauffement planétaire.

Part III: Comprehension Exercise, section 1 (corpus)

*You may only use the corpus to gather information to guide you in answering the questions below (please right-click the link to open in a new tab)

Estimated time: 20 mins

I. Fill in the blanks: Select the most appropriate term for each context.

A-1. To _____ viable power from tidal energy, in most cases, the difference in high tide and low tide height must be at least five meters (16 feet). Only 20 to 40 locations on earth have this potential, most of which are located in the Bay of Fundy by Nova Scotia.

- extract
- capture
- collect

A-2. For example, the geothermal fluids _____ from the reservoir to drive the turbine in a geothermal power plant could, after their utilization, be injected back into the reservoir through specific injection wells.

- captured
- collected
- extracted

A-3. As it has been pointed out above, a rectenna is the basic element of the RF and optical rectenna technologies. It basically consists (figure 9) of an antenna, in charge of efficiently _____ the energy emitted from a radiative source in the EM spectrum, and a diode, in charge of rectifying the ac voltage induced at the antenna terminals by the EM radiation.

- collecting
- capturing
- extracting

A-4. Wind flow kinetic energy can be harvested by a wind turbine, which _____ energy from moving air by slowing it down and using the obtained energy to drive a generator.

- captures
- extracts
- collects

A-5. By using heat pumps and geothermal wells, heat can both be _____ from and stored in the ground.

- collected
- captured
- extracted

A-6. But researchers are developing new technologies for _____ the heat in deeper, "dry" rocks, which would support drilling almost anywhere.

- collecting
 - capturing
 - extracting
-

B-1. On an annual basis, 0.62 Mg of atmospheric CO₂ was _____ in roots of species grown in monocultures, and 160% more CO₂ was captured in roots of 16-species plots.

- separated
- sequestered
- sorted

B-2. This latest effort involved the development of a training program to instruct Nunavut landfill operators to appropriately _____ and store household _____ waste materials that come to the landfill site from residents.

- sequester
- separate
- sort

- hazardous
- harmful
- toxic

B-3. Waste can be separated at the source –i.e. the citizen _____ out the waste – or at the end – i.e. a waste company _____ the waste after it has been mixed.

- sorts
- sequesters
- separates

- sequesters
- separates
- sorts

B-4. As such, post-consumer waste is more difficult to _____ and collect, but very important as it keeps tons of material from going to the landfill.

- separate
- sequester
- sort

B-5. While such fossil fuels offer high energy density, the combustion required to release their energy releases to the atmosphere carbon _____ millions of years ago and thus contributes to climate change.

- sorted
- sequestered
- separated

B-6. This becomes even more evident in the case of many kinds of industrial or _____ waste, for which supplementary fuels have to be added to inertize _____ materials.

- harmful
- hazardous
- toxic

- toxic
- harmful

- hazardous

B-7. As policy makers begin to deal with the enormous challenge of reducing greenhouse gas emissions through the Kyoto Protocol, negotiating subsequent international agreements, and developing policies for reducing the _____ impacts of climate change, improved global and regional climate models will be needed to provide increasingly reliable insights into the consequences of unmitigated climate change and into the effects that different options for reducing greenhouse gas emissions will have on reducing the risks of change.

- harmful
- toxic
- hazardous

B-8. _____ wastes are _____ or fatal when ingested or absorbed (e.g., pesticides, metals such as mercury or lead, and toxic chemicals such as nicotine, benzene, formaldehyde, chloroform, etc.).

- Toxic
 - Harmful
 - Hazardous
-
- harmful
 - hazardous
 - toxic

II. Sense Matching: Based on senses A and B shown below, indicate in which group each of these examples belong

SENSE A	Positive environmental impacts can include reduced emission of atmospheric pollutants, reclamation of degraded land, and potentially a reduction of pressure on forests to the extent that fuelwood derived from such sources is replaced by other energy sources.
SENSE B	Many respondents looked into the e-bike specifically so that they could meet their goals that were motivated by their environmental values to drive their cars less frequently.

	Sense A	Sense B
However, other ENVIRONMENTAL impacts such as effects on acid rain production, ozone depletion, ecosystem destruction, release of carcinogens, etc. are often overlooked in studies and popular media coverage.	<input type="radio"/>	<input type="radio"/>
Businesses are expected to lead in the area of ENVIRONMENTAL sustainability as they are considered to be the biggest contributors and are also in a position where they can make a significant difference.	<input type="radio"/>	<input type="radio"/>
An analysis of current ENVIRONMENTAL goals and targets shows that the successful ones are built on general support from society and a scientific consensus that the problem exists and is urgent.	<input type="radio"/>	<input type="radio"/>
The use of fossil energy is the main contributor to many ENVIRONMENTAL pressures and the fuels will ultimately be depleted.	<input type="radio"/>	<input type="radio"/>

SENSE A	Electricity generation from wind power reduces the emission of carbon dioxide by 99 per cent over coal-fired electricity plants and by 98 percent over natural gas.
SENSE B	Emissions are negligible except in the case of dams when land that has been submerged decomposes and releases greenhouse gases.

	Sense A	Sense B
Cumulative carbon EMISSION reductions attributed to wind energy (compared to expanding the generation mix without wind energy)	<input type="radio"/>	<input type="radio"/>

Anthropogenic greenhouse gas EMISSIONS have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever.

Future GHG (greenhouse gas) EMISSION estimates are highly dependent on the evolution of many variables, including, among others, economic growth, population growth, energy demand, energy resources and the future costs and performance of energy supply and end-use technologies.

CO2 EMISSIONS associated with the manufacture of liquids from coal are even larger than those associated with their burning, unless captured at manufacturing plant level and stored in the ground.

SENSE A	Over the past century, global warming has caused the average sea level to rise by 10 - 25 cm, and another half-metre increase is expected by the end of the 21st century.
SENSE B	A 50 % increase in carbon dioxide levels coincided with a 5 ° C rise in global average surface temperature.

Sense Sense
A B

This change in sea LEVEL occurred in the context of different orbital forcing and with high-latitude surface temperature, averaged over several thousand years, at least 2°C warmer than present (high confidence).

NO2 emission LEVELS (individual measurements) are markedly higher in the incineration of sewage sludge in fluidized-bed plants. An average of 100 mg N2O/m³ was used for the calculations presented here.

Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea LEVEL rise, and in changes in some climate extremes.

Observational and modeling evidence indicates that, all else being equal, locally higher surface temperatures in polluted regions will trigger regional feedbacks in chemistry and local emissions that will increase peak LEVELS of ozone and PM2.5.

III. Based on what you have seen in the corpus, create an example showing the term as it would typically appear in a sentence in this field.

environmental, sense A

environmental, sense B

emission, sense A

emission, sense B

level, sense A

level, sense B

sequester

separate

sort

Part III: Comprehension, section 2 (DiCoEnviro)

*You may only use the DiCoEnviro to gather information to guide you in answering the questions below (please right-click the link to open in a new tab)

Estimated time: 20 mins

I. Fill in the Blanks: Select the most appropriate term for each context.

B-1. To _____ viable power from tidal energy, in most cases, the difference in high tide and low tide height must be at least five meters (16 feet). Only 20 to 40 locations on earth have this potential, most of which are located in the Bay of Fundy by Nova Scotia.

- extract
- capture
- collect

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B-6. But researchers are developing new technologies for _____ the heat in deeper, "dry" rocks, which would support drilling almost anywhere.

- collecting
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 - extracting
-

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- harmful
- toxic

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- separates

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Businesses are expected to lead in the area of ENVIRONMENTAL sustainability as they are considered to be the biggest contributors and are also in a position where they can make a significant difference.	<input type="radio"/>	<input type="radio"/>
An analysis of current ENVIRONMENTAL goals and targets shows that the successful ones are built on general support from society and a scientific consensus that the problem exists and is urgent.	<input type="radio"/>	<input type="radio"/>
The use of fossil energy is the main contributor to many ENVIRONMENTAL pressures and the fuels will ultimately be depleted.	<input type="radio"/>	<input type="radio"/>

SENSE A	Electricity generation from wind power reduces the emission of carbon dioxide by 99 per cent over coal-fired electricity plants and by 98 percent over natural gas.
SENSE B	Emissions are negligible except in the case of dams when land that has been submerged decomposes and releases greenhouse gases.

	Sense A	Sense B
Cumulative carbon EMISSION reductions attributed to wind energy (compared to expanding the generation mix without wind energy)	<input type="radio"/>	<input type="radio"/>
Anthropogenic greenhouse gas EMISSIONS have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever.	<input type="radio"/>	<input type="radio"/>
Future GHG (greenhouse gas) EMISSION estimates are highly dependent on the evolution of many variables, including, among others, economic growth, population growth, energy demand, energy resources and the future costs and performance of energy supply and end-use technologies.	<input type="radio"/>	<input type="radio"/>
CO2 EMISSIONS associated with the manufacture of liquids from coal are even larger than those associated with their burning, unless captured at manufacturing plant level and stored in the ground.	<input type="radio"/>	<input type="radio"/>

SENSE A	Over the past century, global warming has caused the average sea level to rise by 10 - 25 cm, and another half-metre increase is expected by the end of the 21st century.
SENSE B	A 50 % increase in carbon dioxide levels coincided with a 5 ° C rise in global average surface temperature.

	Sense A	Sense B
This change in sea LEVEL occurred in the context of different orbital forcing and with high-latitude surface temperature, averaged over several thousand years, at least 2°C warmer than present (high confidence).	<input type="radio"/>	<input type="radio"/>
NO2 emission LEVELS (individual measurements) are markedly higher in the incineration of sewage sludge in fluidized-bed plants. An average of 100 mg N2O/m ³ was used for the calculations presented here.	<input type="radio"/>	<input type="radio"/>
Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea LEVEL rise, and in changes in some climate extremes.	<input type="radio"/>	<input type="radio"/>
Observational and modeling evidence indicates that, all else being equal, locally higher surface temperatures in polluted regions will trigger regional feedbacks in chemistry and local emissions that will increase peak LEVELS of ozone and PM2.5.	<input type="radio"/>	<input type="radio"/>

III. Based on what you have seen in the DiCoEnviro, create an example showing the term as it would typically appear in a sentence in this field.

environmental, sense A

environmental, sense B

emission, sense A

emission, sense B

level, sense A

level, sense B

sequester

separate

sort

Part IV: Translation Exercise II

Estimated time: 40 mins

Translate the following fourteen (14) sentences from French into English. N.B. For this section, you may consult any resource you choose, including the corpus and the DiCoEnviro.

A/B-1. En plus de capter l'énergie solaire, la toiture solaire est résistante et étanche.

A/B-2. Un capteur solaire est un élément d'une installation solaire destiné à recueillir l'énergie solaire pour le convertir en énergie thermique.

A/B-3. Appareil pour extraire l'énergie des vagues comprenant un flotteur couplé à un mécanisme d'entraînement de telle sorte qu'un mouvement vertical du flotteur peut servir à générer une puissance.

A/B-4. Les niveaux de performances exigées des dispositifs utilisant de l'énergie et les impératifs de la gestion environnementale font de plus en plus l'objet de réglementations et de normalisation.

A/B-5. Comme forme d'écologie industrielle à l'échelle de l'entreprise, la valorisation résiduelle devrait être à la fois « écologique » et « industrielle » dans le sens premier de ces concepts tels que présentés et discutés plus haut.

A/B-6. Bon nombre d'activités humaines entraînent aussi l'émission d'aérosols sulfatés et contenant de la suie, des particules de combustion de la biomasse ainsi que de la poussière du sol.

A/B-7. Les actions coordonnées sont susceptibles de calmer les préoccupations relatives à la compétitivité, d'éviter les éventuels conflits avec les règles commerciales internationales et les transferts d'émissions de carbone.

A/B-8. Le renversement de ces processus par la restauration des écosystèmes est une occasion incommensurable de rétablir la diversité biologique et de séquestrer le carbone.

A/B-9. Que ce soit au niveau de la collecte ou du traitement, il existe des équipements qui nous permettent de séparer la portion solide de la portion liquide afin d'épaissir les boues.

A/B-10. Il s'agissait d'une première expérience de collecte sélective puisque les gens devraient séparer ou trier leurs déchets selon trois catégories : les matières putrescibles, les papiers et les chiffons, la céramique et les coquilles d'huîtres.

A/B-11. Par contre, l'ozone troposphérique est nocif pour l'environnement de la Terre parce qu'il diminue la qualité de l'air que nous respirons et contribue à l'effet de serre.

A/B-12. Ces considérations conduisent à soutenir que les indicateurs des performances environnementales tendent à être utilisés dans les entreprises à vocation résiduelle primaire ou secondaire dont les matières résiduelles introduites dans les procédés de fabrication industrielle sont perçues comme étant toxiques, dangereuses ou susceptibles de produire des émissions toxiques.

Longer contexts

(b). On a scale of 1-4, to what extent did the following components of the corpus help with your USAGE of specialized terminology:

1 (Not helpful) 2 3 4 (Very helpful)

Keyword in context (KWIC)

Longer contexts

5 (a). On a scale of 1-4, to what extent did the following components of the DiCoEnviro help with your COMPREHENSION of specialized terminology:

1 (Not helpful) 2 3 4 (Very helpful)

Annotated Contexts

Lexical Relations

Actantial Structure

(b). On a scale of 1-4, to what extent did the following components of the DiCoEnviro help with your USAGE of specialized terminology:

1 (Not helpful) 2 3 4 (Very helpful)

Annotated Contexts

Lexical Relations

Actantial Structure

6 (a). In the future, would you consider using a corpus for translation projects in the field of the environment?

Yes

No

(b) Why or why not?

7 (a). In the future, would you consider using the DiCoEnviro for translation projects in the field of the environment?

Yes

No

(b) Why or why not?

Thank you for your participation in this project. Once you have completed this page, you may click submit.