Bottom up specialized phraseology in CLIL teaching classes

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Abstract

When dealing with language for specific purposes (LSP), teachers always have to confront with issues which are strictly linked to the specificities of the language of a given field. This is particularly true for CLIL teachers in Italy, who are subject teachers sharing with language teachers some aspects of pupils' language education; though, not being prepared to lead students through a path of language awareness and analysis.

This is why these people should be trained in analyzing the features of language and recognizing recurrent lexical and syntactical paths which distinguish specific textual genres or discourse, in order to let their students develop autonomous language capabilities in turn.

Familiarizing with corpus-based procedures turns out to be one of the most useful tools at these teachers' disposal to enquire LSP peculiarities and to find out patterns of specialized phraseology, which are barely mentioned in the general bilingual and monolingual dictionaries used by their students.

Corpus-based methodology in CLIL classes means to empower both teachers and students to develop competences in moving away from mere surface features of text to selecting and understanding meanings and structures, thus using texts with specific intentions and becoming familiar with lexicographic tools such as corpora to compensate the defects of general dictionaries.

1 Introduction

One of the basic principles of Content and Language Integrated Learning (CLIL) is to implement language-aware instruction, which should naturally lead to content-aware instruction. As Ting (2011) reported, that focus on language positively supports content comprehension has been pointed out even by science educators recognizing that language is the access key to content. In particular Snow (2010) acknowledges the language of science to be 'alienating', if not downright annoying, and in fact when teachers adopt that concise and authoritative tone to explain strange-sounding phenomena which young minds could neither see nor fathom, they might transform even the mother tongue into a foreign language. The context thickens when dealing with 'alienating' language for specific purposes (LSP) in a foreign language where the development of a language-aware content education is strictly required.

It is thus clear that content teachers, right before their pupils, should be trained in developing defined competences as well as a general capacity to deal with linguistic settings and requirements that are not fully predictable. (Richards and Farrell, 2005; Tsui, 2003). On this point Hütter et al. (2009) quote teacher education as an "interface of theory and practice", suggesting to train future teachers to work with and analyze LSP texts within an applied linguistics framework in order to prepare them to mediate these insights to language and teaching practice.

Dealing with CLIL implies a deep knowledge of lexico-grammar elements associated with the different domains and disciplines, everyday language can assume different and extremely precise meaning when contextualized in a LSP environment. In economics texts, for example, we find words like *isocost*, *utility*, and *duopoly* occurring frequently; they are unlikely to occur at all or with high frequency in other kinds of texts with

the same meaning. One has to know syntagmatic relationship between words, semantic associations (collocations and prosodies), lexical bundles, besides a specific textual organization (Durrant 2009, Nelson 2006, Gledhill 2000).

In fact, competence in LSP means to master different aspects - lexico-grammatical features, patterns of textualisation, and genre-structuring features or 'moves' - which are relevant to the foreign language learner who needs considerable information regarding the appropriateness and acceptability of particular linguistic choices in individual genres. And some pieces of information are not to be found either in paper or in e-dictionaries (cf. 3), or in even in translation tool kits (i.e. Google translator tool kit, which is extremely popular among students), whereas more detailed information on lexico-grammatical features - such as syntactical markedness and nuances in meaning of near-synonyms - is possible through the use of corpus linguistics, another area of linguistics whose undoubted importance has been reflected also in language teaching, as pointed out by McEnry and Xiao (2011).

A corpus-based bottom-up approach can foster LPS competence of both content teachers and students, by offering facts of actual language usage which are hard to come by with other means (Mindt 1997, Gavioli 2005, Hütter et al. 2009, Walker 2011), especially with regard to typical choice of words (sorting them by frequency), meaning nuances and appropriate use of collocations.

Following this methodology, subjects involved in CLIL education familiarize with the potential of specialized corpora, learning how to use them as a tool in materials development and as special lexicographic source which is tailored to their LSP needs. It is a way of introducing a kind of Computer-Aided/Assisted Language Learning (CALL) in subjects where it has not been considered yet, using computational methods and techniques not only for language learning and teaching but also to pass on subject contents.

2 CLIL classes and LSP

As pinpointed by Coonan (2007) "the difficulties related to the discipline concern the conceptual complexity of the subject which is compounded by the fact that input and tasks are mediated through the L2".

Learners face a considerable effort for learning new meanings, new textual organization, understanding processes, making distinctions and often deducing information not explicitly stated; on their side content teachers don't know how to affectively select the language peculiarities they have to present to scaffold their students.

CLIL comprises many different disciplines, ranging from neuroscience to history, which means for each subject teacher the necessity to be well-aware of the differences between LSP and the common use of language, as for word frequency, nuances in meaning, syntactic preferences and textual organization. Scientific and academic texts represent a different genre compared to contracts of sale, business applications or literary passages and focus on the language is necessary so that the student can acquire and manifest competence on the content and recognize and use terms and structures specific of each field.

The most frequently mentioned aspect concerns lexis, specifically the lexis of the discipline that has repercussions on the syntactical patterns and obviously on the learning of the content itself. Even though there is evidence of a strong relationship between vocabulary knowledge and reading comprehension ability (Coady 1993), research (Barnett 1986) long ago demonstrated that vocabulary is only one of the variables involved in language competence, and that knowledge of syntax and textual cohesive devices are also related to successful comprehension as defined by recall. What is therefore necessary when dealing with CLIL and LSP is processing all those relationships at the sentence level and intersentential level in order to connect pieces of information or meanings of words and thus synthesize the overall meaning (Chun and Plass 1996).

Teachers are often limited when it comes to effectively introducing and rehearsing new language. Furthermore, strategic, cognitive

language training is something most subject teachers either don't know how to teach or don't have time for in class, so they rely on bilingual word lists and vocabulary matching exercises which seem an attractive shortcut because it takes less time than contextual presentation and yields excellent short term results, whereas long term retention is often disappointing (Walker 2011). A preliminary systematic analysis of the most important aspects of the L2 word learning problem, that is to say, selecting the relevant vocabulary (which and how many words) and creating optimal conditions for the acquisition process is therefore highly desirable.

2.1 Differences in collocational behaviour

As Firth (1968:179) pointed out, "you shall know a word by the company it keeps".

Gaskell and Cobb (2004) stress the importance of working on concordances to reveal grammatical patterns besides vocabulary objectives to define the syllabus. This is particularly important for CLIL lessons because each textual genre and subject is marked by its own 'collocationality' index (Kilgarriff 2006). Words of specialized fields have a particularly strong tendency to occur in collocations, or are most 'collocational', even though their collocates might not be shown in dictionaries.

A bottom-up approach which is aimed at discovering the collocational behaviour of key lexis can be used to answer many other questions. Such an approach can reveal the different senses of a word and show how it may be associated with a particular semantic prosody (as defined in Louw 1993). By studying the collocations associated with a group of so-called synonyms it is often possible to identify slight but significant differences in the meaning of the words in the group, thus fostering language awareness (Gavioli 2005) and noticing processes (Schmidt 1990). Furthermore students are exposed to redundant information and multiple examples of foreign language structures which help them understand how to use constructions they might have had troubles with at first, as proved by Gaskel and Cobb's (2004) work.

Nonetheless it is a process that should be set out by the teacher himself first for two main reasons:

i. language training for himself and consciousness of the possible difficulties students could encounter

ii. selection of the language objectives and contents that should be presented

In fact, while concordances for lexical and even collocational information are quite easy for learners to interpret and for instructors to set up, grammatical concordances may be less so. A grammar pattern is normally distributed, and grammatical patterning may be fairly tricky for learners to extract from a corpus or even to interpret when extracted for them (Vannestal and Lindquist 2007).

Some studies such as the one reported in Walker (2011) prove, for instance, how a corpus-driven approach can help in choosing between semantically-related verbs (e.g. *head, run, manage*) and nouns (e.g. *system, process, procedure*) taken from a LSP domain - namely business English, giving evidence of their collocational behaviour, thus enabling teachers to suggest students the best item fitting different contexts. In a corpus analysis carried out on the BNC it turned out that there are differences in meaning which reflect different styles and convey different approaches in management: based on corpus evidence both the word *run* and the phrase *in charge of* seem to be associated with power (e.g., *run the show, in charge of the country*) and therefore a top-down management style. In addition, the data show that *run* frequently occurs with nouns which describe non-human entities and may give the feeling to the native-speaker audience that their new masters regard them as automatons who simply have to be told what to do. On the contrary the verb *manage* or a phrase such as *responsible for* do not seem to carry the same connotation of power and are more frequently associated with people.

This example perfectly fits the possible contents of a CLIL unit in Economics and clearly demonstrates that many collocations are not simply arbitrary or idiomatic combinations of words. Especially in CLIL contexts teachers should master the tools that might help to disambiguate the different uses of a word and identify slight but significant differences in meaning between what might appear to be groups of synonyms, but differentiate in their prosody and connotational association;

information that is often neglected in dictionaries, Computer Assisted Language Learning (CALL) tools and translation kits.

3 CALL and dictionaries

Intelligent Computer Assisted Language Learning (ICALL) systems inherently provide more learner control than traditional CALL programs due to their sophisticated answer processing mechanisms and are theoretically more CLIL-oriented and suitable than traditional CALL. Unlike the more conventional drill and practice programs, ICALL software employs Natural Language Processing (NLP) which overcomes the rigidity of the response requirements of traditional CALL (Heift, 2002) thus scaffolding language comprehension and learning through interaction with the learner. Furthermore, ICALL should have the potential "to raise awareness of the variety of strategies available and to allow students to make informed choices about the approaches most useful to them" (Bull 1997, cited in Arispe 2014), just as a corpus-based approach would.

It is true that electronic dictionaries and ICALL tools are currently in the process of merging into full-scale lexicographic information tools offering more than just word-to-word translations or paraphrases for a given lemma. Nonetheless users are asked to formulate their own hypotheses and make decisions among a range of possible options given by the tools. Few of them offer support for the choice, LangBot (Arispe 2014) for example gives some words in context to help users choose, but it rather acts as any online translator and is not suited to deal with any phraseological pattern, idiomatic phrases or colloquial expressions; it is best used at the simple word level or when one wants the meaning of a complex - though unmarked -sentence.

Reporting their experiences with EFL learners using dictionaries to decode foreign language texts, both Augustyn (2013), Marello (2014) and Corino (forthcoming) notice that most of them entirely rely on translation, as they choose to type literally on their electronic devices (whether apps or online dictionaries) every utterance they do not understand in L2, or want to produce in the L2, as if they were using a translation tool such as Google Translate, which highlights a lack of proficiency and severe difficulties learners in looking up words in dictionaries.

What is important for CLIL purposes is the lack of NLP tools which take into consideration the different specialized languages with their shades of meaning and connotative implications, with respect to students' habits to widely rely on these language mediators.

If language teachers are getting used to integrate tools that provide scaffolding tutorials and language practice in and out of the classroom, disciplinary teachers are still to be trained as for (I)CALL; the result is that to understand LSP language students often turn to popular tools of machine translation which - though improved - provide pseudotranslation without analysis of grammar or meaning with an "output inevitably peppered with howlers" (Pullum 2013) students seem not to be sensitive to.

Let us consider the field of physics and Italian word *velocità*, for instance, that has two different translations in English: *speed* and *velocity*, meaning two different content concepts.

If we compare the parallel texts produced by Google Translator the problem becomes immediately clear: in the first question *velocità scalare* and *velocità vettoriale* are translated *speed* and *velocity* respectively, but in the following line both of them are referred to as *velocity*. So which should be here the right word?
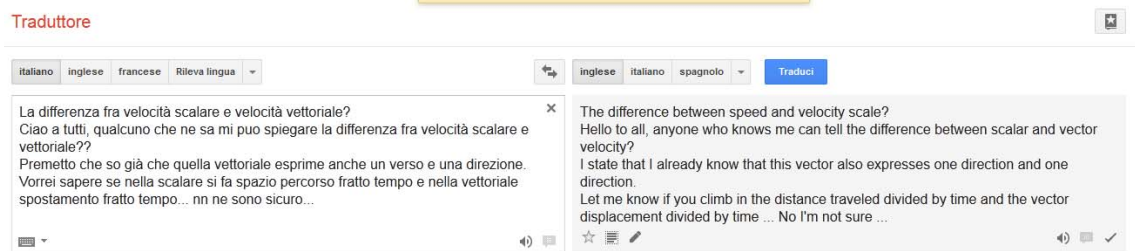
Figure 1. Speed and Velocity according to Google Translate

Of course the translator offers the possibility to substitute the word by one of the suggested options, as in a sort of multiple choice exercise (*speed*, *velocity*, *rate, pace, momentum*), implying the previous knowledge of the semantic content of the word related to the disciplinary content. It could be efficiently used to build up exercises and tests but it is of no use if one has to disambiguate a term, especially if the process should be applied by a student in a complex CLIL context (much worse and almost droll is the translation of the isolated phrase *velocità scalare > climb speed*, which totally ignores PoS attribution).

Nonetheless, even the information found in the bilingual dictionary[1] article is not conclusive in order to define the difference between the two items, neither in the Italian>English section nor in the English>Italian part.

♦ velocità
f.
1 (anche fis.) speed; velocity; (velocità di variazione) rate; (ritmo) pace: (fis.) velocità angolare, angular velocity (o speed)

♦ speed /spi:d/
n. 🆄🅲[U][C]1 velocità; celerità; rapidità; destrezza; sveltezza: the speed of light, la velocità della luce; What was your speed?, che velocità tenevi (in auto, ecc.)?; (autom.) speed limit, limite (massimo) di velocità; (autom.) low speed, marcia bassa; steady speed, velocità costante; at speed, a grande velocità; at full speed, a tutta velocità; maximum speed, velocità massima (consentita); at top speed, a rotta di collo; di gran carriera; di volata; at a breakneck speed, a velocità folle; to reduce speed, ridurre

la velocità; to gather (o to pick up) speed, prendere (o acquistare) velocità; wind speed, velocità del vento2 (mecc.) velocità; marcia: Most cars have five forward speeds, per lo più le auto hanno cinque marce avanti; a ten-speed bike, una bicicletta con il cambio a dieci marce3 (fotogr. = shutter speed) velocità dell'otturatore; tempo d'esposizione4 (fotogr.) sensibilità (di una pellicola)5 (slang) droga stimolante (amfetamina, metamfetamina, ecc.)

♦ velocity /vəˈlɒsətɪ/
n. 🆄🅲[U][C]velocità; rapidità: (mecc.) uniform velocity, velocità uniforme; the velocity of sound, la velocità del suono; (miss.) escape velocity, velocità di fuga; (econ., fin.) velocity of circulation, velocità di circolazione (della moneta)
● (elettron.) velocity filter, filtro di velocità □ (mecc. dei fluidi) velocity head, altezza cinetica □ (econ., fin.) velocity of money = velocity of circulation ➢ sopra (fis.) □ velocity profile, profilo di velocità.

Under the entry *velocità* in Italian both English *speed* and *velocity* are mentioned following the *(fis)* tag, but without examples or other technical references it turns out to be difficult to decide to which context each term refers to. Starting from the English>Italian section does not make the situation less vague as we cannot find any reference to vectors, and the monolingual dictionary (MEDAL) certainly doesn't either, as no LSP use of the two terms are provided for.

4 Corpora for disambiguation in LSP

With regard to corpus linguistics, direct use of corpora by learners involves their guided discovery of information about L2 use in corpora (Bernardini, 2004; Leech, 1997). Such

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[1] Ragazzini Italian and English dictionary Zanichelli (online edition, www.ubidictionary.zanichelli.it last accessed on 04.09.2014)

an approach can be motivating for learners, and encourages a critical reflection on (prescriptive) grammatical rules or the nuances in meaning of near-synonyms.

One could object that corpora for CLIL purposes should be extremely specific and highly representative, which large generic corpora are not. Tools like the Sketch Engine (www.sketchengine.co.uk) and the web crawler WebBootCat can help in retrieving suitable data and compiling content specific ad hoc corpora.

In the above mentioned case, the disambiguation of *speed* and *velocity* can be solved by compiling a corpus[2] with texts dealing with vector physics and drawing the word sketches of the two words to observe their linguistic behavior. It is then interesting to point out that *velocity* is often modified by *resultant*, *displacement* and *space* (terms generally associated to vector quantity), whereas *speed* is linked through a high frequency number of occurrences to *average* (meaning scalar quantity). *Velocity* followed by the preposition *of* often occur with *center* (talking about velocity of center of mass it is obvious to refer to a vector quantity), while *speed* followed by the same preposition occurs together with *sound* or *wave*, reinforcing the *scalar* suggestion. Comparing the common patterns of the two word sketches it is also to be notice the exclusive occurrence of *speed of light*, conventionally meaning the module of speed, on the other hand *relative* is restricted to the vector quantity.

Figure 2. VELOCITY - Word Sketch

Figure 3. SPEED - Word Sketch — "speed" only patterns

and/or	70	1.0		adj_subject_of	18	1.9		pp_in-i	18	1.0		pp_of-i	258	5.6
wavelength	4	7.7		close	3	9.6		vacuum	3	10.1		sound	13	9.9
density	3	7.4		**predicate**	**16**	**2.4**		direction	4	6.9		bullet	8	9.8
velocity	3	6.6		c	4	10.0						galaxy	7	9.0
object_of	**157**	**1.9**		v	6	8.0						s	9	8.9
determine	11	9.2		**modifier**	**239**	**1.1**						ball	9	8.8
attain	3	9.2		recession	11	10.5						car	4	8.1
estimate	3	8.7		average	15	10.1						wind	3	8.1
find	5	8.4		wind	8	9.6						rotation	3	8.1
know	5	8.0		high	13	9.0						wave	13	7.9
subject_of	**70**	**1.2**		mean	4	8.9						source	6	7.3
remain	3	8.9		steady	3	8.5								
depend	3	8.2		maximum	4	8.4								
				minimum	3	8.3								
				low	5	8.2								
				great	4	7.7								
				wave	9	7.4								

pp_obj_of-i	31	0.7		pp_obj_at-i	56	11.3		pp_obj_to-i	16	1.7
independent	4	10.0		travel	18	10.4		equal	4	7.4
measurement	6	8.7		move	10	8.4		**pp_obj_on-i**	**5**	**1.1**
term	3	7.8		kg	3	8.1		depend	3	8.5

Figure 4. SPEED/VELOCITY - Common patterns

speed/velocity CLIL2013_fisica freqs = 666 /554 Common patterns

speed	6.0	4.0	2.0	0	-2.0	-4.0	-6.0	velocity

and/or	70	95	1.0	1.6		modifies	67	114	0.3	0.6
v	3	6	6.9	7.9		graph	3	9	7.1	8.6
mass	5	7	6.6	7.1		u	5	7	9.0	9.3
speed	6	3	7.3	6.3		v	24	27	9.9	10.0
object_of	**157**	**103**	**1.9**	**1.5**		**pp_of-i**	**258**	**98**	**5.6**	**2.6**
change	4	10	8.2	9.7		x	3	3	6.5	6.7
get	3	5	8.0	8.9		particle	5	4	6.4	6.2
give	3	4	6.2	6.6		object	13	8	8.3	7.7
have	20	21	7.8	7.9		s-	21	6	10.4	9.1
reach	4	3	8.4	8.2		light	71	8	10.6	7.6
be	32	22	5.8	5.3		**pp_obj_for-i**	**10**	**7**	**2.1**	**1.8**
calculate	19	6	10.3	8.8		value	3	4	6.4	6.8
measure	17	3	9.3	6.9		**pp_obj_with-i**	**53**	**35**	**10.6**	**8.7**
subject_of	**70**	**86**	**1.2**	**1.8**		move	12	9	8.7	8.3
be	39	62	6.1	6.7						
modifier	**239**	**195**	**1.1**	**1.1**						
relative	6	26	8.7	11.0						
final	3	9	8.3	10.1						

Figure 2 — "velocity" only patterns

and/or	95	1.0		adj_subject_of	21	2.7		modifies	114	0.6		possessor	6	2.7
acceleration	15	9.7		relative	3	8.6		change	15	9.0		object	4	6.9
displacement	9	9.4		constant	4	7.8		acceleration	6	8.3		**pp_obj_in-i**	**26**	**1.8**
position	4	8.1		equal	5	7.7		vector	13	8.2		change	23	9.8
momentum	3	7.2		**modifier**	**195**	**1.1**		unit	3	6.9		**pp_of-i**	**98**	**2.6**
force	8	6.6		resultant	10	10.2						boat	8	10.7
direction	3	6.4		certain	8	9.5						center	16	10.5
object_of	**103**	**1.5**		terminal	4	9.2						rocket	5	9.4
double	3	9.5		free	5	9.0						molecule	4	8.2
call	3	6.8		displacement	7	8.8						body	3	7.1
subject_of	**86**	**1.8**		horizontal	4	8.8						electron	4	6.7
change	7	9.2		drift	3	8.8								
have	4	5.5		vertical	4	8.7								
				terminal	3	8.3								
				linear	3	8.3								
				space	5	8.3								
				force	3	5.2								

pp_obj_of-i	52	1.4		pp_between-i	8	4.8
component	13	9.6		observer	4	8.9
magnitude	7	8.4		**pp_obj_with-i**	**35**	**8.7**
change	7	8.0		T	3	8.2
direction	4	6.9				

4.1 Case study: Bottom-up approach in *Ideal Gas Law*

Within a CLIL methodological course for inservice subject teachers given at the University of Turin in 2013, participants were introduced to corpus linguistic tools for teaching purposes. They were asked to work on disciplinary corpora created with the Sketch Engine and to reflect upon the language they should present to their students, creating a path for content and language integrated learning and teaching.

They first extracted the word list from their corpora, then they asked queries for LSP collocations, expanded the context of the occurrences to explore possible different meanings and finally created the word sketch of the keywords they thought to be crucial for content understanding. After a process of self-awareness language acquisition, they sketched the same - simplified and adapted - activities for their students with the aim to render the content accessible.

As an example the didactic unit about Ideal Gas Law[3] will be here analyzed. Corpus-based approach was used both to actively collect a LSP vocabulary and to give a warming up summary of the topics to be studied in depth throughout the unit.

At a preliminary stage the teacher makes a word list of nouns, verbs and adjectives in order to get a handle of the lexical material he/she is going to deal with, the he/she chooses the most significant items to be dealt with: *gas, temperature, volume, pressure, particle, collision, constant, proportional, universal, absolute*.

Starting from the first word on collocations are extracted and word sketches are drawn.

The most frequent attributes of the noun gas are ideal and real and it is often associated to the expressions *temperature of... / ...at temperature*; *volume of... / ...at volume*; *pressure of... / ...at pressure*; *state of…*etc, and to the verbs *expand, compress, behave like,* besides occurring in the phrases *gas equation, gas law, gas state*.

From the disciplinary point of view, these occurrences introduce through expanded contextualized examples the differences between *ideal gases* and *real gases* and the physical quantities *temperature, volume* and *pressure,* which typify the state of gases.

As for these quantities students could be asked to fill in a table extracting information from collocations and word sketches, thus being actively involved in the bottom-up elaboration process.

	attributes	subj./obj. of verbs
temperature	thermodynamic high/low absolute constant proportional	increase/decrease rise keep measure depend
volume	small/large constant proportional	increase/decrease occupy keep measure depend
pressure	high/low constant proportional	increase/decrease exert keep measure

Some adjectives linked to *temperature* (*thermodynamic/absolute*) are part of the definition of the Kelvin temperature scale and of the concept of absolute zero; the verbs *keep* and *constant* are part of the occurrences *provided volume / temperature / pressure is kept constant*, which express Boyle's and Gay-Lussac's laws. The presence of *proportional* in connection to the three nouns suggests a relationship between all these quantities and it is frequently connected to the adverbs *directly* and *inversely,* the numerous examples at students' disposal also offer a linguistic model for expressing direct and inverse proportionality in English.

The syntagmatic relations of the keyword *particle* give some clues on the modality of interaction between the molecules of ideal gases: it occurs with the verbs *collide* and *interact*, in particular *interact by/ through/ on collision,* while *collision* has its highest frequency concordances with the adjectives *elastic /inelastic.* And so on.

Starting from the ten selected keywords this bottom-up approach allows students to get a sizeable portion of the LSP needed and to draw a fairly detailed mind map to scaffold further

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[3] The Didactic Unit was experimented by professor Anna Grazia Botti

exercises such as cloze texts of reading comprehension tasks.

5 . CONCLUSIONS

CLIL teachers are confronted with a challenging task, which implies a clear mind about the features of the LSP they are dealing with. General dictionaries, CALL, machine translation tools are not enough to support them in handing out content through a foreign language.

Where traditional approaches show their limits, the integration of corpus-based approaches in disciplinary teaching and learning proves essential. On the one hand getting familiar with corpus analysis allows teachers to improve their own linguistic knowledge, on the other hand word sketches, collocations, frequency lists help them in selecting, planning and organizing didactic materials. Co-occurrences show which verbs are associated to a certain key-noun, which are the right prepositions or the most suitable adverbs, and their position. It is all about a knowledge that enriches the teachers' language in class and reinforces language awareness. The same happens with students who get involved in the process of knowledge construction and learn how to disambiguate polisemous terms and how to choose between near-synonyms inferencing linguistic information right from the context, thus - hopefully - avoiding to rely exclusively and rashly on automatic translation for reading comprehension and writing production.

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