HARTAes-vas: Lexical Combinations for an Academic Writing Aid Tool in Spanish and Basque

HARTAes-vas: Combinaciones léxicas para una Herramienta de ayuda a la redacción de textos académicos en español y en vasco

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Abstract: Academic writing has become an object of study because of the need for tools to help novice writers. We focus on routinized lexical combinations that characterise academic discourse in Spanish and Basque. The aim is to extract these combinations from two academic corpora in order to build a writing aid tool serving both languages. **Keywords:** Academic writing, collocations, discourse function, writing aid.

Resumen: La escritura académica se ha convertido en un objeto de estudio debido a la necesidad de herramientas de ayuda para los escritores noveles. Nos centramos en combinaciones léxicas rutinarias que caracterizan el discurso académico en español y en vasco. El objetivo es extraer estas combinaciones a partir de sendos corpus académicos con el fin de construir una herramienta de ayuda para las dos lenguas.

Palabras clave: Escritura académica, colocaciones, funciones discursivas, herramienta de ayuda.

1 General description

The HARTAes-vas project is funded by the Ministry of Science and Innovation in the 2019 call for R&D Knowledge Generation Projects. It is a project coordinated between the UPV/EHU and the UDC and, in some objectives, it is a continuation of previous projects related to academic writing in Spanish. In this new project, we are tackling a contrastive approach with two different languages from both a typological and a sociolinguistic point of view. The research team is made up of members of the LyS group at the UDC and the Ixa group at the UPV/EHU together with researchers from the Foundation Elhuyar.

In recent years, academic writing has become a priority object of study, especially in English (Hyland and Shaw 2016, among others). In order for members of the academic community to produce knowledge, they must be able to write in the conventional forms of academic texts. However, when students enter university, they are confronted with new written genres for which they are not provided with tools to facilitate the production of texts. Moreover, university students in Spain must be able to show proficiency in several languages and. paradoxically, Spanish students have more resources to help them with academic English than with the other languages of the state. One of the keys to this competence in writing lies in the mastery of certain routine expressions that give it its specific character: academic lexical combination (ALC), ranging from collocations (extraer conclusiones, ondorioak atera 'draw conclusions'), to discourse markers (en conclusión, ondorioz 'in conclusion') and also formulas such as *parece razonable concluir que* ('it seems reasonable to conclude that'), ondorioz esan daiteke ('consequently we can say'); all these expressions are ALC which we have in order to express a conclusion in Spanish and Basque.

However, before developing the tool that would help the students learn to write in this academic style, a diagnosis of the current written productions of our university students is needed. In previous research we have compiled a corpus of written productions of Spanish academic novices made up of Bachelor's and Master's theses (Alonso-Ramos et al. 2017; García-Salido et al. 2018; hereafter the Spanish novice corpus) and during this project we have compiled a comparable corpus of written productions of academic novices for Basque (hereafter the novice corpus). The different Basque sociolinguistic status of Basque with respect to Spanish forces different strategies: on the one hand, there is no academic corpus of expert academic writing in Basque available as a reference; on the other hand, Basque has not had enough time for the stabilisation of academic registers (Zabala et al. 2021), which suggests as a starting hypothesis that ALCs will have a lower degree of fixation and recurrence. Likewise, the agglutinative nature of Basque poses a challenge to the usual techniques for extracting combinations.

2 Goals

The overall goal is to create a bilingual tool (or two coordinated monolingual tools), focused on the use of ALCs, combining a dictionary and a corpus. We aim to build a tool where the user can choose the language and find help in choosing the appropriate lexical strategies according to different discourse needs.

More specifically, the project aims to: a) develop a model of ALCs that includes the characteristics of agglutinative languages such as Basque where different lexicographic and discursive classifications will be established; b) analyse the learners' use of such combinations in Spanish and Basque; c) investigate what kind of help related to the phenomena of lexical combinations they need when writing; d) develop corpus-based linguistic technologies for the automatic identification of ALCs.

3 Methodology

The project has multiple orientations: lexicological (as far as the linguistic phenomena studied are concerned); corpus linguistics and computational linguistics (insofar as the corpora are the fundamental source of data and the techniques with which they are exploited come from NLP) and didactics (following the approach of so-called *computer-assisted language learning* and, more particularly, the *data-driven learning* methodology).

The agglutinative nature of Basque inspired the design of alternative ALC identification techniques since the usual lexical bundle extraction technique is not suitable in all cases for Basque. The reason is that some formulas are made up of a single word in Basque and it is necessary to take into account the so-called morphemic bundles to complement the results obtained with the techniques used for inflectional languages. For example: en resumen 'in short' - *laburbilduz* 'short+gather+INSTR'; por consiguiente 'therefore'ondorioz 'consequence + INSTR'.

3.1 Extracting academic vocabulary lists with corpus linguistics and NLP techniques

We analysed the Spanish novice corpus morphologically and syntactically to extract collocations with LinguaKit, Freeling and UDPipe, following the same criteria we used in the expert corpus (García-Salido et al. 2018). We extracted the following syntactic patterns: Subject-Verb (objetivo se centra 'objective focuses'), Verb-Object (alcanzar objetivo 'reach objective'), an Noun-Modifier (objetivo fundamental 'main objective'), N of N (serie de objetivos 'series of objectives'). We also extracted lists of n-grams, applying criteria of frequency and distribution by scientific domains and assigned the discursive function according to the typology established in García-Salido et al. (2019).

We applied a similar procedure to the Basque novice corpus which was morphologically analysed using Eustagger. We started by extracting an academic vocabulary based on the criteria defined in García-Salido (2021). We have used this word list to identify collocations, without the need to syntactically analyse the corpus (Gurrutxaga and Alegría 2011). We have extracted the following syntactic patterns: Subject-Verb (datuek erakutsi 'data show'), Verb-Object (datuak bildu 'collect data', datuetan oinarritu 'rely on data'), Noun-Modifier (datu esanguratsu 'significant data'), N-N (datu sorta 'data set', datu-bilketa 'data collection'). To obtain the formulas, we extracted lists of ngrams, applying the same criteria of frequency and dispersion and the same typology of discursive functions described in García-Salido et al. (2019). Once the formula candidates have been validated, the variation was analysed in order to identify prototypical formulas and their variants.

3.2 Testing distributional semantics strategies

Once the two corpora of Spanish and Basque novice academic writing are balanced, we can exploit them as comparable corpora and apply computational techniques of distributional semantics in order to find correspondences between the formulas of the two languages. With Spanish list, vector representations the (embeddings) of each formula can be generated using non-compositional strategies, and we can then use them to identify the Basque single word equivalents of Spanish expressions in a previously obtained cross-linguistic semantic space. In this way, we may be able to relate *por* consiguiente and ondorioz, or para terminar 'to conclude' and bukatzeko, following the noncompositional strategy used by Garcia et al. (2019).

Monolingual distributional models, both monolexical and polylexical, will be generated with *fastText*, and mapped to a multilingual space with vecmap. Since we find both compositional and non-compositional expressions among the formulas, we will use equivalent search strategies adapted to each type of structure. For the non-compositional ones, we will represent each formula with a single vector, using the non-compositional method presented in Garcia et al. (2019). We consider that the use of this multilingual strategy can help in the identification of formulas, because if a Basque expression has a high degree of both internal cohesion and distributional similarity with a Spanish formula, the probability that it is indeed a formula in Basque is also very high. Likewise, it seems interesting to explore whether distributional models also identify a more discursive meaning, such as that of the formulas.

4 Results

The quantitative data from the Spanish novice corpus analysis are shown in Table 1. The data are presented with normalised frequency per million words due to the different size of the corpora.

		Types/ M	Tokens/M
	N-Modif	192	2.724
	N de N	85	1.106
Collocati	Subject- Verb	39	313
ons	Verb-object	219	2.753
	Total collocations	536	6.897
Formulae	Total formulas	211	20.474

Table 1: The ALC data	from the	Spanish novice
corpus		

The results of a contrastive analysis with the expert corpus show that novices use fewer collocations than experts. Also, novices use more collocations belonging to the general language. With respect to formulas, we see that novices use fewer types than experts, but almost as many tokens.

As far as Basque is concerned, we already have a corpus of novice academic writing (Aranzabe et al. 2022). Although its analysis has not yet been completed, we can already observe some characteristics: the ALCs are less stable compared to the Spanish novel corpus and a higher number of ALCs are considered incorrect. By validating the lists of ALCs in the Basque corpus, we will be able to make a more thorough comparison: contrasting formulas by functions and verifying whether the same functions are covered in the two languages and checking whether the equivalent bases are linked to more or fewer collocates in the different languages. This comparison will be vital for the design of the writing aid tool. Pending the aforementioned further analysis, the quantitative data are shown in Table 2.

		Types /M	Tokens/M
	N-Modif	150	4.024
	N - N	43	1.251
Collo	Subject-Verb	3	58
cation	Verb-object	108	4.136
S	Total collocations	305	9.471
Form ulae	Total formulas	196	38.171

 Table 2: The ALC data from the Basque novice corpus

5 Conclusions and future work

We have presented the main tasks we carried out to obtain the data for an academic writing aid tool. Next, we will explore the transfer strategies for the automatic identification of ALCs in several languages. We start from the hypothesis that a cross-linguistic language model trained to identify the formulas in Spanish could recognise expressions with similar characteristics in Basque. If the results obtained with this strategy are adequate, we could, on the one hand, automatically obtain new formulas in both languages in other corpora and, on the other hand, identify formulas in Basque that could be mapped to those in Spanish. Pending the results of the experiments with distributional semantics techniques, we are making progress in the design of the tool, which must meet two requirements: 1) provide onomasiological access by discursive function; 2) include a field of warnings where examples will be provided as correction models.

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