

# Application of Textual Analysis in the Context of Vocabulary Teaching for the Marine Electrotechnics Students

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**Abstract:** *The paper aims to highlight current trends in vocabulary teaching of English for the students of marine electrotechnics studies. Nowadays, the education process includes a variety of teaching materials, the majority of which are found in a digital format. In addition, language teachers have become actively involved in designing language materials and textbooks with the help of the subject experts. With this in mind, the paper presents how language teachers combine textual analysis software with the subject knowledge of the field they teach in order to establish communicative patterns. This approach requires not only knowledge and expertise about the content subject, but it also implies teachers' technical versatility and availability of digital platforms for students. In order to prove the assumptions presented in the paper, we made use of the textual software in the analysis of the specialized reference book in electrotechnics titled "Practical Marine Electrical Knowledge" by Denis Hall. After the texts were converted into textual files and imported in the software, the analysis was focused on the prevalent lexical aspects in teaching English for the marine electrotechnics students at the Faculty of Maritime Studies in Kotor.*

**Keywords:** *marine electrotechnics, textual software, vocabulary, communicative patterns*

## 1. INTRODUCTION

Recent years have seen the development of many research papers dedicated to the application of technological tools in teaching professional subjects. The use of technical equipment which educational institutions have obtained, such as sophisticated licensed audio and video materials, professional software, and simulators, helped teachers of English language at the Faculty of Maritime Studies to refresh their language curricula and language course content. In the context of English language learning for students of marine electrotechnics, it can be said that technical innovations enriched the learning environment and brought benefits to English teachers and subject-specific teachers as well. A blended approach where traditional face-to-face learning is complemented with an online learning environment, aims to encourage students to participate in the class actively and benefit more from it [1].

With the increasing need for the electrotechnical officers (ETOs) on the international seafaring market, subject teachers, along with the English teachers at the Faculty of Maritime Studies, have dedicated specific attention to adapting theoretical and practical classes to professional needs. As the focus of this paper is English as the leading language in seafaring and marine electrical engineering, respectively, we shall first focus on the particularities of this professional discourse

community. Among many characteristics defining a concept of a discourse community as proposed by Swales [2], the most relevant to the topic of this paper are (1) the fact that members of discourse community use specific genres to achieve their specific communicative goals, (2) the use of specific lexis that the participants of discourse community use, and (3) means of communication that the discourse community members utilize to achieve their communicative goals.

With the subject in mind and discourse communities on one side, one should keep in mind the multidisciplinary nature of science and digital technical benefits. Interaction between people in their professional work settings and the technical environment has been on the rise [3].

Teachers' involvement in the professional subjects is inevitable and requires constant endeavours to grasp the communicative needs of the professional community which is the focus of professional language research and education.

## 2. COMMUNICATIVE NEEDS OF THE ETO OFFICER

Discourse community formed by the ETOs comprises a variety of verbal and written genres and discourse types. The electrotechnical discourse is vital for the proper functioning of the electrical equipment on board a vessel. These officers use a

range of different discourse styles in daily and emergency activities related to the electrical and technical operations of all the main systems on board ships [4]. As per Model Course 7.08 [5] and in line with Table A/III of the STCW convention, English language competence for operational level implies the use of English in written and verbal form. The level of English language competence is not strictly laid down, but ETOs must have at least good semantic knowledge of the terms used in their daily assignments. However, it may be assumed that the grammatical structure of marine electro-technical genres is not difficult to acquire. Although genres may vary, the learning of grammar includes passive forms and schematic structures found, for instance, in the language of instructions, manuals of the electrical appliances on board ship. However, the narrative component and an appropriate level of verbal competence are of particular importance in those situations where narrative discourse prevails. This particularly refers to the situations when the ETO needs to explain deficiencies, point to problems, suggest solutions, and write reports. Despite various communicative situations that the ETO may tackle, we believe that, compared to deck and engine officers, language requirements of the ETOs are more demanding. The very fact that the ETO is involved in many discursive situations related to the proper functioning of equipment in departments on board ship (deck, engine, catering department), leads to the assumption that the ETO's level of English competence must be high and complex.

Relying on the recommendations pertaining to the English teaching course stated in IMO Maritime English Model Course 3.17, part 2.3 titled "English for Specialized Maritime English for Electro Technical Officers" [6], we concluded that marine engineering discourse blends a variety of communicative situations. Apart from general English competence that these officers need in order to work in a multicultural environment on board ship, i.e. the ability to communicate with fellow mates on board, we will focus on the segment of technical-specific words that the students of marine electrotechnics, future ETOs, will use upon embarkation on board ship.

According to IMO 3.17 teaching recommendations, ETOs are required to verbalize various language skills that are in the scope of the ETO's duties. These include understanding and using engineering books, electronic and electrical publications, deck and bridge equipment, publications related to the main and auxiliary engines, and communication systems on board such as computers and computer networks [6]. Electro-Technical Officers are involved in many professional communicative situations that vary from factual to narrative language competence.

Despite various literature resources and methodologies that we have encountered in the teaching practice so far, we have realized that the most important aspect of teaching English for the marine electrical students lies in semantics. Vocabulary and specialized words in each professional discourse community present the basis for learning [7]. After acquiring a domain-specific vocabulary, learners are then encouraged by their ambition to succeed and upgrade their communicative competence in specialized English.

### 3. PATTERNS OF SCHEMATA

The concept of schemata is closely related to the learning of different genres. It refers to establishing predictable linguistic means and structures making up a particular genre. As far as pedagogic context is concerned, "content schemata can facilitate not only the learning of generic conventions and rhetorical action but also the linguistic resources to realize them [8]". In our paper, we aim to demonstrate how the concept of schemata reveals dominant linguistic peculiarities of the marine electrotechnics discourse. Learning schemata is particularly convenient in technical studies as it facilitates learners grasping text structure, which they will apply in practical work settings. Technical texts must be concise and clear, which is imposed by the nature of the profession and institutional requirements. Among many norms prevailing in "building up the formal architecture of technical communication [9]" are the need for clarity and brevity.

### 4. METHOD

The corpus for the analysis in this paper comprises texts from the book "Practical Marine Electrical Knowledge" [10], a well-known literature reference used by the marine and electrical practitioners in the education process. The text pages, excluding figures and tables, were converted into the textual file and processed in the textual software AntConc 3.5.8 [11]. One of the options offered by this software is to generate frequency lists. Frequency lists are particularly applicable for the compilation of technical or other field-specific glossaries.

The analysed texts contain 403,999 tokens of which 338,001 are common words that repeat throughout the text (such as articles "a", and "the", and the prepositions "of", and "with"). The concept of schemata in this paper was deployed on the semantic level. Namely, after the reading of the specialized texts about the basics of ships electrical systems, electrical distribution, generators, electrical propulsion, we decided to focus on the most frequent concepts and the typical context in which they appear.

We first created the word list and found the most frequent words. After that, we explored the

linguistic exponents denoting how the things operate and what are the cause and effect relationships within the specific domain of engineering and electrical systems. We also identified the examples of nominalization, which is typical of educational and technical texts, as well as the passive constructions used to express scientific facts, such as motor or generators operations (running of the equipment, the relationship between voltage, current, and resistance, spatial relationships).

We analysed lexical and function words. Lexical words are content words, typically nouns and verbs that convey meaning in a sentence, whereas function words express grammatical relationships. In this paper, we found that the frequency of certain grammar words should not be underestimated in these types of texts.

## 5. RESULTS

Our texts for the most part deal with the technical discourse found in the academic book intended for students and lecturers engaged in the specific field of engineering and electrotechnics. In that light, we focused on the lexical words, prepositions, passive constructions, and nominalization.

### 5.1. Lexical words

Content or lexical words with more than 100 occurrences in the texts are given in descending order in Table 1.

**Table 1.** Nouns (content) words in the texts

Word	Number of occurrences
Motor	765
Current	422
Circuit	390
Voltage	387
Power	385
Generator	281
Equipment	218
Fault	191
Insulation	143
Earth	143
Resistance	111
Frequency	106
Maintenance	102

The search results pointed to the examples of collocations that the antonyms *high* and *low* make with the nouns presented in Table 1. The adjective *high* is found in 187 instances as in: *high voltage* (34 examples), *high power* (33), and *high temperature* (28). On the other hand, the adjective *low* (108 instances) collocates with the same nouns (*low pressure/ current/voltage temperature*).

Identification of the key words in the corpus makes the basis for the preparation of dictionaries or glossaries that can be used in the teaching. For example, students may be asked to find as many words as they know that collocate with the word *motor* as in *motor acceleration*, *motor action*, *induction motor*, and *drive/synchronous motor*.

Verbs are also important in our corpus, as some of them occur more than 50 times, such as with *start*, *keep*, and *maintain*. One activity is to establish patterns that the verbs make, as with the verb *maintain* in *maintain safety/equipment*, and *maintain generator operation*.

Nouns derived from the verbs, usually hyphenated two-word strings, are also worth investigating in light of technical discourse, as in *start-up delay/equipment/sequence*. Similar examples include *run-up*, *back-up*, *pick-up*, and *set-up* as in *back-up fuses/protection/trip/voltage*, *run-up time/period*, and *pick-up power/setting/current*.

The use of passive constructions in technical discourse provides the objectivity of facts. In our corpus, the formation of passive voice is found in 584 examples formed by the *is/are + past participle* pattern (Fig. 1).

The diodes are connected as  
the lamps are connected between  
pply cables are connected directly  
to the are connected in  
.c. motors are connected in  
ck switches are connected into  
ically. They are connected so  
e windings are connected to  
where they are connected to  
y voltages are connected to  
bars which are connected together  
conductors are connected together

**Figure 1.** The examples of the passive voice in the corpus

The most representative verbs found in the passive voice are: *make*, *connect*, *maintain*, *keep*, *arrange*, *use*, *adjust*, *design*, *drive*, *construct*, *feed*, *locate*, *monitor*, and *require*. The following are the examples from our corpus:

- (1) "Emergency suppliers are necessary for loads which *are required* to handle a potentially dangerous situation."
- (2) "The other phase of the phase windings *are connected* to outgoing conductors."
- (3) "The compressor, air fan and sea water pump *are driven*."

### 5.2. Function words

Function words such as prepositions *at*, *which*, and *of* are interesting for language research. They provide grammatical and semantic cohesion within

the sentence and text, but in the context of our analysis, they are indicative of the patterns they make with the content words presented in table 1.

In our corpus, the most frequent function words are articles (*a, an, the*), prepositions (*to, at, with, by, in*), determiners (*that, this*), and conjunctions (*and, or*):

**Table 2.** Function words in the texts

Word	Number of occurrences
To	1596
At	328
With	477
By	488
In	456
This	345
That	245
A/an	1582
The	4412
And	1687
Or	503

The preposition *at* is the most commonly used function word in the corpus. It denotes place, rate, direction, speed or intensity (Fig.2). The preposition *at* occurs in 328 examples. It is found in the instances: *at speed, at 110 V, at a frequency, at about 4 seconds, at all times, and at high temperature.*

Hit	KWIC	File
5	to operate at a definite	CORPUS MARINE EI
6	is fixed at a definite	CORPUS MARINE EI
7	is produced at a frequency	CORPUS MARINE EI
8	would be at a frequency	CORPUS MARINE EI
9	that operate at a high	CORPUS MARINE EI
10	is generally at a high	CORPUS MARINE EI
11	signal and at a high	CORPUS MARINE EI
12	re-test at "a". If	CORPUS MARINE EI
13	sets operating at a 67% load	CORPUS MARINE EI
14	, e.g. at a motor	CORPUS MARINE EI
15	usually rated at a nominal	CORPUS MARINE EI
16	current level at a point	CORPUS MARINE EI
17	capacitor C2 at a rate	CORPUS MARINE EI

**Figure 2.** Concordance of the preposition "at" in the corpus

Conjunctions *and* as well as *or* occur in the binomial expressions which are commonly found in electrotechnical texts. They occur in binomials and denote opposite relationship as in *outside and inside, inlet and outlet, input and output*, and in pairs implying direct connection between the two concepts as in *rotor and stator, control and safety, and humidity and salinity.*

The high representation of the prepositions *in, with, by, and to* in the electrotechnical discourse signals the importance of the concepts of time, location, place, and the relationship between the objects, activities and conditions.

Spatial precision when describing places and components is necessary. When interior spaces or the inside of the object are referenced, the preposition *in* is used, for example, *in the boiler, in the generator, in the glass, in the propulsion.* Direction, measurements and accurate values are expressed with the preposition *to* as in *to a level, to 1000 A, to a maximum, to a shaft, to about 750 V.*

The preposition *with* indicates that a specific tool or other means is being used to do something. Examples are: *with a multimeter, with power, with a vacuum, with boracic powder, with fresh grease.*

Among many language activities used to teach prepositions are those in which students are asked to choose among the offered prepositions. According to our teaching experience, the most common mistakes occur with the prepositions *with* and *to*. For instance, students say *with a speed, with a large extent.* Instead, they should say *at a speed, and to a large extent.*

### 5.3. Nominalization

The analysed corpus displays a high representation of nominal expressions. Nominalization is used in technical genres with the aim to achieve accuracy and describe condition, value, and rate. Compared to the verbs expressing dynamic actions or processes, nominal expressions denote activities that have already been completed. The most representative examples in our corpus are formed by the suffix *-ion* as in *generation, classification, production, operation, protection, aeration, -ance* as in *maintenance, resistance, clearance, and -ency* as in *frequency.*

(4) Electrical *generation* on board ship is typically at three phase.

Such nouns are commonly found in a string of three words (trinomials) which are, along with binomials, preferred in marine technology discourse.

(5) Motor and starter *construction, operation, and protection* are explained.

(6) Laundry equipment and cathodic protection are described together with battery *support, care and maintenance.*

### 5.4. Application of the textual analysis in the classroom

In light of the results shown in the previous sections of the paper, it is worth noting that the study programme of the Marine Electrotechnics at the Faculty of Maritime Studies Kotor was reaccredited in 2017. Goals and syllabi comply with the latest trends in the marine electrotechnics domain and follow the increasing demand for the ETOs on the seafaring market. The teaching staff have put much effort into combining the traditional teaching with laboratory and practical work and to use simulators

in the training process (such as the recently acquired high voltage simulator).

In addition to this, the importance of the English language for the marine electrotechnics students has been accentuated from the first year of enrolment. Given the availability of sophisticated digital learning environment, all teaching material is placed on the Moodle platform. Education process has gathered various subject teachers in that they "back-up" each other's efforts in compiling materials and designing practical activities. As far as English classes are concerned, the English teachers have recently implemented collaborative work with subject teachers, particularly in the domain of glossary production. Some samples are already available on the Moodle platform of the faculty and contain basic electrotechnical terms that the student, the future seafarer, will use in his/her work environment on board ship. Despite limitations that exist in terms of the lack of hours anticipated for some specialized courses in marine electrotechnics and the English courses, the attitude taken by our faculty is to increase future interaction between teachers in the subject-specific field and English teachers.

## 6. CONCLUSION

The availability of materials and corpora which can be a subject of linguistic research is a step forward in the recent practice of English language teaching. Also, many types of textual analysis software can be used to process large segments of general and specialized texts. In this paper, we tried to highlight how software outputs can be used to identify patterns of a specific genre. The focus of the analysis was on the lexical words prevailing in this professional discourse (*motor, generator, current, voltage, maintain, back-up, start-up*), and the way they can be taught in the classroom. We also examined function words (*at, in, by, to*), which are equally relevant for the marine electrotechnics discourse.

In this way, the teacher may select which aspect of language he or she will focus on, and design language activities respectively. There is no doubt that technical vocabulary presents the basis for upgrading communicative competence of the learners.

However, it must be noted that the interpretation of the identified language patterns or schemata requires the knowledge of the context of the domain under investigation. In the context of marine electrotechnics, there is a variety of genres and discourse types that the ETOs will utilize in the future.

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