

Teaching acronyms to the military: A paper-based DDL approach

Yolanda Noguera-Díaz^a – Pascual Pérez-Paredes^b
Technical University of Cartagena^a / Spain
University of Murcia^b / Spain

Abstract – This research investigates the use of Data-driven learning (DDL) tasks in the teaching and learning of acronyms in a specialised corpus. Our target population is professional military staff (n=16). The researchers collected and analysed the *Salvage and Rescue of Submarines Corpus* (SAR) where the patterning of acronyms, neglected in English for Specific Purposes (ESP), plays a substantial role. Using a mixed-methods methodology, this research looked at the students' interaction with DDL, as well as at the subsequent interviews with the students. Deductive and inductive paper-based DDL tasks with concordance lines of acronyms were used with two groups of students of different rank. Both groups found the tasks challenging and showed mixed reactions towards concordance lines. While there has been a much-needed emphasis on tools and corpus methods training in DDL, we suggest that conversations with adult, professional students about the nature of instructed language learning and language patterning are absolutely essential to promote a more active learner role in DDL approaches.

Keywords – corpora; specialised discourse; Data-driven language learning; acronyms

1. INTRODUCTION

Linguistic analyses of English for Specific Purposes (henceforth ESP) registers have turned their interest towards professional practice by looking at both their academic and their specialised discourses (Bhatia *et al.* 2011). These findings have revitalised the interest of ESP professionals in the use of authentic language in language teaching (Gavioli and Aston 2001; Gavioli 2005; Boulton and Cobb 2017).

Corpora are useful tools for both increasing teachers' language awareness and improving lesson planning. Apart from revealing hidden patterns of use, they can also help ESP teachers capture the reality of professional discourse (Gavioli and Aston 2001: 238). In the language classroom, language learners seem to improve their linguistic competence (Boulton and Cobb 2017: 348) as they engage with corpus data via Data-driven learning (henceforth DDL) and language research tasks (Mishan 2004: 219).

DDL explores the application of corpus linguistics tools and techniques for pedagogical purposes in the classroom. However, DDL has been implemented in limited language education contexts, mainly in Higher Education (Boulton and Cobb 2017). In universities, Boulton and Cobb (2017: 379) report that DDL in ESP contexts yields a very high d effect size of 2.15 on average in pre/post-test designs, which underscores the impact of corpora on language learning. ‘Cohen’s d ’ is an effect size for the comparison between two means. It is widely used in meta-analysis (Plonsky and Oswald 2014: 878). The use of DDL in professional language-learning contexts outside Higher Education classrooms, however, remains largely underexplored. New materials and empirical studies for DDL are needed (Vyatkina 2020: 306).

Our focus is a professional community that has been particularly under-researched in the specialised literature: the military. Due to the dearth of English teaching materials for the military (Noguera-Díaz and Pérez-Paredes 2019: 118), we decided to explore the viability of corpus analysis and DDL in the context of a Navy School. In this research, we examined acronyms as used in a corpus of *Salvage and Rescue of Submarines* (SAR). This paper examines the use of a corpus-driven approach and a DDL pedagogic application in an ESP context for the first time in a Military Naval School. It focuses on the experience of the students who attend their specialisation course at the Spanish Navy Submarine Warfare School, and how DDL contributes to the learning of a selection of discourse features that are relevant to their practice. Our main research question is how professional Military understand the use of DDL in their process of language learning. This research question is theoretically framed and motivated by previous efforts to use DDL across different instructional contexts (Agee 2009). It seeks to shed further understanding of how to integrate language corpora (Boulton 2012) in specialised language instruction.

Section 2 of this paper reviews the roles of acronyms in specialised languages and, particularly, in the language used by the military. Section 3 describes a DDL approach in our specialised corpus while Section 4 describes this military context and the participants. Section 5 provides the research methodology. In Section 6, data analysis is described together with the explanation of some relevant findings. Finally, in Section 7 we discuss our results and possible future applications.

2. ACRONYMS AND THE MILITARY

Acronyms are considered as essential lexical units in science and technology. They embody the economy of language as well as being space-saving. Acronyms in biomedical and clinical documents are pervasive. A study conducted at the University of Minnesota involving clinical documents (Moon *et al.* 2013) from four hospitals used a small corpus to facilitate the extraction of acronyms and the creation of a guide for new and established practitioners. Jablonski (2005) compiled a dictionary of acronyms from medical books and periodicals from the *U.S. National Library of Medicine*.

Acronyms are “words formed from the initial letters of words that make up a name” (Quirk *et al.* 1985: 1182). New acronyms are freely produced on a daily basis, especially by scientists, journalists and administrators. Minkova (2001: 83) categorises blends as subtypes of acronyms while in Stockwell and Minkova (2009: 16) acronyms are a type of shortening. Plag (2003: 13) notes that blends are based on orthography and are called acronyms. Likewise, Stockwell and Minkova (2009: 16) distinguish between ‘true acronyms’ (e.g. ASCII), pronounced as any other word, and ‘initialisms’ (e.g. *FBI*), when the letters are pronounced individually. For the purpose of this study, we will use the cover term *acronym* to include both true acronyms and initialisms.

Despite the importance of acronyms in specialised discourse and their high frequency of occurrence in different disciplines, it is not unusual to see them neglected in ESP research. A case in point is Valipouri and Nassaji (2013), who rejected the study of acronyms in their corpus analysis of academic vocabulary in chemistry research articles, as they were not considered content words. Similarly, Konstantakis (2007) compiled the *Business Word List*—a corpus with texts from business English course books devised to train students for their university business studies— but acronyms were excluded from the analysis. Finally the *Academic Word List* (AWL) does not include acronyms either (Coxhead 2016).

The Navy and, more generally all military organisations, use acronyms for different purposes, such as organisational groups, projects and technology. For example, all organisational units within the Navy have an official acronym designation, i.e. HQ-LANDCOM, which stands for ‘headquarters for allied land command’ (Evered 1980: 135). In the NATO open-access documents, acronyms are frequently used in written joint operation planning by the *Allied Air Forces* (AAFCE), usually in glossaries and

dictionaries “to ensure uniformity in the use of terms and definitions” (*DOD Dictionary of Military and Associated Terms* 1998: 3).

Acronyms in the English Military lexicon have received some scholarly attention. For instance, Malenica and Fabijanić (2013) studied the abbreviations from a dictionary of military terms. They did an orthographic and morphological classification of these abbreviations ranging from acronyms and blends to clippings and initialisms. In particular, they highlighted the importance of these shortened word forms in military discourse as a way to facilitate their use and favour complex communication protocols. As all branches of the Armed Forces do, the Navy also uses a specialised jargon that makes it quite unintelligible outside the discipline. In this jargon, acronyms play a substantial role. Navy acronym dictionaries come in different forms, ranging from traditional paper-based dictionaries (Cutler and Cutler 2005) to published books, and from classified publications to official reports issued as directives. The *Navy Tactical Reference Publication* (NTRP-1-02) is, for example, an unclassified Navy report, while the *DOD Dictionary of Military and Associated Terms* (1998) is an instance of a publication issued by a military section. This dictionary standardises the professional language of the U.S. Navy by defining the terminology, acronyms and abbreviations used in *Navy Warfare Library* (NWL) publications.

Using corpus analyses of a specialised military corpus, Noguera-Díaz and Pérez-Paredes (2019) have found that acronyms play a fundamental role as appositions in noun phrases. In fact, acronyms are the most common type of post-modifier in the *Cartagena Military Submarine Corpus* (CMSC) (e.g. 45-CMSC: *Test firing from a UK Royal Navy nuclear attack submarine (SSN) were in June 2005*). This corpus is made up of 822,755 words and comprises twelve years of curated texts published in a variety of professional magazines and journals. In the context of noun phrase modification, the most distinctive features of the register represented in CMSC are: 1) an above-average frequency of noun+noun modification, 2) low adjectival premodification, 3) heavy appositional postmodification and 4) low prepositional phrase modification.

In CMSC, appositive nouns occurred in 39% of the instances analysed. These findings challenge previous accounts about the spread and use of postmodifiers in other registers such as English news and academic language (Biber *et al.* 1999: 642), where appositive noun phrases (e.g. *Mr Trump, president*) account for about 15% of the postmodifiers. In the specialised corpus of *Salvage and Rescue of Submarines* (SAR),

which is used in this research, acronyms play a substantial role. They represent 68% of the keywords in the corpus although they do not function mainly as appositive noun phrases. In SAR, they tend to be used as premodifiers in noun phrases (*SAR operation*) or as heads in noun phrases (*the DISSUB is assigned...*). Therefore, the importance of acronyms in SAR is also assumed essential by researchers for their teaching purposes. Table 1 shows the 10 most frequent acronyms in the corpus, their full forms as well as an example of use.

MOST FREQUENT ACRONYMS	
This procedure is applicable to any submarine SAR operation whether the DISSUB is assigned to NATO or not.	DISSUB Distressed Submarine
They have agreed to adhere to policies, procedures and minimum standards in SAR, for the needs of maritime and aviation safety.	SAR Salvage and Rescue
The primary means of securing the rescue system to the dedicated MOSHIP is by twist-lock fastenings.	MOSHIP Mother ship
The Surfacing Signal must be transmitted insufficient time to ensure its receipt by the SUBOPAETH.	SUBOPAETH Submarine Operating Authority
This principle should similarly apply in marine incidents where a Maritime RCC will be designated the responsible.	RCC Rescue Coordination Centre
Occasionally, the RCC requires the OSC to make various search decisions. Such as search pattern selection, track spacing, and individual search area.	OSC On-scene Commander
It should be used in conjunction with ATP- 57 which deals in more detail with the recovery of escapers and rescue of survivors.	ATP Army Techniques Publication
When the distress site and possible survivors have been located the SRV will do everything possible to facilitate the task of conducting the rescue operation.	SRV Safety Research Vehicle
The submarine should be ordered to dive for short periods and use her UWT and main sonar suite to search an area preferably away from the surface ships' search.	UWT Undersea Warfare Technology
Refer to the NATO Standardization Document Database for the complete list of existing reservations.	NATO North Atlantic Treaty Organization

Table 1: Most frequent acronyms in the SAR corpus

3. DDL AND SPECIALISED LANGUAGE

The linguistic analysis of ESP registers has attracted much scholarly attention (see, e.g., Bhatia *et al.* 2012), as new professional domains demand scrutiny and pedagogical attention. Corpus analysis techniques can be used in this context by language

professionals in response to emerging needs. In the foreword to Crosthwaite and Cheung (2019: xiii), a corpus-based study of the language of dentistry and its teaching, Ken Hyland has noted that, through their interaction with corpus-based materials, learners “are required to think their way into their disciplines [...], identifying the particular language features, discourse practices, and communicative skills of target groups.”

Johns and Dudley-Evans (1991) proposed a DDL application of corpora in learning and teaching. DDL was conceptualised as a lexico-grammatical approach that used a concordancer to analyse certain patterns in texts, and which then would be used in the construction of teaching materials. Since then, a wealth of studies in the last decade has advocated the use of corpus linguistics in language education (Boulton and Cobb 2017; Pérez-Paredes 2019), but just some of them have combined corpus linguistics methods, DDL and ESP.

It is fifteen years now that Gavioli (2005) applied the use of hands-on DDL to teach disciplinary language and improve the language learning autonomous experiences of medical students. Research in this area, however, does not seem to have made much progress (Pérez-Paredes 2019). Most researchers seem to agree that, as pointed out by Crosthwaite and Cheung (2019: 20), the use of DDL exposes language learners to evidence about language that

allows them to understand the characteristic language features involved in producing disciplinary genres of writing, thus enhancing their understanding of the complexities of literacy within their target disciplinary field.

However, how corpus-driven disciplinary knowledge is translated into pedagogy remains controversial (Pérez-Paredes 2019). What the evidence shows (Boulton and Cobb 2017; Pérez-Paredes 2019) is that it has been in English for Academic Purposes (EAP) where we have witnessed an increased interest in the use of DDL and specialised corpora (Yoon and Hirvela 2004; Lee and Swales 2006; Boulton and Pérez-Paredes 2014; Cotos 2014; Tono *et al.* 2014; Chen and Flowerdew 2018).

Very often, the focus of ESP research is academic language in the context of a specialised domain. Carter-Thomas and Chambers (2012) studied first-person pronouns in corpora of introductions to economics research articles, integrating printed DDL concordance lines as worksheets. Other research efforts have shown an overt, direct

interest in pedagogical applications. Hafner and Candlin (2007) explored a selection of legal writing tasks from a legal corpus using an online concordancer and collocation tools. They developed an online resource called *Legal Analysis and Writing Skills* (LAWS) that included an online concordancer and a collocation tool. It was designed to familiarise students with corpus tools to improve their competence in writing for legal purposes. Several task-based exercises were created in a concordancing help section on the LAWS website. The results showed that students preferred the use of the concordancer to retrieve instances of usage for modelling-based legal articles over the completion of concordancing tasks.

Some uses of DDL in ESP, however, showed positive results. Maniez (2011) studied adjectival versus nominal modification in medical English in a corpus of texts published by the *European Medicines Agency* (EMA). The election between a premodifying noun and an adjective is difficult for French native speakers. His corpus helped students make better-informed lexical choices. The researcher created this corpus as a guide when selecting the type of modification for non-native medicine ESP writers and specialised translators. Curado-Fuentes (2016) used DDL in ESP lessons with students of business and tourism. He found that the DDL group obtained better results than the control group that followed a traditional non-DDL methodology. The researcher chose texts related to economy and business from the *Corpus of Contemporary American English* (Davies 2008). The DDL students integrated hands-on concordancing of grammatical points (verb tenses) in their lessons, and reported a most positive feedback in terms of the usefulness of examining concordance lines.

However, the combination of corpora and DDL is not a panacea for ESP contexts (Boulton 2012: 281). According to Boulton (2012), what seems to be key is finding the balance between the appropriate corpus data and the integration into the learning environment, minimising the obstacles and highlighting the potential of DDL. As suggested by Crosthwaite and Cheung (2019: 20) corpora offer educators and learners target disciplinary language that students can use “to discover the key features of disciplinary language in use.” Despite the benefits identified in the specialised literature (Boulton and Cobb 2017; Pérez-Paredes 2019), there is a dearth of emic studies that explore learners’ engagement with DDL through qualitative methods and interviews. Pérez-Paredes and Sánchez-Hernández (2019) is an exception. Their interviews with university researchers two years after the corpus training sessions provide insights into

the writing practices of researchers in the Spanish University context, and their reluctance to use corpora when writing. In our specific context, the use of the SAR specialised corpus for pedagogical purposes is the main target of our study.

In the following sections, we will discuss the context of this study and the methodology that was adopted to carry out our research.

4. CONTEXT AND PARTICIPANTS

The Spanish Submarine Flotilla was founded on February 17, 1915 when the Miranda Act was passed by King Alfonso XIII. The Spanish Submarine Flotilla is located in the city of Cartagena and provides specialised training on a wide range of areas through monographic courses. The Submarine School provides training to officers and ratings specialising in weapons engineering and warfare operations. The Submarine School develops and trains future Spanish submarine crews (officers, petty officers and master seamen). It has four main departments: Weapons, Tactics, Energy and Propulsion. All teachers are military staff except for the languages section in which they are civil members. The Flotilla Commander is also the Base's Chief and the Submarine School's Headmaster.

This study involves naval military personnel taking one-year specialisation course before joining the *Spanish Navy Submarine Force*. The school compulsory subjects range from acoustics, communications, torpedoes, first aid, tactics, data, equipment, services to salvage and rescue. The course runs every year from September to June. Intensive six-month theory courses are followed by three training months on board. Students are divided into three groups according to their military rank: sailors, petty officers and officers. Spanish submarines are currently part of the NATO Sea Guardian and E.U. Sophia operations.

Sailors have a certificate of Compulsory Secondary Education and have completed one year of military training in a military school. This course at the Submarine School is described as a specialisation course. Officers have a four-year degree in Naval and Military studies. Both groups took either the Preliminary English Test (PET) or the First Cambridge Test (FCE) upon their arrival at the School. A total amount of sixteen military students participated in this research: ten sailors and six officers. Once these students were debriefed, they provided consent following standard

ethical guidelines for good research practice (*The British Association for Applied Linguistics Ethics* 2006; see Appendix 2). No Internet connection was available during the sessions for reasons of security.

The sailors' group consists of ten male students whose mother tongue is Spanish. 10% of the sailors have a B2 profile, another 10 % a C1 English profile and 80% an A2 (see Appendix 1A for demographic information).¹ These results can be aligned with the assessment methodology used by the Armed Forces. The language proficiency levels are measured by some level descriptors included in the *Standard NATO Agreement 6001* (STANAG 2019). STANAG includes five levels which range from 1 (survival), 2 (functional), 3 (professional), 4 (expert) to 5 (highly articulate native). See Table 2 below for equivalence.

CEFR	STANAG 6001
A1	0 or 1
A2	1~1+ or 2 (mostly 1)
B1	1+ or 2 (mostly 2)
B2	2~2+ or 3 (mostly 3)
C1	2~2+ or 3 (mostly 3)
C2	3~3+ or 4

Table 2: CEFR/ STANAG 6001 equivalences

As far as the officers' group is concerned, it consists of one female student and five male students. Spanish is their mother tongue. They all have a B2 English level and have developed a basic command of Naval English (mainly military ship-related vocabulary) due to their previous military academic training (see Appendix 1B for demographic information).

5. METHODOLOGY

We adopted a mixed methods research methodology. Corpus linguistics exploration and pedagogic intervention was followed by a qualitative approach within an interpretive paradigm (Taber 2013) to explore the adoption and use of DDL in a professional military context.

This was a three-stage research project whose classroom intervention went on for a month. In the first stage, the SAR corpus was put together so as to extract and analyse

¹ These levels are those established by the Common European Framework for Reference (CEFR).

the features of the *Cartagena Military Submarine Corpus* (CMSC) following the guidelines in Noguera-Díaz and Pérez-Paredes (2019). We found that 69% of the 100 most frequent keywords in the corpus are acronyms (e.g. DISUBB, SAR, COMSUBMAR...). We examined the different grammatical relations and found a tendency for these words to function either as subjects (e.g. *The Argentinean DISSUB was found six months later*) or objects (e.g. *They have finally located the DISSUB*). This analysis gave us the understanding to move on to an informed selection of materials to be used in the language classroom based on the frequency of the acronyms, their syntactic roles at the clause and the phrase levels and their collocational profile. Analyses were carried out via *Sketch Engine* (Kilgarriff 2003). In the second stage of our research, students engaged with paper-based DDL activities. Finally, in a third stage, interviews were conducted to probe into the receptions and viability of DDL in a professional context.

5.1. Stage 1: Analysis of the specialised corpus

‘Salvage and Rescue of Submarines’ is a compulsory subject in the syllabus of the Spanish Navy Submarine Warfare School. While endorsed and curated by the Ministry of Defence, SAR publications are non-confidential and non-restricted, which made them the ideal target for our corpus. The SAR corpus consists of 18 non-classified NATO publications, including fifteen books and manuals and three journal articles. The corpus contains 37,615 types and 717,446 tokens. Some of the most important publications here are the so-called ATP-57(i) and (ii). These are manuals that address the techniques and procedures for salvage and rescue operations involving submarines. It is published by the STANAG, which defines processes, procedures, terms and conditions for common military technical procedures or equipment among the member countries of the alliance. Each NATO state ratifies a STANAG and implements it within their military system. The purpose of STANAG-compliant procedures is to provide common operational and administrative practices and logistics. Most of the specific bibliography was provided by the officer in charge of the International Submarine Escape and Rescue Liaison Office (ISMERLO) at the Submarine School. The ISMERLO Office is based in Northwood, United Kingdom. This site provides the worldwide submarine rescue coordination and information exchange.

5.2. Stage 2: Introductory workshop on DDL and paper based DDL activities

The second stage of our study examined the informants' first contact with the SAR corpus. Both groups of students received a 60-minute introduction to the corpus. The introduction sought to unlock the potential of corpus consultation and to unveil lexicogrammatical patterning. The introduction covered aspects such as collocations, colligation and keywords. The word *submarine* was chosen as an example and some concordances lines, which included noun phrase structure (determiners and modifiers), were displayed. During the session, students were asked to identify some patterns of use and were offered the opportunity to discuss difficulties and their first reaction. The following week, students were provided with worksheets with all the concordances of the two most frequent acronyms in the corpus: DISSUB and SAR. The students were asked to examine the lines following a similar procedure to that used in Thurston and Candlin (1998) and to note the type of words that tend to premodify and postmodify the acronyms. Once they shared their findings with the group, the instructor provided explicit explanation and solved doubts or inquiries. In the third week, the instructors used a smaller selection of concordance lines of the same acronyms (DISSUB and SAR) to showcase collocational and colligational behaviour and, thus, facilitate a closer examination of the contexts in which acronyms were used. Students were provided with a worksheet that included different exercises. In the first block, learners were offered a brief explanation on word order and the verb phrase in the English language. The follow-up activities in Tables 3 and 4 were conceptualised as deductive activities.

Activity 1: Underline the finite verb phrases after the acronym DISSUB and level them.

- It was three days after the DISSUB had been found, Marine Sound Signals (MSS) off.
 - They are in a hard situation unless the DISSUB has underwater Morse or voice signal.
 - Unless you are in a scarcity of power, the DISSUB will try to transmit continuously.
 - There are not pills available, this DISSUB crew will concentrate on using masks.
-

Table 3: Activity 1 - SAR corpus and finite verbs

Activity 2: What are the word classes that appear frequently before DISSUB? Are they adjectives, determiners, nouns, etc.?

- At nautical miles during all DISSUB transfer evolutions. A 20-angled wedge is needed.
 - With precise angled DISSUB mating. Using a combination of trim and draught.
 - Hatches and portholes in the DISSUB when equalised with the RC. A CO2 scrubbing.
 - Localising a DISSUB: Maximum angle 60 degrees to the horizontal plane at any ratio.
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Table 4: Activity 2 - DISSUB premodification

In the second block, students completed activities 3 and 4 (see Tables 5 and 6) without any exposure to explicit declarative knowledge. Time was provided to facilitate discussions around the completion of the activities and the lexico-grammatical points raised. In the last week, further feedback on the previous lesson activities was given and semi-structured interviews were conducted.

Activity 3: Left context of the acronym. Choose one of these three adjectives for suitable gap-nuclear, simulated, atmospheric, diesel.

- Rescues from a DISSUB should be taken as radiological contaminated until proven otherwise.
 - Monitoring the DISSUB internal data during the ventilation operation is crucial for the efficacy.
 - Establish UWT communications between surface and DISSUB in accordance with scripts.
 - Rescue crewmembers from aDISSUB carry out basic medical training scenarios.
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Table 5: Activity 3 - DISSUB left context.

Activity 4: Right context of the acronym. Choose one of these nouns for suitable gap: crew, position, request, condition.

- The ship(s) nominated by the SSRA to carry stores and equipment which may be needed to sustain DISSUB's
 - Marking the Submarine's position. It is important that the DISSUB..... is not lost, particularly in a tideway.
 - Every effort must be made to comply with the DISSUB..... to obtain specialist advice on what might be required.
 - The purpose of the divers is to orient and familiarise the rescue unit, inspect the DISSUB..... and damage
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Table 6: Activity 4 - DISSUB right context

The same paper-based DDL activities (Boulton 2010) were used in both groups on different dates following the same protocol. The acronyms DISSUB and SAR were chosen, as they are the most frequent keywords in our corpus. These acronyms function either as the subjects of a clause and display some of the properties of regular nouns, thereby being premodified by a variety of structures (e.g. adjective phrases, noun phrases or past participles), or functioning as premodifiers in noun phrases (e.g. *A SAR operation covers the whole process*). A careful analysis of the frequency of appearance and breadth of syntactic functions helped us to decide what concordance lines to select and the target forms to discuss during the activities, particularly during week 3. The overarching objective of these DDL activities was to make the students familiar with the patterning of these words, together with discovering of some of their most common pre- and post modifiers in (authentic) contexts.

5.3. Stage three: Semi-structured interviews

We used semi-structured interviews (Gray 2015: 213) to tap into the learners' use of DDL. The interviews were conducted in Spanish and were recorded and transcribed for further analysis. The students were debriefed and were reminded that anonymity and their right to remove themselves from the research were warranted. The sequence of the questions went from students' general personal learning experience with English—as in *What is your goal as a language learner? How do you learn grammar and vocabulary?*—to more precise recall of their experience with DDL, as in *Describe your experience with the DISSUB concordance lines, or Can you focus your attention just on the right section of the line?* (see Appendix 3 for details). The students were all cooperative and eager to provide their answers openly. In total, 3.15 hours of recorded material were transcribed: two hours in the sailors' group and one hour and fifteen minutes in the officers' group.

6. DATA ANALYSIS AND FINDINGS

We analysed both the DDL activities completed by the informants and their interviews. The researchers categorised the answers to the four activities for each acronym (two inductive and two deductive) as correct or wrong in order to evaluate the students' understanding of the activities. We used 'theme analysis' (Gray 2015: 319) to examine the students' reactions to DDL in the interview data. Theme analysis is a widely used data reduction and analysis method that extracts themes and subthemes from textual data in order to understand how they are interrelated (Pérez-Paredes 2020).

6.1. DDL activities

Paper-based DDL involves the study of patterns by means of printed materials prepared by language teachers or researchers (Tribble and Jones 1997). Our students had no direct access to the corpus or concordance software during the activities. One of the main advantages of paper activities is that corpora insights can be shared with a wider audience, who cannot have access to computers or the Internet. In our case, the School is heavily protected against cyber-attacks, which makes it extremely difficult for students to use their own devices or for teachers to access a Wi-Fi or a LAN point. Another positive side is that, in classroom contexts where technology is not normalised

(Bax 2003), students may feel at ease with printed concordance data. This eliminates much of the challenges discussed in the literature concerning training to use a corpus (Boulton and Cobb 2017: 350).

The first activity, which is illustrated in Table 3 (see Section 5.2.), involved 1) looking at the concordance lines, 2) paying attention to the verbs which follow DISSUB and 3) underlining them. Then, the students examined the concordance lines and underlined the words that pre-modified or post-modified the acronym in order to classify them into a morphological category. Informants were also asked to consider the verb tenses which post-modified the acronym. These activities followed an introduction to tenses in verb phrases and noun phrase complexity, where the instructor used explicit declarative knowledge about the grammar of the English verbal and noun systems.

Activity 1 and 2 (see Tables 3 and 4 in Section 5.2) followed a deductive learning approach (Flowerdew 1996: 97) that was successful in both groups (95% of the answers were correct). In-depth observation of the left and right contexts helped students infer information about the syntactic nature of both acronyms. However, the results of the third and fourth activities (see Tables 5 and 6 in Section 5.2.) yielded low scores in both groups. These activities followed an inductive learning approach that seemed to be more cognitive demanding, as the students were asked to discover patterns and analogies that implied language noticing and the use of a wider range of vocabulary. For these activities, the instructor did not offer an explicit account of the grammar or the lexical properties of the noun phrases involved. Only 20% of the sailors' group answers were correct, while in the officers' group only 30% of the answers were not.

6.2. *Semi structured interviews activities*

Different themes emerged from the questions that were discussed during the interviews with the two groups of students. What follows provides a summary of both the themes and the reactions to those themes in the two groups. Transcriptions are presented *verbatim*.

6.2.1. Concordance lines

The students' perceptions in both groups reflect certain feeling of confusion over the concordance lines. Students felt that going through the lines was more exhausting than other activities they were more familiar with. In general, they seemed to prefer the teacher's explicit guidance and a more traditional method. By way of example, in the sailors' group, student Number 2 affirmed: "[...] the system requires a significant effort of concentration because after the fifth line you get dizzy. Sometimes the word does the same function in each sentence and you must pay attention and make a much greater effort than normal. It is very repetitive."

In the officers' group, student Number 3 said: "I see it very intuitive but very hard. It does not help me more than a direct translation of the word in my mobile or reading the English definition in a dictionary." In addition, student Number 5 added: "It reminds me of my best English dictionary with different entries of the same word."

6.2.2. English language methodology

Students claimed they preferred a more traditional teaching method, with less innovative techniques and more teacher guidance. Sailor Number 4 said: "This is a lot of time-consuming work. Sometimes it is boring. I prefer reading and applying grammar rules in the workbook. It is almost automatic and easier for me." However, officer Number 5 added: "I would like to know more about this method. It is so new and different [...]. I was very concentrated in doing well the tasks."

6.2.3. Role of vocabulary in learning a foreign language

Both groups commented on the vital role of memorisation, translation and repetition. In the sailors' group, student Number 2 said: "To learn vocabulary you must already have some knowledge, a good base of the English language. I am overwhelmed by the lines."

Student Number 7 added: "I learn vocabulary copying paragraphs and writing words repeatedly. From 1 to 10, I would give vocabulary an importance of 9." However, officer Number 6 claimed the opposite, and said: "The lower your English level, the more grammar you must learn. On a grammar basis, you could add vocabulary easily through repetition, wordlists or reading."

6.2.4. Attitude towards concordance lines

Most students were overwhelmed by the accumulation of concordance lines and, at the same time, felt some frustration with the time needed to analyse the lines. Sailor Number 9 reported that: “There are many exercises for just a word. Too much time consuming for an acronym.” Student Number 8 suggested that: “Reading these lines properly requires a significant effort of concentration. I am not used to do that.”

As for the officers, Number 6 said: “It was a different experience, strange. It is the first time I see this type of approach. It is easier for me to look up this acronym in a monolingual dictionary with different entries.”

Our students experienced more difficulty in reading the target language acronyms than reading short paragraphs with familiar vocabulary. The two less advanced students found it hard to read the concordance output. Sailor Number 10 affirmed: “I feel overwhelmed with this method and at the same time, I get discouraged if too many items in the concordance lines were unknown.”

However, officer Number 3 said: “I would like to experience more with concordances as part of my language learning experience, but I would not like to substitute the traditional English lessons for entire lessons just with concordances.”

Students also expressed their interest in DDL. Sailor Number 10 said: “The last ten or fifteen minutes at the end of the class because if you put the lines at the beginning of the lesson and you don’t understand the vocabulary, you disconnect. It’s like talking about quantum physics to my sister who is ten years old.” Student sailor Number 9 added: “Yes, I think three or four activities of this type would be fine once you have already acquired some of this specific vocabulary. Doing activities with the concordance lines at the beginning of the class become tedious and scattered.” Similarly, officer Number 1 thought: “It is good as complementary exercises in class.”

7. DISCUSSION

While the materials and activities addressed the domain and professional discourse training needs of our learners, both groups of students agreed that interpreting corpus data and reading concordances was quite challenging. The students’ success with deductive DDL tasks seemed to be counterbalanced by the somewhat less positive

results in the inductive tasks. Irrespective of the orientation of the tasks, our informants felt overall motivated and curious about DDL, though they expressed mixed reactions.

The use of interviews in a mixed-methods design facilitates the situatedness of research data in ways that surveys cannot. Particularly, we were interested in understanding how a group of military professionals framed their ideas about language learning and about DDL, and how both are entwined with values, opinions and behaviour (Cohen *et al.* 2018: 285). Our study shows that these students' language learning ideology is dominated by the Grammar-Translation method, which emphasises the mastery of grammatical rules and vocabulary. This is reflected in the way our students have learnt English vocabulary along their academic life by memorising and copying wordlists. Their perception that learning acronyms through DDL is very time-consuming lends evidence to the fact that the type of student-centred discovery learning in DDL clashes with approaches where declarative knowledge is presented to students in ways that favour a lack of learner-centred understanding of lexico-grammatical patterning. This is perhaps a major obstacle for a DDL approach in instructed language learning contexts, where an emphasis on form is met by a lack of input in the foreign language. However, the specialised literature (Boulton and Cobb 2017) has tended to emphasise the obstacles of hands-on concordance as regards corpus consultation (see Pérez-Paredes *et al.* 2011, 2012; Boulton and Cobb 2017) and the interpretation of concordance lines (Pérez-Paredes *et al.* 2011; Pérez-Paredes 2019) ignoring learners' beliefs and their situatedness in a larger social group (Ushida 2005: 49) and their ideologies about language learning (Spolsky 2004: 80). The use of paper-based DDL removes the pressure to instruct learners on how to use concordance and, as a consequence, may enhance the engagement with the interpretation of concordance lines. This area requires further attention by researchers.

We have found evidence that identifying word patterning seems to be perceived as more demanding in inductive activities than in deductive activities, so this would seem a great point of departure to have conversations with students of specialised languages about the roles of language, language form, patterning and learning. A more explicit treatment of how learning happens in instructed contexts, in particular in adult professional contexts, seems relevant as suggested by some of the students during the interviews. The reactions to the use of authentic texts were largely positive and were in line with the findings in the literature (Boulton and Cobb 2017). The group of the

officials was slightly more vocal about the importance of learning English using authentic texts. We note that some of the learners' criticism towards DDL in this research may be tentatively put down to lack of awareness about the lexico-grammatical nature of language, the role of frequency and other statistical properties of language.

It has been claimed that DDL at the tertiary level seems to be effective in contexts such as law, scientific writing or healthcare education (Crosthwaite and Cheung 2019: 27). Boulton and Cobb (2017) have established that it is predominantly Higher Education students that have been extensively examined in past DDL research, and that DDL instruction has a positive impact of language gains. We also know that paper-based DDL is effective: DDL has a mean *d* effect size of 1.06 in pre/post-test designs and 0.52 in control/experimental studies (Boulton and Cobb 2017: 377). What makes our study unique is that we have taken DDL to classrooms where DDL might rarely happen, so this is a first attempt at examining the uptake of paper-based DDL with a population of military personnel that will need to be probed in other similar contexts.

Despite the short contact time with DDL, we found some evidence that our informants noticed basic patterning around the acronyms selected. Boulton (2010: 534) has pointed out that the aim of researching the use of paper-based concordance lines is not to show that DDL is superior to other approaches, but rather present learners with complementary learning that can be useful in contexts with limited time available for training. Our approach implies not only a research-informed form of instruction about acronyms, but also increasing the students' knowledge about their professional register. New training initiatives are needed so as to examine longer exposure to DDL. The context in which we developed this research seems appropriate to use paper-based DDL as hands-on concordance is not possible. While Boulton and Cobb (2017) have suggested that DDL offers a way out of overemphasis on vocabulary lists and grammar exercises, our learners provided evidence that, in the context of a Grammar-Translation methodology, which emphasises the teaching of forms (Long 1991), DDL may face obstacles that go beyond the normalisation of Information and Communication Technologies (ICT) or corpora (Bax 2003; Pérez-Paredes 2019). The compilation of the SAR corpus as well as CSMC (Noguera-Díaz and Pérez-Paredes 2019) will hopefully create the conditions for the preparation of a syllabus that includes corpus findings and DDL as cornerstones for Navy submariners. Some of the learners evaluated DDL and learning acronyms through concordance lines as extremely useful and eye opening, but

for most of them the use of concordance lines was not an efficient way to learn vocabulary. This finding echoes Pérez-Paredes and Sánchez-Hernández (2019), who showed that university researchers did not generally find corpora more useful than vocabulary lists or glossaries, when writing academic English. Pérez-Paredes and Sánchez-Hernández (2019: 60) argue that “learning and development are socially motivated and happen in culturally formed settings,” which explains the divergence of results worldwide and the emic quality to most research design in DDL. Bridging the gap between the emic and the globalised urgency to learn English as the *de facto* language of many professionals worldwide is quite a challenge.

8. CONCLUSION

Our research presents some limitations. It belongs to a specific professional context that cannot be generalised to other learning contexts, both nationally or internationally. Although the number of informants is arguably small, it is representative of the military student enrolled in professional courses every year. We assume that the intervention period was quite short, but it was arguably a necessary step in considering the implementation of further corpus-based classroom work.

We like to think that this experience will give rise to the development of an integrated DDL syllabus, where learners and researchers can find themselves more at ease with both the DDL methodology and the sort of language-related insights that emerge from interacting with concordance lines.

DDL work requires substantial contact time, particularly in hands-on concordance contexts. Although more research is needed on the selection of concordances lines and activities, an integration of paper-based DDL into current methodological options may contribute to bringing together students’ awareness of language patterning in professional contexts and approaches that favour a more active learner role.

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Corresponding author

Yolanda Noguera-Díaz

Technical University of Cartagena

Department of Quantitative Methods, Legal Sciences and Modern Languages

Calle Real, 3.

30201. Cartagena.

Spain

e-mail: yolanda.noguera@upct.es

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APPENDICES

APPENDIX 1A: Demographic information (10 informants; sailors)

1. Gender: 100% male

2. Mother tongue: 100% Spanish

3. Where did you last study English?

Secondary School: 70%

At University: 0%

At Military Schools: 30%

Others: 0%

4. What type of learning materials did you follow?

Books and workbooks: 80%

Blending learning (Books and online resources): 10%

OERs (Open Educational Resources): 10%

5. What is your performance level? Others?

CEFR: A1, A2, B1, B2, C1, C2.

NATO profiles:

0-70% (A1)

1-0%

2-20% (B2)

3-10% (C1)

4-0%

6. Have you studied general English or naval English in the Navy School?

Always general English: 80%

Always technical English related to the Navy: 0%

Fifty/fifty (general English and naval English): 10%

Sometimes naval English: 10%

Sometimes general English: 0%

Others: 0%

7. Some specific subjects were taught in English. If you remember the name of any, please, write it down.

Never: 100 %

Always: 0%

Often: 0%

Sometimes: 0%

Subject: ...

8. Do you use a dictionary for writing tasks?

Yes: 80%

No: 20%

What type of dictionary?

Paper: 10%

On line: 90%

Others: 0%

9. Have you ever heard the term English for Specific Purposes?

Yes: 80%

No: 20%

Maybe: 0%

Reminder: English for Specific Purposes is related to particular disciplines. It has specific lexical, semantic and syntactic features of technical language. Its communicative functions convey their meaning in a unique way.

10. How often do you use a computer when studying English?

About once a day: 0%

About once a week: 40%

Never: 60%

Always: 0%

Others: 0%

11. How do you use the new technologies to improve your English skills? Choose the most suitable one.

a) Sometimes I use the Internet to look for grammar tutorials and similar: 80%

b) I often download podcasts and videos in English: 0%

c) I rarely use the new technologies, except for the CD player: 0%

d) I love surfing the net, reading, chatting or playing games with foreign people: 0%

e) I often use free/established digital didactic platforms to revise my English: 10%

f) I mainly use printed material: 0%

g) Other options: 10% (for music and chat)

12. Do you think the English Language is important for the Submarine crew in the Armed Forces?

a) If the Submarines are Spanish, the crew can speak Spanish to communicate the problems with the Base: 0%

b) The English language is only important when we sail in international waters in case of engine failures, damages or injured people: 50%

c) The International Submarine Escape and Rescue Liaison Office (Ismerlo) coordinates the rescue efforts from Norfolk: 10%

d) The Ismerlo protocols can also be translated into Spanish quickly: 0%

e) English language is only important for promoting: 0%

f) The high ranks must have a good English standard profile: 0%

APPENDIX 1B: Demographic information (6 informants; officers)**1. Gender:** 80% male and 20% female**2. Mother tongue:** 100% Spanish**3. Where did you last study English?**

Secondary School: 100%

At University: 100%

At Military Schools: 100%

Others: 0%

4. What type of learning materials did you follow?

Classic: Book, workbook and media: 80%

Photocopies of different sources provided by the teacher and media: 0%

Blending learning: 10%

Open Educational Resources: 10%

5. What is your performance level? Others?

CEFR: A1, A2, B1, B2, C1, C2.

NATO profiles:

0-0% (A1)

1-0%

2-100% (B2)

3-0% (C1)

4-0%

6. Have you studied general English or naval English in the Navy School?

Always general English: 0%

Always technical English related to the Navy: 0%

Fifty/fifty (general English and naval English): 100%

Sometimes naval English: 0%

Sometimes general English: 0%

Others: 0%

7. Some specific subjects were taught in English. If you remember the name of any, please, write it down.

Never: 100 %

Always: 0%

Often: 0%

Sometimes: 0%

Subject: ...

8. Do you use a dictionary for writing tasks?

Yes: 100%

No: 0%

What type of dictionary?

Paper: 0%

On line: 100%

Others: 0%

9. Have you ever heard the term English for Specific Purposes?

Yes: 80%

No: 20%

Maybe: 0%

Reminder: English for Specific Purposes is related to particular disciplines. It has specific lexical, semantic and syntactic features of technical language. Its communicative functions convey their meaning in a unique way.

10. Can you express the words *proa*, *popa*, *puente*, *escotilla* and *cabo* in English?

All of them: 100%

50%: 0%

I don't remember now: 0%

11. With what type of content would you feel more comfortable in a role-play classroom activity, in a professional one or in a general one? Choose one.

a) Dialogue about the features of your current vessel: 0%

b) Dialogue about the Spanish/British weather: 0%

c) Dialogue about the protocols of safety on board: 100%

d) Dialogue about your spare time and hobbies: 0%

12. How often do you use a computer for studying English?

- About once a day: 20%
 About once a week: 0%
 Never: 0%
 Always: 80%
 Others: 0%

13. How do you use the new technologies to improve your English skills? Choose the most suitable one.

- a) Sometimes I use the Internet to look for grammar tutorials and similar: 80%
 b) I often download podcasts and videos in English: 0%
 c) I rarely use the new technologies, except for the CD player: 0%
 d) I love surfing the net, reading, chatting or playing games with foreign people: 0%
 e) I often use free/established digital didactic platforms to revise my English: 20%
 f) I mainly use printed material: 0%
 g) Other options: 0% (for music and chat)

14. Do you think the English language is very important for the submarine crew in the Armed Forces?

- a) If the submarines are Spanish, the crew can speak Spanish to communicate the problems with the Base: 0%
 b) The English language is only important when we sail in international waters in case of engine failures, damages or injured people. 0%
 c) *The International Submarine Escape and Rescue Liaison Office* (Ismerlo) coordinates the rescue efforts from Norfolk: 0%
 d) The Ismerlo protocols can also be translated into Spanish quickly 0%
 e) English language is only important for promoting 0%
 f) The high ranks must have a good English standard profile 70%
 g) English language is the lingua franca for all sailors all over the world 30%

APPENDIX 2: Adapted from *The British Association for Applied Linguistics* (2006).

Academic Protocol: Interviews with students of the Navy Submarine School. Cartagena, Spain. May 2019.

Basis: Academic and Didactic Research Project on English Language Learning with Linguistic Corpora. Phase II.

Coordinator: Yolanda Noguera-Díaz. Lecturer at Technical University of Cartagena.

A) General responsibility with the informants (students):

- Anonymous and confidential identity (including gender and age). Numerical or alphabetical identification (e.g. student 1 or student A).
- Objectives and contents always of didactic type.
- Around 15 minutes of questions of a didactic nature in pairs or individually.
- Consent to record the answers with voice (zero image). Once the interviews between the researcher and the students have been transcribed, the audio files will be deleted.

B) Acceptance:

Once I have read the academic protocol and section A, I agree to participate in Phase II of this study in a totally anonymous and confidential manner.

In Cartagena, Spain, ... May 2019.

Signed: The informant

APPENDIX 3: Semi-structured interview questions

- a) How do you find this approach at first sight?
- b) How do you approach language learning on an everyday basis?
- c) What is your goal as a language learner?
- d) How do you balance your needs as an EFL learner and your needs as a military?
- e) What is the role of vocabulary in your language learning?
- f) How do you learn grammar and vocabulary?
- g) Describe your experience with the DISSUB concordance lines.
- h) How have concordance lines helped you understand and learn new language?
- i) Have you found in concordance lines a good didactic method?
- j) When are concordance lines useful to find out language patterns?
- k) Can you focus our attention just on the right section of the line? Can you focus our attention just on the left section of the line?
- l) Would you like to explore this Salvage and Rescue corpus with similar didactic exercises during a whole term?