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The Construction of Field in Science Popularization Stories

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ABSTRACT

Systemic Functional Linguistics proposes a model of language that views texts as context-situated social activities. Context is modeled into two levels: context of culture which accounts for variation according to genre, and context of situation which accounts for variations according to three dimensions: field, tenor and mode. The register variable field, understood as the way in which a particular domain of experience is construed and organized through ideational meanings, is explored in a corpus of science popularization stories. The aim is to understand how science as a social activity is represented in these texts and to gain insights on how this approach can be useful in English as a Foreign Language reading courses in university environments. The data collected From a corpus of 60 popularization articles from the science popularization website Science Daily, including 30 stories extracted from the subsection Fitness in the Health section and 30 from the Chemistry Section, we randomly selected 10 stories from each field. One component of the Rhetorical Structure (Presentation of the Popularized Research) is selected to identify entities, activities and qualities through an analysis of Transitivity. Taxonomies are constructed related to the following entities: researchers, institutions, research reports, and research. The results show how the fields of doing science and reporting science are construed in this component through the description of those entities and the activities they are involved in. Pedagogical implications are suggested in relation to the design of pedagogical materials in EFL university reading courses.

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I. INTRODUCTION

Many universities in Latin America include English as a Foreign Language (EFL) reading courses as part of their undergraduate programs. These courses are based on the need for Latin American students to have access to specialized literature published in English. In this context, there has been a growing interest in selecting content and designing reading tasks from a genre based perspective, including approaches to genre that stem from different traditions, particularly, from the English for Specific Purposes tradition (Bhatia, 1993; Swales, 1990, 2004), and Systemic Functional Linguistics (SFL) (Martin and Rose, 2008; Painter 2001; Figueiredo 2010). In science undergraduate programs, research articles have constituted the most favored genre to be included as part of the reading materials, although other science genres are also being considered, among these, science popularization texts (Muñoz, 2015).

Popularization genres present an advantage over research articles particularly when EFL reading courses are taken during the first years of study, when students have not yet developed enough disciplinary knowledge to approach research articles. A further advantage is that popularization deals with the latest scientific advances and does so in a way that is accessible to the non-specialist reader, as opposed to textbooks, which also deploy strategies to make the content accessible to novice readers, but mainly present well established knowledge in

the field.

This work is part of a larger research project which focuses in the development of teaching materials for these courses that integrate the contextual and language strata proposed in the approach to genres developed within Systemic Functional Linguistics (Martin, 1992; Martin and Rose, 2008): the context of culture that accounts for the social purpose and rhetorical organization of texts, on account of which genres can be identified, the context of situation that accounts for the register variables of field, tenor and mode and the lexicogrammar systems that account for the different types of meanings (metafunctions) construed by the language (ideational, experiential and textual) and that are activated by each of the register components (field, tenor and mode), respectively (see Figure 1 below).

Since at this stage we are particularly interested in developing strategies for students to re-construe the knowledge encoded in these texts, we will particularly focus on the register variable of field, understood as the way in which a particular domain of experience is construed and organized through ideational discourse semantics. The field components will be related to elements of the rhetorical organization of the genre and visualized as relationships between lexical items which realize the units of ideational grammar.

Field analysis of academic and scientific texts has been the focus of a number of studies in an attempt to explore how knowledge is construed. To cite a few we can mention studies of the discourse of history (Coffin 1996, 2006; Eggins, Wignell, & Martin, 1993), biology (Hao, 2010, 2015; Martin 1993a, 1993b; Humphrey & Hao, 2013), geography (Wignell, Martin, & Eggins, 1993), industry (Rose, 1997, 1998), and administration (Iedema, 1995). As regards popularization texts, although they have been the focus of interest of a number linguists, to our knowledge, no studies on field have been yet performed.

Our purpose here is then to present the results of an analysis of field in a corpus of Science Popularization Stories from two research areas: Chemistry and Health and to propose ways in which such analysis can be useful for the design of reading activities that relate field with the more abstract plane of genre and with the more concrete plane of lexicogrammar.

The notion of Field in the stratal model of language

As it is well known, SFL proposes a stratal model of language as a resource for creating meanings in context (Figure 1). The context in which a text unfolds can be modeled into two levels: the context of culture in which the restrictions deriving from ideology and genre are conceptualized, and the context of situation, which accounts for the relationship between the interactants (tenor), the social activity that is going on and the subject matter of the text (field) and the way in which the linguistic resources are deployed, covering the medium spoken, written and various subtypes such as written to be spoken) as well as the relationship between the field of activity, this is to say, to what extent the language constitutes, accompanies or reflects on the activity (mode) (Martin 1992; Eggins 1994).

At the language stratum, the semantic system is functionally diversified into the ideational, interpersonal and textual metafunctions, which correlate with field, tenor and mode respectively. These pairs are

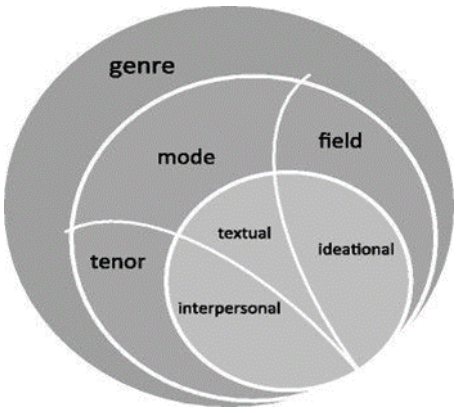

Fig 1. Stratal model of language in SFL

described as "mutually predictive" (Halliday & Matthiessen, 1999).

Briefly, the three metafunctions correspond to different kinds of functions performed by language, or, in other words, the types of meanings created by the resources of language. The ideational metafunction is broken down into two components: experiential and logical. The former creates representations of human experience and the latter accounts for the linguistic resources to relate fragments of experience in terms of cause, time, and the like. The interpersonal metafunction has to do with meanings created to interact with others and express judgements and attitudes. Finally, the textual metafunction refers to the resources that languages have developed to organize the discursive flow (Halliday & Matthiessen, 2014). Experiential meanings, which are critical for the purpose of this work, are realized by configurations of processes (actions, events, relations), participants involved in those processes and circumstances associated with those processes. In SFL, the lexicogrammatical system of Transitivity accounts for these relationships and distinguishes the following types of processes:

- Material (processes of doing and happening)
- Relational (processes of being and having)
- Mental (processes of perception, cognition, desideration and emotion)
- Verbal (processes of saying)
- Behavioral (processes of physiological and psychological behavior)
- Existential (processes of existence)

Each of these process types is associated with participants that play roles in the transitivity structure. For example, material processes are associated with participants such as Actor (the "doer") and Goal (the entity on which the doing impacts), among others. Table 1 shows the process types proposed in SFL and the participants that are directly involved in each configuration.

Table 1. Process types, their meaning and directly involved participants (Adapted from Halliday & Matthiessen, 2014). Examples are simplified versions from the corpus of this study, except for Behavioral processes.

Process Type	Participants directly involved	Example
Material (action, event)	Actor (Ac), Goal (G)	The researchers (A) tested a model (G)
Mental (perception, cognition, desideration, emotion)	Senser (S), Phenomenon (Ph)	It's important we (S) see more research on this field (Ph)
Relational (attribution, identification)	Carrier (Ca), Attribute (Att) Token (To), Value (Va)	Previous studies (Ca) are flawed (Att) Hypothermia (T) is the leading cause of death in pups (V)
Verbal	Sayer (S), Target (T)	Nearly all the girls (S) told the researchers (T) they wanted to know more about breast health
Behavioral	Behaver (Beh)	They (Beh) are sleeping.
Existential	Existent (Ex)	There was no significant change (Ex) in the score.

In *English Text*, Martin (1992) further elaborates on the language stratum and makes the distinction between clause-oriented and text -oriented resources for meaning, the latter being referred to as discourse semantics. Such approach, according to Martin, is useful as a means of exploring the relationship between text and context and for the development of an educational linguistics, this is, a linguistics that "deconstructs texts in such a way as to draw attention to the semiotic systems they instantiate, with a view to critically evaluating the ideologies they construe" (p. 2). The central discourse systems that constitute the discourse stratum proposed are Negotiation, Identification, Conjunction And Ideation, which correspond to the three metafunctions: interpersonal, textual, logical and experiential, respectively. In turn, the meanings that are at risk in each system are related to contextual variables. Particularly, the above mentioned discoursal semantic systems resonate with the

register variables of Tenor, Mode and Field, respectively (See Figure 2 below).

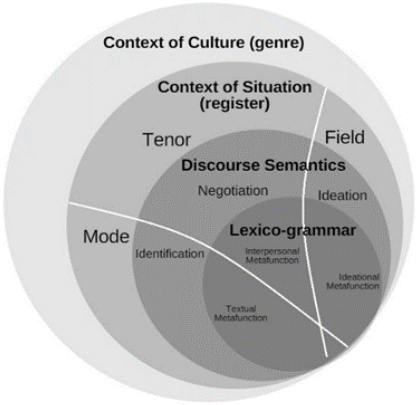

Figure 2: Stratal model of language as reformulated by Martin (1992). Figure adapted from Martin & Rose (2008)

II. METHOD

Corpus description

From a corpus of 60 popularization articles from the science popularization website Science Daily, including 30 stories extracted from the subsection Fitness in the Health section and 30 from the Chemistry Section, we randomly selected 10 stories from each field. A Rhetorical analysis of the articles was first performed to identify the generic stages, using a simplified version of Nwogu (1991), which has been reported in Figini & Rezzano (in press). Our proposal includes the following generic stages:

Background information

- by reference to established knowledge in the field
- by reference to the main research problem
- by explaining principles and concepts
- by reviewing related research
- *Results of the popularized research*

by presenting research results (partial or total)

- *Presentation of the popularized research*
- by reference to authors and researchers
- by reference to researchers' affiliations
- by reference to the research purpose of the original research
- *by reference to the original study*

Procedural or Methodological details

- *by describing materials*
- *by describing methods*

Conclusions and Implications

- *by stating research conclusions*
- *by indicating the significance of the main research outcome*
- *by indicating implications of the research*
- *by promoting further research*

According to our analysis of the complete corpus, components 2, 3 and 4 were present in all the stories, and could therefore be characterized as obligatory, while components 1 and 5 were optional. There is a marked tendency for the stories to start with the *Results* stage, usually followed by *Background* or *Presentation,* and close with *Conclusions and implications of the popularized research*. Most stages tend to realize in cycles, which is a feature of news stories in general. Each stage tends to include one or more clause complexes but some of them, particularly, *Presentation* tend to realize in smaller units, for example, as a circumstance of angle: "according to a study in the January 5 issue of JAMA" or a participant "Dalane W. Kitzman of the Wake Forest School of Medicine, Winston Salem, N.C". This feature, however, was much more marked in the Health than in the Chemistry corpus.

Component 3 was selected for performing field analysis. This component could be said to contain information that characterizes popularization texts, this is, focusing on the researcher(s) that made the scientific accomplishment.

Categories of analysis

The point of departure for exploring the construction of a field is lexis & Martin (1992) proposes that activity sequences, can be broken down into:

Taxonomic Relations: taxonomies of actions, people, places, things and qualities which include composition or classification relations. Composition relations organize people, places and things with respect to part/ relations, for example finger/hand. On the other hand, classification relations organize entities according to class/subclass relations such as such as *dog/mammalian* or *biology/natural science*

Nuclear Relations: configurations of actions with people, places, things and qualities and of people, places, and things with qualities, this is, the ways in which actions, people, places, things and qualities are configured as activities in activity sequences.

In this work, our point of departure for field analysis focuses on the nuclear relations and therefore we begin by exploring experiential grammar systems. Table 2 below shows the congruent relationship between lexicogrammatical units and the elements of experiential meanings (Halliday & Matthiessen, 1999).

Table 2: Congruent relationships between lexicogrammatical units and ideational meanings

Lexicogrammar	Ideational Grammar
Clause complex	sequence
Clause	figure (process + transitivity roles)
Verbal group	process
Nominal group	Participant
Prepositional phrase or Adverbial group	circumstance
Conjunction group	relator

A figure is a representation of experience in the form of a configuration consisting of the following clause elements: a process, participants taking part in this process, and associated circumstances. Processes (actions, events, relationships) are realized by verbal groups, participants by nominal groups and circumstances by prepositional phrases or adverbial groups. There is one further type of element in a figure, the relator, which serves to construe logico-semantic relations of expansion between figures in a sequence and is realized by conjunction groups. In turn, ideational meanings that construe the field of a text are analyzed as units such as activity sequences, activities, entities, qualities and places. There is not a one-to-one relationship between the units of ideational grammar and those of ideational discourse semantics and field. For example, an activity can be realized as a figure (e.g. They rejected the proposal) or as a participant involving a nominalization (Their rejection of the proposal was unexpected); a quality can be a participant in a figure involving a relational describing process (Their rejection of the proposal was unexpected) or as an Epithet in the nominal group realizing a participant (e.g. The unexpected rejection of the proposal caused a negative reaction).

It becomes necessary at this point to briefly describe the semantic structure of Nominal Groups (Halliday & Matthiessen, 2014). The semantic core of a nominal group is referred to in SFL as the Thing (realized as a noun). The Thing can be preceded by premodifiers including: Deictic (realized by a determiner), Numerative (realized by numerals), Epithet (realized by adjectives) and Classifier (realized by an adjective or a noun) and followed by a Qualifier (a prepositional phrase or a clause). We reproduce below the example provided in Halliday & Matthiessen (2014) to illustrate this:

Table 3: Semantic structure of the nominal group (Halliday & Matthiessen, 2015)

those	two	splendid	old	electric	trains	with pantographs
Deictic	Numerative	Epithet	Epithet	Classifier	Thing	Qualifier
Pre-modification					Head	Post-modification

In this work, we are going to explore field by focusing on the following units of ideational semantics (See Table 4 below):

Entities realized as Thing in Nominal Groups that play the role of Participant or Circumstances (in prepositional phrases) in figures

Entities realized in the pre-modification or post-modification structures of Nominal Groups (e.g.: "patients with a common type of failure")

Qualities realized as Epithets in Nominal Groups that realize Participants or as attributes in descriptive relational figures

Activities realized by Verbal Groups playing the role of process in figures. It must be noted that activities can be also realized abstract entities in nominal groups as a nominalization. We are going to include these in our analysis of entities following Martin & Rose (2008).

Table 4: Units of ideational semantics explored in this study

Unit of Ideational Meaning	Transitivity Role	Lexicogrammatical realization
Entities	Participants	Thing in Nominal Group realizing a Participant
	Participants	Pre / Post-modifying structure in NG realizing a Participant
	Circumstances	Nominal Group in Prepositional Phrase realizing a Circumstance
Qualities	Participants	Epithet in NG realizing a Participant
		Attribute in Relational Figure
Activities	Processes	

RESULTS AND DISCUSSION

The construction of Entities

Conscious entities: the researchers

In the *Presentation of the Popularized Research* component of both the Health and the Chemistry stories of our corpus, all conscious entities (people) relate to the scientist/s that took part in the research being popularized. The stories either give information about individual researchers or about research groups (*researchers, the research team, collaborators, colleagues, scientists*). These entities are frequently construed in extended nominal groups (NG) including pre- and post-modification, or in complex NGs. These NGs play one of the following Transitivity roles:

1- Actor or Sayer in material or verbal figures, respectively, as in:

Lead author Dr. Andrew Higginson from the College of Life and Environmental Sciences at the University of Exeter said…" (H1)

"Researchers at Goethe University Frankfurt and Technische Universitat Dresden have now made a pioneering discovery…" (Ch1)

2- In relational attributive figures such as:

"Wang is also a UC Berkeley associate professor of physics" (Ch2)

"Grzywacz is director of the UT-ORNL Joint Institute for Nuclear Physics and Applications (JINPA)" (Ch4)

3- Circumstance, as in:

"(….) according to Yang and co-first author Yuan Zhang, M.D, who is completing her Ph.D research at UF as part of the College of Medicine's joint training program with the Second Hospital of Shandong University in Jinan, China" (H5)

"The idea sprang from a conversation between Feng Wang, a faculty scientist in Berkely Lab's Material Sciences Division, whose research focuses (….) " (Ch2)

The information provided about the researchers includes one or more of the following:

Name of researcher(s)

Role in the research (as publication or as project): lead author, senior author, first author, co-author, assistant project scientist.

Affiliation: UT Southwestern Medical Center researchers, a STAR affiliated researcher, University of Manchester scientists,

Position or academic status at University: senior lecturer, associate professor, assistant professor, University of California Assistant professor, post-doctoral researcher, graduate student, PhD student, Dr.,

Position at research center: Director

Field of research or professional practice:

physics, chemistry, kinesiology, sociology // physiotherapist, evolutionary biologist, kinesiologist, physicist

Non-conscious entities

Non-conscious entities in the *Presentation of the Popularized Research* component are mainly abstract and construe:

a) The Research or part of the research: research, study, research work, approach, measurement, aim, goal, trials, method, findings

b) The Institutions with which the researchers are affiliated: institute, research foundation, research centre

c) The Original source of publication: journal, issue, paper

The research or part of the research was construed:

As Thing in NGs that realize a participant in material, verbal and relational figures:

The study, published on line (...) maintains … (H1)

The findings are being published (H8)

The research (…) is published in… (H3)

The trials investigated the impact of… (H6)

The research work was funded by… (Ch1)

A new approach developed by researchers at MIT (Ch3)

The research is outlined in a paper, "...." (Ch9)

In Relational figures of identification:

Our aim was to unpick the genetic conflict between the care a parent provides and the amount that offspring want. (H4)

The goal was to better understand the visual and auditory messaging and how it might affect users. (H8)

In circumstances:

(...), according to a study in the January 5 issue of JAMA (H2)

In the current study, published in Cell reports, the researchers investigated…. (H10)

As Qualifier of researchers:

…. a co-lead author of a study published Dec. 16 in Nature Communications (Ch2)

As regards the institutions where the research was conducted or where the researchers are affiliated, they are frequently construed as part of the NGs that have the researcher(s) or the research as Thing, either as classifier or as qualifier:

"Lead author Dr. Andrew Higginson from the College of Life and Environmental Sciences at the University of Exeter said…" (H1)

"A University of Exeter study…" (H3)

"University of Manchester scientists" (H4)

"University of Florida Health researchers" (H5)

"The research group, led by Professor Michael Lang of the Physics Institute at Goethe University Frankfurt…" (Ch1)

"Li-Jun Yang, M.D., a professor and lead investigator in the UF College of Medicine's Department of pathology, immunology and laboratory" (H5)

"A team of researchers from Missouri University of Science and Technology and National and Kapodistrian University of Athens in Greece" (Ch7)

Institutions are also construed as Circumstance in relational figures:

"Balch (…) is a physics PhD student at UC Berkeley" (Ch2)

"Dr. Hekstra is now an Assistant Professor at Harvard University" (Ch6)

"Balch is also affiliated with the Kavlil Energy Nanosciences Institute" (Ch2)

The original source of publication is predominantly construed in circumstances, for instance:

"Those findings were published this month in the journal BBA Molecular and Cell Biology of Lipids" (H5)

"The researchers have reported this in the latest issue of the Science Advances Journal" (Ch1)

It is also construed as Qualifier or apposition of NGs construing the research:

"The study, published on line in the journal

Proceedings of the National Academy of Sciences, ….” (H1)

“(….) said Jason Horng, a co-lead author of a study published Dec. 16 in Nature Communications that details the first demonstration….” (Ch2)

Table 5 below shows the distribution of the identified entities according to the role played in the transitivity structure:

Table 5: Distribution of entities according to role in the experiential grammar

	Researchers		Institution		Publication Source		Research	
	Health/Chemistry		Health/Chemistry		Health/Chemistry		Health/Chemistry	
Participants in Material Clauses	8 as Actor	12 as actor 1 as Goal					5 as goal 5 as actor	5 as goal 3 as actor
Participants in Verbal Clauses	14	11					1	1
Participants in Relational	2	12					2	2
Participants in Mental	1	2						
Circumstances	2	2	2	6	7	11	4	1
Pre-Modifier in NG construing Research(er)			4	7				
Post-Modifier in NG construing Research(er)			17	22	4	1		
Total	27	40	27	35	11	11	17	12
	67		58		22		29	

The above data resulting from the exploration of lexis and transitivity profiles of this component permit to suggest that this component construes four kinds of entities involved in science: scientists, institutions where research is done, research reports (as the original publication source) and the research itself (see Table 3). In addition to proper names, scientists are identified including a number of criteria: their role in the publication, their affiliation, their position at the institution where the research was conducted, and their area of field of research. Institutions (universities, research centers and research foundations) are identified by their name and location, and are construed as part of the researcher identification, either as pre- or post modifier (*a University of Manchester Scientist, a professor at MIT*) or as a circumstance of location *(the research was conducted at the University of….*). Details of the original publication reporting the research are also given, in particular the name of the journal and the issue. As regards the abstract entity we have called “the research”, related lexis stands either in synonymic relation (*study, research work*) or in part-whole relations (*aim, goal, method, approach, finding, discovery*). Figure 3 displays a provisional taxonomic organization of these entities.

Activities

Finally, our analysis of the processes in figures that involve the researcher(s) shows that the activities construed relate to two domains: doing research and reporting research:

Doing research: *study, discover, find, assign, make advances, compare, demonstrate, develop, identify, test, investigate, set out to learn,*

Reporting research: s*ay, report, write, explain, describe, outline, publish* with one activity pertaining to an additional sub-field of science: *fund*

As regard the research or part of the research, the following activities are identified, that pertain to the same domains as those identified for researchers, that is, doing research: *investigate, find, uncover, show, gather*; and reporting research: *maintain, publish, write*.

In each of these two domains, this is doing research and reporting research, the activities identified can be organized in taxonomies. For some of the activities, the two entities (research and researchers) are sometimes conflated, since both may be part of configurations involving the same activities, for example, *the*

researchers/the research investigated. In Figure 4 below, activities that only relate to the researchers as participants are in bold, activities that only relate to the research are in italics, and the remaining can involve any.

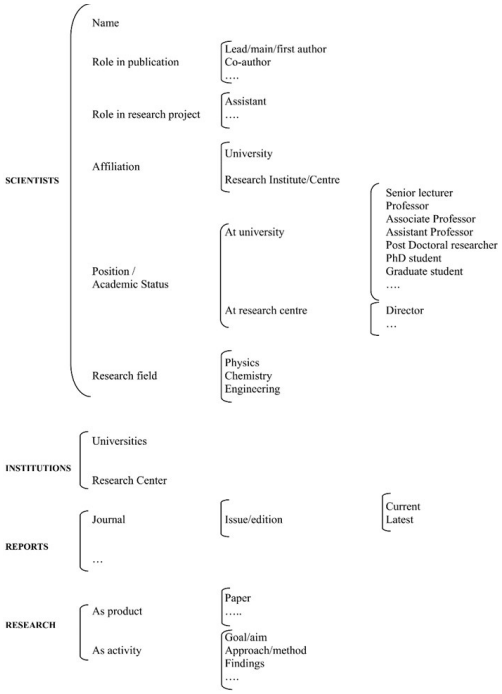

Figure 3: Entities involved in science as construed in the Presentation Component of Popularization stories.

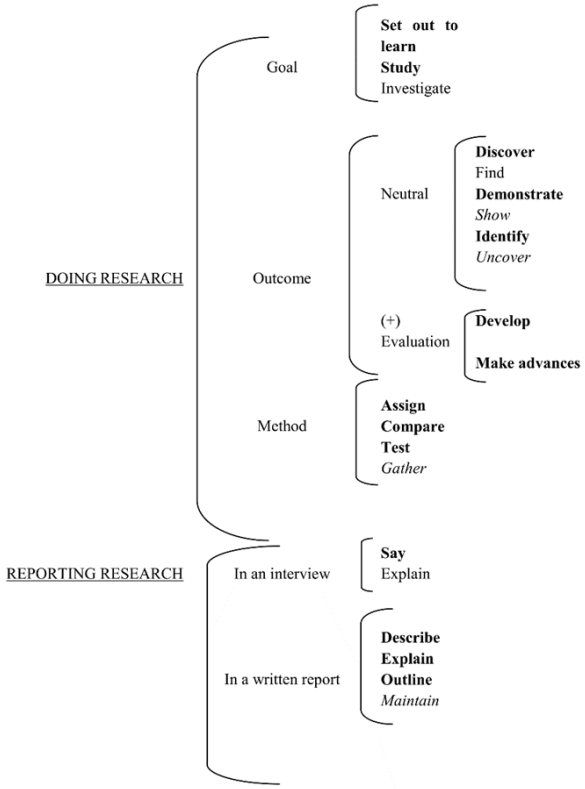

Figure 4: Provisional taxonomy of Activities as construed in the Presentation of Popularized Research component of Science Popularization Stories

It must be noted also, that many of the activities above identified do not strictly belong to the *Presentation of the Popularized Research* component. Rather, they may be said to constitute a kind of hinge between this component and, for example, Conclusions and Implications (underlined in the examples), for instance:

"*Lead author, Physiotherapist Bruno Saragiotto, from The George Institute, University of Sydney, Australia,* said, ´Targeting the strength and coordination of muscles that support the spine through motor control exercise offers an alternative approach to treating lower back pain. We can be confident that they are as effective as other types of exercise, so the choice of exercise should take into account factors such as patient or therapist preferences, cost and availability… ´". (H7)

"´This discovery will significantly benefit the search for an efficient water splitting catalyst,´ write *the researchers in the cover profile of the Nov. 17, 2016, issue of ChemSusChem".* (Ch7)

Finally, only a few qualities were observed in this component, mainly as Epithet in the NG (*new approach, critical advance, world-first*).

CONCLUSIONS

The analysis of ideational meanings in the *Presentation of the Popularized Research* rhetorical component of science popularization stories shows that the main entities construed are the *researchers* and the *institutions* the researchers are affiliated with. The entity researcher(s) is construed in great detail, including information about their complete names, academic status, degrees, field of research and so on. Additionally, they tend to play nuclear roles in the transitivity configurations, mainly as Actors or Sayers, with additional information construed within the pre or post-modifying elements of nominal groups. In all cases, information about the *institutions* they are affiliated with is provided, though these entities tend to be construed in more peripheral transitivity roles, namely, in Circumstances or within the structure of NGs realizing the research or the researchers. The entity research, though less frequent than the researchers, also plays nuclear roles in the transitivity configurations, and sometimes seems to be conflated with the researchers in the role of Sayer. The entities researcher(s) and research are mainly involved in activities related to reporting science and doing science. Although some differences were observed between the two disciplines (see Table 4), the corpus size does not allow to make generalizations in this respect. The taxonomies emerging from the lexis that realizes the entities and activities identified construe the fields of doing science and reporting science and permit to visualize various facets of the institution *science*, with great emphasis on the researchers.

The obtained results may be potentially productive as reading frameworks in reading comprehension courses in particular to work with t*he first order field o*f the analyzed texts. Taxonomies in our results may constitute a useful tool to teach vocabulary in a significant way by showing how science work from the very first steps of studying previous works and gathering information to finally publishing obtained results as novel findings in a way that is accessible to non-specialist readers. Just to mention an example, during text-deconstruction activities (Rose and Martin, 2012), a task could include the identification of the Entities *Researchers* and *Research* in relation to the lexis used in the text to represent them, and identification of Processes connected to the entities just mentioned in relation to the main activities they perform: doing and reporting research. Such an approach may be productive for teaching vocabulary since organized lexis should be easier to learn.

In this paper, we have shown how a study through language strata can be performed to gain an insight on how a social activity is built. In doing so, we may have moved a step forward towards the design of pedagogical materials favoring the development of strategies to help students understand how the circuit of science communication works. Working with the levels Genre, Register and Lexicogrammar can help students build systematic links between contextual and linguistic parameters, a goal which is facilitated by SFL's view of language. Further research in this line should be necessary so as to come up with results that are valid for popularization texts in general, with a larger corpus including texts from other disciplines as well as further analysis of the remaining rhetorical components.

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REFERENCES

Bhatia, V. (1993). *Analyzing genre: Language use in professional settings*. Essex: London

Coffin, C. (1996). *Exploring literacy in school history:* Metropolitan East Disadvantaged Schools Program, NSW Department of School Education.

Coffin, C. (2006). Historical discourse: the language of time, cause and evaluation. London: Continuum.

Eggins, S. (1994). *An Introduction to Systemic Functional Linguistics*. London: Pinter.

Eggins, S., Wignell, P., & Martin, J. R. (1993). The Discourse of History: Distancing the Recoverable Past. In M. Ghadessy (Ed.), *Registers in Written English: situational factors and linguistic features* (pp. 75-109). London: Pinter.

Figini, F. & Rezzano, S. (in press). The generic structure of science popularization stories: an exploratory analysis for pedagogical purposes in university reading courses. Proceedings of the 27th European Systemic Functional Linguistic Conference. Salamanca, 29 June-01 July, 2017.

Figueiredo, D. (2010) Context, register and genre: Implications for language education. *Revista Signos* 43, Número Especial Monográfico Nº 1, 119-141.

Halliday, M.A.K & Matthiessen, C.M.I.M. (1999). *Construing Experience through meaning. A language-based approach to cognition*. London: continuum.

Halliday, M.A.K & Matthiessen, C.M.I.M. (2014). Halliday´s Introduction to functional grammar (4th ed.). New York: Routledge.

Hao, J. (2010). *Exploring 'doing biology': A multifunctional investigation of undergraduate Honours' and related published research warrants*. University of Sydney. Unpublished MA Thesis.

Hao, J. (2015). *Construing biology: An Ideational Perspective*. University of Sydney. Unpublished Doctoral Thesis.

Humphrey, S., & Hao, J. (2013). Deconstructing written genres in Undergraduate Biology. *Linguistics and the Human Sciences*, 7(1-3), 29-53.

Iedema, R. (1995). *Literacy of Administration (Writing it Right Literacy in Industry Research Project - Stage 3). Sydney*: Metropolitan East Disadvantaged School Program.

Martin, J. R. (1992). *English Text: System and Structure*. Amsterdam: Benjamins.

Martin, J. R. (1993a). Life as a noun: Arresting the universe in science and humanities. In M. A. K. Halliday & J. R. Martin (Eds.), *Writing science: Literacy and discursive power* (pp. 242-293). London: The Falmer Press.

Martin, J. R. (1993b). Technicality and abstraction: Language for the creation of specialized texts. In M. A. K. Halliday & J. R. Martin (Eds.), *Writing science: Literacy and discursive power* (pp. 223-241). London: The Falmer Press.

Martin, J. R. & Rose, D. (2008). *Genre Relations. Mapping Culture*. London: Equinox.

Muñoz, V. L. (2015). The vocabulary of agriculture semi-popularization articles in English: A corpus-based study. *English for Specific Purposes, 39,* 26–44.

Nagano, R. (1996). *Materials for vocabulary in context: short popular science texts for EST*. Language Center, Nagaoka University of Technology. Available in http://lib.nagaokaut.ac.jp/kiyou/data/language/g10/G10_5.pdf.

Nwogu, K. N. (1991). *Structure of Science Popularizations:* A genre-analysis Approach to the Schema of Popularised Medical Texts. *English for Specific Purposes*, 10, 111-123.

Painter, C. (2001). Understanding genre and register: Implications for language teaching. In A. Burns & C. Coffin (Eds.), *Analysing English in a global context: A reader* (pp. 167-180). London: Routlege/Macquarie University/The Open University.

Rose, D. (1997). Science, technology and technical literacies Genre and institutions. Social processes in the workplace and school (pp. 40-72). London and New York: Continuum.

Rose, D. (1998). Science discourse and industrial hierarchy. In J. R. Martin & R. Veel (Eds.), *Reading science: Critical and functional perspectives on discourses of science* (pp. 236-265). London and New York: Routledge.

Rose, D & Martin, J, R. (2012). Learning to Write, Reading to Learn: Genre, Knowledge and Pedagogy in the Sydney School. Sheffield (UK) and Bristol (USA): Equinox Publishing Ltd.

Wignell, P., Martin, J. R., & Eggins, S. (1993). The discourse of geography: Ordering and explaining the experiential world. In M. A. K. Halliday & J. R. Martin (Eds.), *Writing science: Literacy and discursive power* (pp. 151-183). London: Falmer.

AFFENDIX

Texts Used For Analysis

Field Of Chemistry

1: Goethe-Universität Frankfurt am Main. (2016, December 16). Fundamental solid state phenomenon unraveled: Universal behavior detected in Mott metal-insulator transition. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/12/161216114307.htm

2: DOE/Lawrence Berkeley National Laboratory. (2016, December 16). New graphene-based system could help us see electrical signaling in heart and nerve cells: Team creates a system to visualize faint electric fields. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/12/161216115540.htm

3: Massachusetts Institute of Technology. (2016, December 16). Movable microplatform floats on a sea of droplets: New technique offers precise, durable control over tiny mirrors or stages. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/12/161216115545.htm

4: University of Tennessee. (2016, January 30). New elements recently added to periodic table. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/01/160130182456.htm

5: Goethe-Universität Frankfurt am Main. (2016, February 1). Unconventional superconductivity near absolute zero temperature. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/02/160201084823.htm

6: UT Southwestern Medical Center. (2016, December 15). Scientists invent new way to see proteins in motion. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/12/161215143313.htm

7: Missouri University of Science and Technology. (2016, December 19). New approach to water splitting could improve hydrogen production. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/12/161219100129.htm

8: The Agency for Science, Technology and Research (A*STAR). (2016, December 19). Into the light: Modeling the fluorescence enhancing capabilities of materials paves the way for more sensitive biological and chemical tracking technologies. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/12/161219100553.htm

9: University of California - Riverside. (2016, January 19). Watching electrons cool in 30 quadrillionths of a second: Technique developed by researchers could have applications in visual displays, solar cells and photodetectors. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/01/160119142259.htm

10: University of California - San Diego. (2016, January 18). Seeing where energy goes may bring scientists closer to realizing nuclear fusion. *ScienceDaily*. Retrieved from www.sciencedaily.com/releases/2016/01/160118084152.htm

Field of Health

1: Boston University Medical Center. (2016, January 4). Effects of obesity on death rates understated in prior research. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160104163215.htm

2: The JAMA Network Journals. (2016, January 5). Exercise, diet improves ability to exercise for patients with common type of heart failure. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160105132925.htm

3: University of Exeter. (2016, January 6). People face subconscious urges to over-eat in winter, research shows. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160106091840.htm

4: eLife. (2016, January 6). Generous mothers are nagged less: Study uncovers fitness cost to begging for care, so pups don't continue asking for more if they are already well provided for. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160106125042.htm

5: University of Florida. (2016, January 6). New details linking stress, fat metabolism revealed. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160106125046.htm

6: Wiley. (2016, January 6). Exercise to improve skill and coordination can help reduce lower back pain, new research shows. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160106220031.htm

7: Queensland University of Technology. (2016, January 7). Light exposure and kids' weight: Is there a link? World-first study revealing light exposure plays a role in the weight of preschool children. *ScienceDaily*. Retrieved February 25, 2016 from www.sciencedaily.com/releases/2016/01/160107104820.htm

8: Oregon State University. (2016, January 8). Exercise DVDs could be psychologically harmful

for users, new research shows. *ScienceDaily*.Retrieved February 25, 2016 from ww.sciencedaily.com/ releases/2016/01/160108083733.htm

9: American College of Cardiology. (2016, January 11). Exercise reduces heart disease risk in depressed patients Further evidence regular physical activity is beneficial. *ScienceDaily*. Retrieved February 25, 2016 from https://www.sciencedaily.com/ releases/2016/01/160111152808.htm

10: Gladstone Institutes. (2016, January 12). Brain receptor regulates fat burning in cells. *ScienceDaily*. Retrieved February 25, 2016 from https:// www.sciencedaily.com/ releases/2016/01/160112091418.htm