A metaphor-metonymy continuum?
Evidence from cross-field L2 set texts

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Abstract

While the typology of metonymy has remained relatively stable in the literature, there is still ongoing discussion about metaphor varieties and their distinction from the former. Some theorists (Radden, 2003; Chen & Lai, 2012) have argued that language must be approached as stages along a continuum, with literal and metaphoric uses at both ends, and metonymy somewhere in the middle. However, in L2 contexts, particularly in specialised domains, the nature of such figurative uses can be obscure to learners, as they often follow the received models in their fields of study, and language tends to be perceived as primarily literal. This actually distorts the position of language elements within the metonymy-metaphor continuum, and it prevents linking figurative and non-figurative uses into a more comprehensive use of language as a richer tool for communication. Using a three-dimensional taxonomy for metaphor, which takes into account communicative, conceptual and linguistic factors, and a detailed revision of metonymy types as research instruments, this paper performs a cross-field comparison of a corpus of 150 CEFR-B1 set texts to which undergraduates in Economics, Geography, and Chemistry at a Spanish university are exposed. It gives statistical treatment to the appearance of figurative language in texts, showing variations and trends among disciplines, and the prevalence of metaphor-metonymy overlap in those areas of knowledge. In addition, the findings encourage the integration of a cognitive approach when highlighting metaphor and metonymy to L2 students, since the cross-linguistic and cross-cultural variations that characterise these figures may complicate transitioning from literal to figurative language uses without instructors needing to resort to their mother tongue.

Keywords: metaphor, metonymy, second language acquisition, specialised texts.

Resumen

¿Un continuo metáfora-metonimia? Evidencias en textos intercurriculares para la enseñanza del inglés para fines específicos

Mientras que los tipos de metonimia han permanecido relativamente estables en la literatura, existe todavía controversia acerca de las variedades de metáfora y su diferenciación de la metonimia. Algunos autores sostienen que el lenguaje debe considerarse como etapas a lo largo de un continuo, con el sentido literal y metafórico en ambos extremos, y la metonimia situada en algún punto entre ambos. Sin embargo, en contextos de adquisición, particularmente los especializados, la naturaleza de tales usos figurativos puede resultar opaca para los aprendices, ya que estos a menudo siguen los modelos prevalentes en sus disciplinas y tienden a percibir el lenguaje de una manera literal. Esto distorsiona la posición de los elementos en el continuo metáfora-metonimia, ya que impide unir usos figurados y no figurados de forma más amplia en un uso más rico del lenguaje comunicativo. Usando como instrumentos de investigación una taxonomía tridimensional para la metáfora, con valores comunicativos, conceptuales y lingüísticos, y una revisión de los tipos de metonimia, este artículo compara un corpus de 150 textos MCER B1 que los alumnos de los grados de Economía, Geografía y Química deben estudiar en una universidad española. Se examina estadísticamente la aparición de usos figurados en los textos, mostrando variaciones y tendencias entre estas disciplinas, y un frecuente solapamiento entre metonimia y metáfora. Los resultados sugieren la integración de un enfoque cognitivo que haga relevantes las metáforas y metonimias a los aprendices. Las variaciones inter-lingüísticas e inter-culturales propias de estas figuras pueden dificultar la transición entre usos figurados y literales, obligando a los profesores a recurrir a su lengua materna.

Palabras clave: metáfora, metonimia, adquisición de segunda lengua, textos especializados.

1. Introduction

Most modern cognitive approaches to figurative language stress the complexity of discerning the limits and conditions for metonymy and metaphor, but systematically retain Roman Jakobson's (1971/1956) view of such figures as poles along a continuum. Such an approach has been justified because "the interactions of metonymy and metaphor are so intricate that the boundary forms not a dichotomy but a continuum" (Chen & Lai, 2012: 235). This metaphor-metonymy linearity has progressively been replaced by a continuum between figurative and literal uses of languages. Figurative is a

language whose primary meaning is partially structured by metaphor and can be extended "beyond the range of ordinary literal ways of thinking and talking into the range of what is called figurative" (Lakoff & Johnson, 1980: 13) or which is experienced "in terms of another domain of a different kind" (Johnson, 1987: 15).

Studies of metaphor and metonymy have found it notoriously difficult to separate one from the other, as they often overlap or motivate each other. Furthermore, a detailed quantitative analysis of a variety of figurative expressions has rarely been applied to L2 classroom settings. This study first reviews relevant literature on metaphor and metonymy, so as to highlight how their relevance can, in practice, cast aspersions on the usefulness of such clear-cut distinctions. Subsequently, the methodology and the results of the analysis of figures within a corpus of specialised texts will be reported and discussed. Finally, from the findings of the study, a number of pedagogical implications will be suggested, as well as potential directions for future research.

2. Metaphor, metonymy: Differences and taxonomies

Metaphor has often been defined within cognitive linguistics as a conceptual mapping where target and source domains do not have a common experiential superordinate domain (Lakoff & Turner, 1989: 103-104). In that respect, metaphor works essentially through domain substitution, whereas metonymy has been considered more as a cognitive apprehension of the relation between two concepts (Arata, 2005) of particular relevance to communication (Barcelona, 2003a; Benczes, Barcelona, & Ruiz de Mendoza Ibáñez, 2011). However, its demarcation from conceptual metaphor remains as a challenge; the consensus view from cognitive linguistics is that metonymy establishes "an asymmetric mapping of a conceptual domain, the source, onto another domain, the target. Source and target are in the same overall domain and are linked by a pragmatic function, so that the target is mentally activated" (Barcelona, 2011: 19). This means that its nature is fundamentally concept-forming, and it is rooted in experience, or in the apprehension of a particular relation between concepts or parts by means of contiguity. There is ongoing debate, however, on whether metonymy is prototype-based or, on the other hand, domain-based. Unlike metaphor, metonymy can be considered a conceptual mapping which remains "within-

domain" (Lakoff & Turner, 1989: 103) or their "functional domain" (Barcelona, 2011: 52), as both can be encompassed within a field. Thus, "baton" can replace "runner" within the same "athletics" domain metonymically, but metaphorically outside its domain ("to take the baton" as "take over a role"), as the latter involves the "two separate domains" (Geeraerts, 2011: 215) of "athletics" and "drama".

This clear-cut distinction has been challenged as potentially "an arbitrary intervention by a linguist" in the selection of domain boundaries, since these are "experientially based and consequently to a large extent individually determined" (Feyaerts, 1999: 318). Also, the fact that at a superordinate domain (in the case of "athletics" and "drama", the overall domain "group activities") it may be conceived complicated to discern whether an expression operates in a single domain. Langacker advanced the notion of active zones, as "those portions of a trajectory or landmark that participate directly in a given relation" (1984: 177), which has influenced more recent research. For example, Radden and Kövecses (1999: 21) stated that "metonymy is a cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, within the same idealized cognitive model", while Benczes et al. (2011:202) survey compounds to show how "metaphors and metonymies can and do interact rather often in linguistic expressions" and metaphors can do so "within the same domain matrix".

Goossens (2002: 340) proposed the term "metaphtonymy" to refer to cases when both metaphor and metonymy act upon an idiomatic expression. Subsequent studies have stated that the source of metaphoric mapping is often created by a previous metonymy (Urios-Aparisi, 2009; Hidalgo-Downing & Kraljevic-Mujic, 2011). Barcelona (2011: 52-53) refines the definition of metonymy as "an asymmetric mapping of a conceptual domain, the source, onto another domain, the target," and that of metaphor as having the properties of "a symmetric mapping" and "source and target, either in different taxonomic domains and not linked by a pragmatic function, or, in different functional domains". In the sentence "He is a star bass", the "bass" as "bass player" metonymy belongs to the same functional domain "concert", and it is linked pragmatically as an instrument-agent, but it is accompanied by the "celebrity is star" metaphor which, in turn, will activate the different functional domain "fame". However, Barcelona (2011:12) also establishes how a metonymical mapping is asymmetric, unlike metaphor's symmetric mapping, so that in the latter structural features are

shared, while metonymies shift focus in a particular direction. This allows not only having the existence of a single domain as a defining factor, but also using the specific nature of the mapping to discern metonymy from metaphor more clearly.

Theoretical considerations aside, language in these studies has been considered primarily in ideal terms, and not through real-life language usage data. Corpora are arguably the most promising empirical approaches to research into figurative language. Some studies on metaphor have successfully investigated into the nature of both conceptual and linguistic metaphors (Steen, 1999; Charteris-Black, 2000; Babarczy, Bencze, Fekete, & Simon, 2010) and metonymies in specialised domains (Hilpert, 2006; Pérez Sobrino, 2016), moving beyond the limitations of dictionary-based research. However, some more conventional approaches can be salvaged. In this sense, the *Historical Thesaurus of the Oxford English Dictionary* can aid not only as a historical source but also as a taxonomic classification of conceptual fields, since it lists synonyms next to their dates of use, and it may be used both semasiologically and onomasiologically through lexemes and near-synonyms.

While it is not the only approach to the identification of metaphor, the Metaphor Identification Procedure (Pragglejaz Group, 2007; Steen et al., 2011) puts forward a scientific method for identifying, classifying and annotating metaphorical uses. Metonymy annotation, however, has been more contested due to the seemingly inexhaustible variety of potential metonymies. A number of practical procedures have been proposed to differentiate among target domain lexicon (Hilpert, 2006; Markert & Nissim, 2006) or conceptual mappings (Steen et al., 2011), but the need for a conclusive taxonomy is still due. The most widely used in the field is the comprehensive taxonomy by Radden and Kövecses (1999), which has been adapted of late (Littlemore & Tagg, 2016) to address the intensely creative ways in which metonymy can be used within a given context.

3. Specialised domains and figurative language

The technical contexts in which English can be used usually fall under English for Specific Purposes (ESP), but these are also intersected in classroom uses by English for Academic Purposes (EAP) and English as a Medium of Instruction (EMI). As an integral part of linguistic creativity,

both metaphor and metonymy can appear in specialised language. However, the intended exactitude, conciseness and precision of scientific or academic discourse in Geography, Biology or Chemistry would discourage from their use. Both metaphors and metonymies help highlight conceptual relations between entities, whether or not part of the same domain. "Rodents" are metonymically characterised by their actions, mapping a wide number of animals in a category that is nevertheless subjective, since other animals that also gnaw – such as moles or rabbits – are not rodents; rather than helping make sense of the world, its use may complicate scientific knowledge in a L2 context.

The pervasiveness of metaphor in scientific and technical texts has come under closer scrutiny in the last decade, in fields such as politics (Arntfield, 2008), medicine (Kreuzthale & Schulz, 2012) and, more extensively, science and technology (Dalke, Grobstein & McCormack, 2006; Cuadrado-Esclapez & Robisco-Martín, 2011; Gelernter, Cao, & Carle, 2013; Durán-Escribano & Argüelles-Álvarez, 2016; Koteyko & Atasanova, 2016). Their capacity to "have organizing, theory-constitutive, educational, and persuasive functions" (Steen et al., 2011: 107) in scientific thought and discourse is undeniable. These studies evidence that regardless their potential nature as mappers, both metaphor and metonymy point at referents through iconic or indexical relations (Panther, 2006: 148), but nevertheless replace source meaning with target meaning, and consequently displace the target frame or domain structure. Such figurative processes serve as inputs for pragmatic inferences, which depend on the reader for their felicity; in the case of undergraduate set texts, and particularly in English-based instruction to speakers of other languages, this would seemingly complicate the transmission of key concepts and data.

To further complicate the successfulness of such specialised-but-figurative educational texts, it is worth remembering that the interaction between both phenomena can also happen at the purely conceptual level (Barcelona, 2003b: 10), so that the metaphoric or metonymic nature of these mappings may be obscure, particularly to speakers of other languages. Therefore, analysing a corpus of various set texts to which L2 students are exposed in their subjects can reveal pertinent conclusions towards the quantitative weight and features of the metaphorical and metonymical concepts they interact with. In such a frame, the metaphor taxonomy set forth by Steen (2011) can prove fruitful, as it revises the role of "deliberate metaphor" in communication. That is to say, when a linguistic expression is used in such a

way that speakers "are aware of its foundation in a cross-domain mapping, and in such a way that they may also want to alert their addressee to this fact as well" (Steen, 2011: 37).

In the case of ESP textbooks, deliberate metaphors are those that would be recognised as metaphors by an ideal reader. Two example annotations in our Geography subcorpus might be illustrative. "The sea is 'harmful' to people" includes a marked word choice which is both encoded and decoded as a metaphor; on the other hand, "The Earth's 'crust'" is a common expression, hence annotated as a non-deliberate metaphor. As an example of the unmarked use of a metaphoric expression, its relevance within the L2 classroom is greater than in less formal settings. A number of approaches have been offered to ascertain the deliberateness of authorial metaphor in educational discourse (Cameron, 2003; Aubusson, Harrison, & Ritchie, 2006), but whether authors "use a linguistic expression in such a way that they are aware of its foundation in a cross-domain mapping, and in such a way that they may also want to alert their addressee to this fact as well" (Steen, 2011: 37) has been largely ignored within the theoretical discussion of metaphor and metonymy. Contemporary cognitive-linguistic approaches have highlighted how these can work conventionally, automatically, and even unconsciously; in doing so, the extent to which users may deliberately use these for communicative purposes has been elided. A corpus analysis including deliberateness, as well as other cognitive-linguistic factors, would show that these are not at odds: conventional metaphors are not necessarily non-deliberate. They can be used both non-deliberately ("Lakoff attacked Glucksberg") or deliberately ("Wasps, the wrong weather, and why this summer's got a very nasty sting in the tail") since "conventionality is part of one dimension, metaphor in thought, which is orthogonal to the other dimensions, in this case the communicative dimension, which includes deliberateness" (Steen, 2011: 40). Steen's taxonomy also offers the additional advantage of distinguishing metaphor from simile, which has been kept in our annotations.

Another often overlooked aspect is the lack of emphasis on the speaker's creativity in metonymical processes. Metonymy, just as metaphor, can serve a range of functions, such as those of illocution, cohesion, euphemism, humour or persuasion (Littlemore & Tagg, 2016: 7-8). Therefore, the way these are conveyed matters just as much as the cognitive mappings these figures perform. While comprehensive frameworks for metonymical classification, such as the one put forward by Radden and Kövecses (1999),

or concepts such as domain or "idealized cognitive models" (Lakoff, 1987: 85) can be retained, the uses of metonymies in longer academic texts must consider metaphor overlapping. An expression such as "white collar" combines part-for-whole metonymy with the metaphorical substitution "office worker" as "white collar", and its use is an example of creativity – understood as a figure-powered stylistic choice – through a deliberate figuration, if conventional. In other words, metonymy and metaphor interact richly as conceptual mappings, rather than being milestones along a continuum. What is pertinent in educational settings is that this mapping is activated through the "business" frame, often delivered to students – just as "biology" and "geology", or their subdivisions – holistically through texts. Without such reciprocal knowledge of both figurativeness and its context of appearance, the non-literal meaning of the expression would complicate understanding content. This essential fact may be crucial in the case of L2 students, who may fail to decode either literal or figurative meanings – if not both – thus jeopardizing academic success.

4. Research questions

The main focus of this contribution is on the analysis of metaphors and metonymies in a specialised corpus, particularly quantifying the presence of figurative language in specialised discourse, rather than examining its qualitative or conceptual relevance. Thus, the general research questions that shape the study are:

1. Is the use of figurative language in the corpus significant?

2. Are there any differences between the three corpora regarding metaphor, simile and metonymy?

3. Are there any cases of overlap of metaphor and metonymy in the corpus? If there is such overlap, of what type is it? Is it significant?

4. Can a continuum be kept as a model to situate these figures, or should cognitive/conceptual overlap be considered a more apt conceptualization?

5. Method

Traditionally seen as a teaching or learning process, ESP has also been more recently regarded as a specialised discourse within particular scientific fields and professional settings (Ruiz, Palmer, & Fortanet, 2010). This study focuses on three types of common specialised academic discourse: Business, Chemistry and Geography. The data used in the study comprises a corpus of one hundred and fifty texts, fifty from each field of knowledge under study. The texts are typically 400-500 word long, and their complexity is adequate for B1 students according to the Common European Framework of Reference for Languages (CEFR), being materials used by the authors of this study in their own university ESP lessons. The three subcorpora used in the present study can be said to be formally homogenous (Table 1).

Features	Business	Chemistry	Geography	Total
Number of words	18,439	13,826	17,177	49,442
Number of sentences	1,276	1,207	1,197	3,680
Avg. sentences per text	25.52	23.94	24.14	24.53
Avg. syllables per sentence	15.2	13.56	14.58	14.45
Avg. syllables per word	1.51	1.55	1.52	1.53
Percentage of words with three or more syllables	13.96	14.19	13.31	13.82

Table 1. Corpus features.

The texts were analysed for metaphors following Steen's (2011: 40) three-dimensional taxonomy, which allows for a distinction between non-deliberate versus deliberate uses of metaphor and it includes two further oppositions between conventional versus novel metaphor (conceptual structure) and simile versus metaphor (linguistic form). Following such distinctions, we have considered that a metaphor is used deliberately when users are aware of its foundation in a cross-domain mapping and opt for this figurative use, while a metaphor is used non-deliberately when there is no more usual or more frequent alternative in the specialised domain. The frequency of an expression is analysed quantitatively using the *British National Corpus*, and the use of a high-frequency expression in the *BNC* corpus or the *OED* is therefore tagged as conventional. The opposition between conventional and novel metaphors refers to the conceptual properties of metaphors; that is, there can be, potentially, expressions which are not part of conventional language use, and whose mapping offers novel ways to conceptualise objects or ideas. In our Business subcorpus, for

instance, "word of mouse" refers to online comments and ratings given by users through websites and social networks, repurposing "word of mouth" into its technologically-updated version. Finally, the opposition between simile and metaphor refers to the primarily linguistic properties of metaphors, often marked linguistically by words such as "like" or "as", among others. These criteria, based on Steen's taxonomy, were rigorously applied in each subcorpus to identify each type of metaphor.

For the analysis of metonymies in the texts we followed the key metonymy types in Radden and Kövecses's (1999) taxonomy as adapted by Littlemore and Tagg (2016). Thus, as Table 2 below shows, a clear distinction between whole-and-part metonyms and part-and-part metonymies is kept. The former is further subdivided into things and part, scale, constitution, event, category and member, and category and property. Part-and-part metonymies include action, perception, causation, production, control, possession, containment, location, sign and reference, and modification as major categories (Littlemore & Tagg, 2016: 6).

Metonymy types	Examples
Total Whole and Part	
Thing and Part	Part for whole – "Logo" for "Corporate image"
Scale	End for whole scale – "Junior and Senior" accountants
Constitution	Material for object – "Concrete" for "Wall"
Event	Subevent for whole event – The "Interview" got her the job
Category and Member	Category for member of category – "River valleys"
Category and Property	Salient property for category – Some "muscle" was needed
Total Part and Part	
Action	Agent for action – The "weathering" of materials
Perception	Thing perceived for perception – To "monitor" a department
Causation	Effect for cause – "Manufacturing" of products
Production	Producer for product – A "scan" was required
Control	Controller for controlled – The "Richter" was alarming
Possession	Possessed for possessor – "Wealth" determines policies
Containment	Container for contents – The "envelope" must be sent
Location	Place for inhabitants – "Stockholm" sold less this quarter
Sign and Reference	Words for the concepts they express – "A way to reduce costs"
Modification	Modified form for original form -"CEO" for "Chief executive officer"

Table 2. Metonymy types (based on Littlemore & Tagg, 2016).

Each text has been electronically annotated with the *UAM Corpus Tool* (O'Donnell, 2016) following these two taxonomies. A qualitative analysis of the results included a detailed analysis of the corpus, which allows discerning

specific cases of literal and non-literal uses of expressions, their deliberate uses within different conceptual mappings, and the more complex case of metonymic compounds. It also includes a detailed analysis of relevant instances of metaphor and metonymy overlapping. A subsequent quantitative analysis (see Table 4 below) would reveal whether such particular figurative uses in the texts were relevant and, if so, whether there were significant differences between subcorpora.

Two aspects with regard to language use must be highlighted in our analysis of the corpus. First, the level of lexicalization in specialised and more general uses of a given expression makes the nature of such cognitive mapping often transparent, even in cases of metonymy-metaphor overlap. For instance, the use of "company is business" shares both a metonymic origin (the perception of two or more companions as sharing a commercial interest) and a metaphorical substitution (such group represents the whole productive and commercial enterprise) but records in *OED*'s Historical Thesaurus show its consistent use since at least 1550. Others, such as "success is financial gain", or "programme is a series of events", "see is read", "take is consider" are just as commonly associated that it would be difficult for either L1 or L2 users to perceive these as figurative. As such, these uses have not been annotated as non-literal language within the corpus. Secondly, other common uses, such as the deliberate use of "monitor" as "supervise" have been marked as metonymies on the basis of their optionality, as well as to differentiate from L2 uses, such as "control" as "supervise", evidenced in the *European Parliament Proceedings Parallel Corpus* (Koehn, 2011).

6. Results

Our data reveal a constant presence of figurative tropes in the three subcorpora. More specifically, in response to the first research question, our examination showed a total of 8,462 instances of figurative uses of the language (see Table 3 below). Geography presented the largest number of cases (3,416 instances, an average of 67.46 per text, and 19.64% of total word count), followed by Business (2,764, 55.28, 14.99%), and Chemistry (2,282, 40.22, 15.99%). Examining each trope separately, it is revealed that Business texts used more metonymies (1,047 instances), followed by Geography (1,028), and Chemistry (607). With regard to metaphors,

Geography presented the highest number of this trope (2,130 instances), followed by Business (1,884), and Chemistry (1,723). Regarding similes, only 19 instances were found in the Business subcorpus, and 12 instances in both the Chemistry and Geography ones.

Figurative uses	Business	Chemistry	Geography	Total
Total number of cases	2,764	2,282	3,416	8,462
Metonymies	1,047	607	1,028	2,682
Metaphors	1,884	1,723	2,130	5,737
Similes	19	12	12	43

Table 3. Number of cases of figurative uses of the language.

Prima facie, "technical texts" have been said to be "more tractable because" they lack "figurative language and can be understood in its literal sense" (Copeck et al., 1997: 391). However, we find a high degree of figurativeness; a number of studies have called attention to the use of metaphor in textbooks in the fields of Economics (Boers & Demecheleer, 1997; Charteris-Black, 2000; Kolar, 2012) and Science (Salager-Meyer, 1990; Brown, 2003; Aubusson, Harrison, & Ritchie, 2006) while specific studies on metonymy have been scantier (Runblad, 2007; Catalano & Waugh, 2013). While largely restricted to metaphor, researchers have stressed the importance of figurative language in specialised discourse. They have analysed how particular figures offer models to interpret reality; ours is a first attempt at evidencing such relevance through quantification methods in a more comprehensive manner. The relative weight of figurative language found in the corpus, along with the distinctions between the tropes involved, has severe pedagogical implications not only for L2 contexts, but also for the conceptualization of scientific text-types themselves.

Answering the second research question, important differences were found in the use of metaphor, simile and metonymy in each subcorpora. Table 4 below shows the number of each type and subtype of metonymies in the three corpora. It can be perceived how whole-and-part types are more common, with 1,436 instances (813 in Chemistry, 418 in Geography and 205 in Business), as compared to 1,246 instances of the part-and-part types (842 in Business, 215 in Geography, and 189 in Chemistry). Within the whole-and-part type, the distribution is highly skewed toward the category-and-member subtype, with 665 cases in the Geography subcorpus, 306 in Geography, and 66 cases in Business. The whole-and-part type metonymies are illustrated in the following examples: "Luminol reveals blood 'traces'" is

an instance of the whole-and-part category-member subtype from the Chemistry subcorpus. "Destructive waves destroy the coastline in 'a number of ways'" is an example of the whole-and-part category-property subtype from the Geography subcorpus. "The company 'headquarters' are in New York" is an instance of the whole-and-part, category-property metonymy in the Business corpus. Within the part-and-part type, the causation and action subtypes present the largest numbers of occurrences, particularly in Business, with 314 of a total of 413 instances. The action subtype is also more frequent in Business, with 234 instances out of 359.

Metonymies	Business	Chemistry	Geography	Aggregate
Thing and part	16	30	44	90
Scale	0	0	1	1
Constitution	11	52	43	106
Event	5	1	3	9
Category and Member	66	306	665	1,037
Category and Property	107	29	57	193
Total Whole and Part	**205**	**418**	**813**	**1,436**
Action	234	56	69	359
Perception	37	11	8	56
Causation	314	51	48	413
Production	1	4	0	5
Control	0	3	1	4
Possession	0	0	3	3
Containment	69	14	47	130
Location	58	3	5	66
Sign and Reference	20	24	4	48
Modification	109	23	30	162
Total Part and Part	**842**	**189**	**215**	**1,246**
Total	**1,047**	**607**	**1,028**	**2,682**

Table 4. Metonymy occurrences in the corpora by type.

The following sentences are instances of both subtypes in the Business corpus: "International 'trade' is heavily regulated" [part-and-part causation metonymy], "No more money will be 'pumped' into the project" [part-and-part action metonymy]. The scale subtype within the whole-and-part type, with just one instance in the Geography subcorpus, and the possession and control subtypes of the part-and-part metonymy type, with three and four occurrences in the corpus respectively, present the lowest number of instances in the corpus. The following sentences are instances of the three subtypes in the Geography corpus: "The 'Koppen system' recognizes five

major climatic types" [whole-and-part control metonymy], "The higher on the 'Richter scale' the more severe the earthquake is" [part-and-part possession metonymy], "Some examples of erosion in 'young rivers' are v-shaped valleys, interlocking spurs and waterfalls" [part-and-part scale metonymy].

Table 5 shows the common occurrences of metaphors and similes (5,780 in total) per type in the three subcorpora. Out of the three, the Geography subcorpus presents the largest number of total metaphors and similes (2,142 instances), followed by Business (1,903), and Chemistry (1,735). It can be noted that most metaphors are non-deliberate: 5,005 versus 775 deliberate ones. The Geography subcorpus has the largest number of conventional non-deliberate metaphors (1,996), followed by Chemistry (1,582) and Business (1,417). The following sentences exemplify non-deliberate metaphors in each subcorpus: "There are a number of ways of extracting 'resources' from the ground" [Geography], "Mendeleyev uncovered the 'principle' of the periodic table" [Chemistry], "The hotel 'chain' was struggling financially" [Business].

No conventional non-deliberate similes were found. With respect to conventional deliberate metaphors, 454 instances were found in the Business subcorpus, 134 in Geography, and 131 in Chemistry. The following sentences sample conventional deliberate metaphors: "Oklahoma receives more tornadoes than any other region on the planet. It also receives most of these 'severe' events in the month of May" [Geography], "Carbonic acid 'dissolves' some rocks such as limestone" [Chemistry], "Her 'contribution' to the funds is essential" [Business]. We also found 18 instances of conventional deliberate similes in the Business subcorpus and 11 in both Chemistry and Geography. It is worth pointing out the low occurrence of novel metaphors and similes, and the absence of any instances of novel non-deliberate metaphors or novel non-deliberate similes. Therefore, it can be argued that a novel non-deliberate metaphor may not exist, and that similes are almost invariably deliberate by nature; an analysis of a larger corpus of similar texts may help confirming such an assumption. There were 13 instances of novel deliberate metaphor in the Business subcorpus, whereas no instances were found in Chemistry or Geography. There was just one instance of novel deliberate simile in each ("like a key to a jammed door", "like a big supermarket", "like a frozen ice cube").

Metaphor and Simile	Business	Chemistry	Geography	Aggregate
Conventional Non-deliberate Metaphor	1,417	1,592	1,996	5,005
Novel Non-deliberate Metaphor	0	0	0	0
Conventional Non-deliberate Simile	0	0	0	0
Novel Non-deliberate Simile	0	0	0	0
Total Non-Deliberate	**1,417**	**1,592**	**1,996**	**5,005**
Conventional Deliberate Metaphor	454	131	134	719
Novel Deliberate Metaphor	13	0	0	13
Conventional Deliberate Simile	18	11	11	40
Novel Deliberate Simile	1	1	1	3
Total Deliberate	**486**	**143**	**146**	**775**
Total	**1,903**	**1,735**	**2,142**	**5,780**

Table 5. Metaphor and simile occurrences per type.

The figures in Tables 4 and 5 show two relevant trends; on the one hand, across these subcorpora, there is correlation in the occurrence – or absence – of several subtypes of metonymy and metaphor. That is to say, if a certain subtype is relatively prevalent in a given field, it is also prevalent in the other subcorpora. On the other hand, it seems that while this is the case, the use of these subtypes among fields of specialization is uneven, so that category-and-member metonymies are tenfold in Geography when compared to Business and, conversely, conventional deliberate metaphors amount to a fourth.

The third research question quantifies overlap between metaphor and metonymy as cognitive mappings. As Table 6 below shows, there are numerous cases of such overlap: 324 instances of whole-and-part metonymies that were also conventional non-deliberate metaphors, and a further 82 that were also conventional deliberate metaphors; some examples and details will be discussed further below. The category-and-member and the constitution subtypes showed the largest number of overlapping instances, with 181 and 102 respectively, followed by category-and-property, with 96 cases. There are 139 category-and-member metonymies overlapping with conventional non-deliberate metaphors, and 42 with conventional deliberate metaphors. The following sentence from the Geography subcorpus is an example of the overlapping between category-and-member metonymy and conventional non-deliberate metaphors: "In some situations, many roads may lead to a 'bridging' point". With respect to part-and-part type metonymies, there were 272 overlaps with conventional non-deliberate

metaphors, and 98 with conventional deliberate metaphors. Within this type, the causation subtype presented the largest number of overlaps (244 instances; 185 with conventional non-deliberate metaphors and 59 with conventional deliberate metaphors). The following sentence from the Chemistry subcorpus illustrates the overlapping between part-and-part causation metonymy and conventional non-deliberate metaphors: "If you are 'packing' soft and unbreakable articles, a pair of sheets for example, they should be wrapped in good quality brown paper or sheet polythene". Significantly, overlapping was much more frequent in the case of conventional deliberate metaphors (35.96%) as compared to conventional non-deliberate metaphors (11.91%), in this way it seems that the deliberate use of a metaphor and their partial coincidence with a metonymical mapping is a relatively stronger correlation.

Overlap	Conventional Non-deliberate Metaphor	Conventional Deliberate Metaphor	Aggregate
Thing and part	22	0	22
Scale	0	0	0
Constitution	102	0	102
Event	5	0	5
Category and Member	139	42	181
Category and Property	56	40	96
Total Whole and Part	**324**	**82**	**406**
Action	19	6	25
Perception	14	1	15
Causation	185	59	244
Production	3	0	3
Control	0	0	0
Possession	0	0	0
Containment	26	2	28
Location	24	30	54
Sign and Reference	0	0	0
Modification	1	0	1
Total Part and Part	**272**	**98**	**370**
Total	**596**	**180**	**776**
Percentage of metaphors	**11.91**	**35.96**	**13.56**

Table 6. Cases of overlapping of metaphor and metonymy.

The fourth and final research question encompasses some of the quantitative aspects above, but requires a more qualitative approach.

Whether overlapping is more useful as a conceptualization than a linear continuum needs to be framed within the discussion of specific examples found in the corpus.

7. Discussion

The use of figurative language entails, pragmatically, a "phenomenon whereby we talk and, potentially, think about something in terms of something else" (Semino, 2008: 1). Thus, although it is markedly absent in the pedagogical design of ESP curricula (Doiz & Elizari, 2013) the quantities reported above highlight the need for its inclusion as an active part of ESP learning. L2 students, in the light of such prevalence of figurative uses in these three disciplines, require specific training about figurative uses of words, as well as non-inferential awareness about which cognitive mappings are at work within a given expression, however conventional its usage. As such, the "figurative use of language may itself constitute a field of meaning" (Ritchie, 2006: 156), which is coherent with previous theoretical studies in ESP Business and Science (Herrera-Soler & White, 2012; Roldán-Riejos & Úbeda-Mansilla, 2013). Being able to recognise and explore non-literal uses is an essential skill that may contribute distinctively towards the understanding of a text, let alone the construction of cognitive networks (Littlemore & Low, 2006) and avoiding potentially treacherous conceptual transfer among languages (Juchem-Grundmann & Krennmayr, 2010). However, our corpus study reveals a number of relevant issues that affect both L2 students, who are the main recipients of such ESP texts, as well as L1 users within these specialised domains.

Secondly, it is also important to point out that many of the metonymies and metaphors cited in the paper have calques in other languages, including Spanish: this is the case of "success is financial gain", "programme is a series of events", "see is read", "take is consider", "unemployment is lack of employment". As we can see in these examples, in calques there is a transfer of meaning from one language to the other. These calques should also be taken into account in the design of ESP curricula since, from a pedagogical perspective, they could facilitate students' acquisition of metonymy and metaphor.

Thirdly, the traditional understanding of the overlap is that the same expression at the same time qualifies as both a metonymy and a metaphor,

but in such a way that one prevails over the other. Barcelona (2003a: 31) takes a radical approach, so "that every metaphorical mapping presupposes a conceptually prior metonymic mapping, or to put it differently, that the seeds for any metaphorical transfer are to be found in a metonymic projection". However, as Goossens (2002) points out, both metaphoric and metonymic processes occur in the development of a given expression, so that there are cases of embeddedness: metonymy-from-metaphor and metaphor-from-metonymy. Typically, these involve a conceptual item X being linked to Y, and Y to Z, so that the X-Y link is metaphorical and the Y-Z link is metonymic, or vice versa. However, such linearity – in itself a transposition of the metaphor-metonymy continuum – is not always analysable; it is often unclear in our corpus whether an expression is primarily metonymical or metaphorical, or which precise subtype is at work. A "fork" is a tool for eating which is called so because its tines, usually three, seem to fork from the handle. As such, it is a metaphor-from-metonymy type, but it is nevertheless heavily lexicalised and its use is non-deliberate; furthermore, it can be also indistinctly seen as a perception or part-for-whole metonymy. There can be further embedding of such conceptual mappings: a "fork" can also be perceived, in turn, as a metonymy where the fork is a salient feature that names the whole piece. In L2 contexts, despite its non-literal origin, not much can be gained from highlighting these specific overlaps, unlike in some more specialised use ("fork" as "copy of a process" or "fork" as "detour"). In the case of compounds (such as "pancake", "billboard", "forecast", "airline") such intricate overlap might be more objectively explained. Similarly, the level of deliberateness in metaphorical uses is complex if "market" as "economic activity" is the regular non-deliberate use in a subcorpus, while the distinction between a "local", "domestic", "home", or "internal" market is deliberate on the part of the speaker, however unpremeditated.

In addition, the figurative and non-figurative uses of the expressions in the corpus are largely subcorpus-bound; the use of "range", "star", "growth", "build" and "launch" is less figurative in Geography than in Business, and "solution" means something entirely different in Chemistry than in the other two subcorpora. Other more general uses of "rise", "source", "service", "network", "mouse", "core" and "limit" as non-literal expressions are relatively much more common across subcorpora, and not necessarily in other fields such as, for instance, Health Sciences or Computing.

8. Conclusion

As discussed above, the findings of this study support the need for the inclusion of figurative language in ESP learning. Learners of specialised disciplines need to distinguish literal from figurative language as it may improve their conceptual comprehension. In light of its prevalence in specialised discourses, instructors should explain the definition of figurative language to students clearly and carefully. Ultimately, rather than focusing on perceiving non-literal uses as elements along a continuum, it must be considered that "figurative language" is generally nothing "but a convenient way of identifying and discussing a widely-recognised but fuzzily defined subset" of a number of cognitive processes (Ritchie, 2006: 11). These cognitive processes are best presented in L2 through metaphor and metonymy types, as the goal of language interaction is both content meaning and the way it is formed.

Claims that metaphor and metonymy elude rigorous definition and that these categories do not provide deep insight (Fauconnier, 2009) must be resisted; as evidenced in our corpus analysis, a substantial amount of text is figurative. Contrary to what Chen and Lai (2012) suggest, instructors must not adopt the idea of a metonymy-metaphor continuum; on the contrary, a cognitive overlap in the use of figurative meanings is a more apt conceptualization. Such model must be explicated to L2 students to reveal how language – however specialised – can act both figuratively and creatively. Much insight on meaning would come not only from their status as either metaphors, metonymy, or both, but also from looking at the detailed underlying cognitive operations involved in such mappings, and the way they are combined and blended. A taxonomy of these combinations is perhaps inexhaustible, but making these operations evident to L2 students, at least under metaphoric and metonymic types, may help to illuminate concepts as well as to create networks of meaning. Rather, they must introduce words or expressions with figurative meanings to students within a cognitive operation framework that encompasses the most relevant mappings for an expression, regardless their metaphoric or metonymic type. They must foster vocabulary learning through domain association, as this process of recognition of corresponding "traits between the subjects described and the subjects compared might help them understand expressions better and hence retain those learned longer" (Chen & Lai, 2012: 245). However, they must do so focusing on the particular cognitive operations at hand, and their potential expansions within the domain.

Some limitations to the present study must be acknowledged: the number of disciplines examined in this study is not comprehensive, nor is the amount of samples under analysis extremely large. The research would need to be replicated in other analogous fields of study before they could be generalised to other ESP disciplines. Future studies should then be carried out with a larger sample from a wider range of disciplines. Finally, the present study focuses strictly on a specialised corpus; further studies may also investigate ESP learners' awareness of figurative language use, as well as their ability to comprehend and interpret figurative expressions in context. This could lead to the ultimate aim of contributing to their effective teaching and learning in the ESP classroom.

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