HIGHLY ADVANCED SCIENTIFIC TITLES IN THE FIELD OF READING PEDAGOGY

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Abstract

The immediate need of non-English speaking advanced university students, young fellows and young researchers to read literature in English urges the teaching of selective reading of a variety of academic and highly-advanced scientific texts within the framework of English as a foreign language, particularly English for Specific and Academic Purposes. The aim of this work is to analyze one possible operationalization of an expeditious reading strategy through the reading of highly advanced scientific titles of research papers in terms of cause-effect relationships, as this is as important and necessary as reading abstracts for fast tracking relevant data. Because of the scarce literature available on this topic, our analysis is prudently restricted to a small set of title samples. Still, the strength of our observations lie in that scientific titles demonstrate to be very useful authentic sample material in the field of reading pedagogy, this being an issue neither fully explored nor exploited to date.

Keywords: Titles, Scientific Discourse, Reading

Resumen

Frente a la necesidad de lectura de textos especializados en inglés que tienen los alumnos universitarios avanzados, becarios e investigadores jóvenes no hablantes de dicha lengua, la enseñanza de lectura selectiva de material académico y científico en el marco del Inglés con Fines Específicos y Académicos debe ser prioridad en dicho campo. El objetivo de este trabajo es reflexionar sobre una estrategia innovadora de lectura expeditiva de títulos científicos muy especializados en términos de relaciones causa-efecto para ayudar a identificar datos relevantes de un trabajo científico. Debido a los pocos estudios realizados hasta ahora sobre este tema, nuestras reflexiones se restringen a un reducido número de títulos y aspiran a servir de punto de partida para estudios posteriores. El principal valor de este trabajo radica en mostrar que los títulos científicos son material auténtico muy útil para el campo de la pedagogía de la lectura.

Keywords: Titles, Scientific Discourse, Reading

1. Introduction

Learning through reading is subject to extensive research on the ways in which readers acquire knowledge from written material. In scientific and academic settings, in particular, reading comprehension and learning science have mutual influence. On the other hand, in addition to making science, it is a general truth that scientists should devote long hours to reading (Huckin 1987; Bazerman 1988; Berkenkotter and Huckin 1995). This is an obvious observation which, irrespective of its obviousness, clearly reveals at present how the amount to be read is growing at an alarming rate under the pressure of the "publish or perish" imperative that prevails in scientific contexts. Furthermore, to be informed and up-dated at present –even in a narrow field– is difficult due, in part, to the quantity of material that is published. Scientists must be able to sort through large amounts of published research, understand it and evaluate its relevance and validity. Non-

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English speaking advanced university students, Ph. D. fellows and researchers are therefore confronted to the pressure of consuming knowledge that is communicated in English, the language of science. This was confirmed in a needs analysis conducted within scientific settings which showed that one of the most serious problems for non-English speaking advanced university students, Ph. D. fellows and researchers is the alarmingly high volume of reading in English that is expected from them (Weir 1983). Expeditious reading of academic and scientific literature therefore becomes a very useful tool to cope with this difficulty as selectivity in reading "is essential so that readers have sufficient time to read the truly important papers in detail" (Burden 2003:1).

Within the hectic world of science, titles demonstrate to be crucial for the communication of knowledge. They have gained increasing importance as the amount of published research has also increased at an alarming rate. Therefore, resorting to title scanning through the table of contents of journals operates as a suitable strategy to select titles on issues that are of interest to scientists who select their readings on the basis of the information contained in them. Statistics showed that readers of titles outnumber those of other sections of scientific papers (Hills 1997) and research on scientists´ reading habits also confirmed that they scan the table of contents looking for key words and noting names of authors (Berkenkotter and Huckin 1995). This, in turn, has led to raising awareness about appropriate and intelligent title writing as non-factual and unsubstantial titles may make potential readers discard the reading of either specific sections of papers or the paper as a whole. Therefore, sensitizing readers to the importance of titles secures the identification of whether or not the accomplishment of their two main goals is attained: to provide a compact summary of the content of a scientific paper and to invite readers to read it. They are also central to the organization and retrieval of scholarly information and in this sense, title-reading is a regular activity among trained readers (i.e. scientists) who search for titles in references, tables of contents of journals and edited books, catalogues, periodical indexes, bibliographies, reports, and proceedings.

The focus of attention of research on reading has been comprehension ability, particularly the reading product or the individual variables of the reading process (Bell 2008). Extensive reading has been also studied in detail (Hafiz and Tudoe 1989; Green 2005; Tanaka and Stapleton 2007; Day and Bamford 2002; Mason and Krashen 1997; Waring 1997) and the same observation applies to intensive reading (Morris 1972; Brown 2001; Nation 2004; Yang Dai and Gao 2012; Carrell and Carson 1997). The overriding attention paid to careful reading in theoretical literature indicates that expeditious reading, i.e. the processing of a text by readers quickly, selectively and efficiently to access needed text information, has been somehow ignored. In expeditious reading, the linearity of texts is not necessarily followed and readers try to sample texts to extract data necessary to answer specific questions (Urquhart and Weir 1998). This type of reading can be conducted at a global level (search reading and skimming) or at a local level (scanning). Thus, while in skimming, readers are expected to process texts to identify their essence trying to avoid details by means of a thorough selection of as few text details as possible (Weir 2005), in scanning, readers process texts selectively in an attempt to disregard parts that do not contain useful information for answering specific text questions (Weir and Khalifa 2008). Search reading, scanning and skimming are therefore selective-reading processes, this being the main attribute upon which the differences between expeditious and careful reading lie. They also reflect the real life reading habits in academic and scientific contexts as scientists find themselves having to read and learn from a whole text as well as integrate information from various texts particularly for the preparation of specific assignments. Therefore, taking into account the importance of scientific titles as

instruments that help scientists quickly consume knowledge, the purpose of the present exploratory work is to test one possible operationalization of an expeditious reading strategy through the reading of highly advanced scientific titles of research papers (RP) in terms of cause-effect relationships.

The reasons why titles were experimentally chosen in particular for the present work as sample texts to read lie in: i) the need to continue our studies on this particular section of scientific papers (Soler 2007, 2009, 2011a,b), and ii) our attempt to fuse the development of reading skills and highly advanced scientific title decodification in terms of cause-effect relationships through reading, a niche not fully explored to date except for isolated studies (Nahl-Jakobovits and Jakobovits 1987; Azabache Puente 1996). The present work has therefore been designed on an empirical and exploratory basis.

2. Reading titles

Experimental investigation, which is considered the standard of research, is designed in terms of cause-effect relationships which are reported by means of independent variables (IV) and dependent variables (DV), respectively. In line with this, a high percentage of titles of experimental research operate as mirrors of IVs and DVs. The former, also known as manipulated or controlled variables (Dodge 2003), are those that vary on their own, are not affected by other variables and are expected to have an effect on other variables or measurements (DV). In contrast, DVs, also known as response or responding or outcome variables (Dodge 2003), name what is measured in an experiment and what is affected while an experiment is carried out. An IV does not merely predict a DV but also shapes it so while a DV indicates an outcome or effect, an IV, which is manipulated by the researcher, is the cause of the outcome or effect. Although a high percentage of highly advanced scientific titles convey this information, untrained readers may not immediately identify it. Still, on the basis of carefully guided activities different reading skills can be developed as they involve natural language abilities. For example, if we analyze the following title:

> Role of glycogen synthase kinase-3 in neuronal apoptosis induced by trophic withdrawal, M. Hetman, J.E. Cavanaugh, D. Kimelman and Z. XIA (2000). *Journal of Neuroscience 20*(7):2567-2574 (RP in Biochemistry)

in terms of a cause-effect relationship it could be read as: "The role of IV in DV". Furthermore, if [the role of] were removed from this title, its meaning would still remain implicit. Thus, [the role of] can be considered optional and the title can be interpreted as the announcer of a study on the cause-effect relationship between glycogen synthase kinase-3 and a consequence in neuronal apoptosis induced by trophic withdrawal.

Decoding underlying cause-effect relationships in titles may sometimes be problematic as a result of the variety of stylistic ways of expressing such relationships. To simplify this, Nahl-Jakobovits and Jakobovits (1987) proposed a variety of possible frames for titles of experimental studies, some of which were confirmed (as shown in the examples listed below) from the title database we constructed for our previous studies on highly advanced scientific titles (for details on how this database was constructed please see Soler 2011a), namely:

1) The effect of IV on DV:

> The effects of generation on conceptual implicit memory, N.W. Mulligan (2002). *Journal of Memory and Language 47*(2):327-342 (RP in Linguistics)

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In this title, [generation] is the IV, i.e. the variable manipulated by the researcher by means of generation tasks, such as letter-transposition and word-fragment generation, and [conceptual implicit memory] is the DV. Thus, this title announces the relationship between [generation tasks] and [conceptual implicit memory] in terms of the effects these tasks have on [conceptual implicit memory].

Other examples from our database that fit this title frame are:

1.a) Effects of *atorvastatin* on fasting and postprandial lipoprotein subclasses in coronary heart disease patients versus control subjects, E.J. Schaefer, J.R. McNamara, T. Tayler, J.A. Daly, J.A. Gleason, L.J. Seman, A. Ferrari and J.J. Rubenstein (2002).*The American Journal of Cardiology 90*(7):689-696 (RP in Cardiology)

1.b) Relating print and speech: The effects of letter names and word position on reading and spelling performance, M. Bowman and R. Treiman (2002). *Journal of Experimental Child Psychology 82*(4):305-340 (RP in Psychology)

1.c) Effects of D2-dopamine and alpha-adrenoceptor antagonists in stress induced changes on immune responsiveness of mice, A. Fierová, M. Starec, M. Kuldová, H. Ková, M. Páv, L. Vanucci and M. Pospíil (2002). *Journal of Neuroimmunology 130*:55-65 (RP in Biochemistry)

1.d) Rater agreement on IQ and achievement tests: Effect on evaluations of learning disabilities, R.G. Van Noord and F.F. Prevatt (2002). *Journal of School Psychology 40*(2):167-176 (RP in Psychology)

2) The role of IV in DV:

The role of collaborative planning in children´s source-monitoring errors and learning. H.H. Ratner, M.A. Foley and N. Gimpert (2002). *Journal of Experimental Psychology 82*(1):44-73 (RP in Psychology)

In this particular case, the distinction between surface structure and deep structure (Chomsky 1965) is very useful to make readers see that "the role of IV in DV format" shows the way in which the content of the paper to which this title belongs is encoded in its external or surface structure. Chomsky´s distinction also helps to infer the underlying meaning at the deep structure which reveals that this title is nothing but an abbreviated sentence reading: "[Collaborative planning] (IV) has an effect on [children´s source-monitoring errors and learning] (DV)".

Other examples that fit this title frame are:

2.a) Role of heparan sulfate as a tissue-specific regulator of FGF-4 and FGF receptor recognition, B.L. Allen, M.S. Filla and A.C. Rapraeger (2001). *Journal of Cell Biology 155*:845-858 (RP in Biology)

2.b) Auditory thalamus, dorsal hipocampus, basolateral amygdala and perirhinal cortex role in the consolidation of conditioned freezing to context and to acoustic conditioned stimulus in the rat, B. Scchaetti, C.A. Lorenzini, E. Baldi, G. Tassoni and C. Bucherelli (1999). *The Journal of Neuroscience 19* (21):9570-9578 (RP in Biochemistry)

2.c) Role of tyrosine, DOPA and decarboxylase enzymes in the synthesis of monoamines in the brain of the locust, L. Nagy and L. Hiripi (2002). *Neurochemistry International 41*(2):9-16 (RP in Biochemistry)

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2.d) Proteolytic release of CD44 intracellular domain and its role in the CD44 signaling pathway, I. Okamoto, Y. Kawano, D. Murakami, T. Sasayama, N. Araki, T. Miki, A.J. Wong and H. Saya (2001). *Journal of Cell Biology* 155:755-762, 2001 (RP in Biology)

From Nahl-Jakobovits and Jakobovits´ (1987) list of other cause-effect title formats, the following ones were also confirmed from our title database:

3) IV1 and IV2 as determinants of DV or IV1 and IV2 in DV:

3.a) Risk and invention in human technological evolution. B. Fitzhugh (2002), *Journal of Anthropological Archaelogy 20*(2):125-167 (RP in Anthropology)

3.b) The influence of animacy on relative clause processing, W.M. Mak, W. Vonk and H. Schriefers (2002). *Journal of Memory and Language 47*(1):50-68 (RP in Linguistics)

3.c) Coronary flow reserve and myocardial diastolic dysfunction in arterial hypertension, M. Galderisi, S. Cicala, P. Caso, L. De Simone, A. D'Errico, A. Petrocelli and O. de Divitiis (2002). *The American Journal of Cardiology 90*(8):860-864 (RP in Medicine)

3.d) Pairwise difference analysis in modern human origins research, M. Collard and N. Franchino (2002). *Journal of Human Evolution 43*(3):23-352 (RP in Anthropology).

4) IV and DV:

4.a) The coastal skeleton of Shanidar 3 and a reappraisal of Neandertal thoracic morphology, R.G. Franciscus and S.E. Churchill (2002). *Journal of Human Evolution 42*(3):303-356 (RP in Anthropology)

4.b) Content and cognitive science, H. Clapin (2002). *Language and Communication 22*(3):231-242 (RP in Linguistics)

4.c) CTLA4 dimorphisms and the multiple sclerosis phenotype, T. Masterman, A. Ligers, Z. Zhang, D. Hellgren, H. Salter, M. Anvret and J. Hillert (2001). *Journal of Neuroimmunology 131*:208-212 (RP in Biochemistry)

A further difficulty apart from that deriving from the rich variety of stylistic ways of expressing cause-effect relationships in terms of IV and DV in titles, concerns appropriately inferring which elements in titles are indicators of DVs and which are indicators of IVs. This is particularly the case of titles of studies that either are not designed on an experimental study basis or that belong to studies that are characterized by their non-experimental nature. In the latter respect, it is the nature of the object of study what does not make an experimental study possible. Thus, which could be the reading frame for a title (extracted from our title database), such as *Pragmatics and word meaning*, A. Lascarides and A. Copestake (1998), *Journal of Linguistics 131*:147-159? (RP in Linguistics)?

IV and DV?, DV and IV? Or, why not IV and IV? In this particular case, restricting reading to expeditious title reading will be naturally misleading and therefore expeditious title reading complemented with abstract extensive reading becomes a useful reading strategy. By following this strategy it becomes clear that in the proposed title, the reading frame is IV and DV, i.e. [word meaning] is affected if [pragmatics] is taken into account.

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3. Proposed title reading activities

Because deciphering cause-effect relationships is the core of science, framing titles to fit these relationships appears to operate as a logical rationale and making title IV-DV formats explicit to untrained readers of highly advanced scientific papers secures the appropriate reconstruction of the scientific information contained in the whole article. Thus, in order to test the operationalization of expeditious title reading in terms of cause-effect relationships, activities within the scheme below could be proposed:

- Identification of keywords and other components in RP titles

- Identification of IV and DV which can be confirmed through abstract reading

- Identification of title surface structure and elucidation of title deep structure by paraphrasing

- Analysis of authentic titles to check which are designed on a IV-DV basis and which are not

- Title paraphrasing

Within the framework of this preliminary scheme, the following practical activities could be carried out:

1. Differentiation between cause-effect title constructions and other title constructions

1.a) Say whether the following titles are constructed under a cause-effect format or not. Give support to your answer.

1.a.1) Acute effects of caffeine on heart rate variability. H.P. Sondermeijer, A.G. J. van Marle, P. Kamen and H. Krum (2002). *The American Journal of Cardiology 90*(8):906-907.

1.a.2) Role of heparan sulfate as a tissue-specific regulator of FGF-4 and FGF receptor recognition. B.L. Allen, M.S. Filla and A.C. Rapraeger (2001). *Journal of Cell Biology 155*:845-858.

1.a.3) Amygdala neurons mediate acquisition but not maintenance of instrumental avoidance behavior in rabbits, A. Poremba and M. Gabriel (1999). *The Journal of Neuroscience 19*(21):9635-9641.

1.a.4) Stress, glucocorticoids, and damage to the nervous system: The current state of confusion, R.M. Sapolsky (1996). *STRESS 1*:1-19.

1.a.5) Energy metabolism, stress hormones and neural recovery from cerebral ischemia/hypoxia, A. Schurr (2002). *Neurochemistry International 41*(2):1-8.

1.a.6) Mast cells: new targets for multiple sclerosis therapy?, J.P. Zappulla, M. Arock, L.T. Mars and R.S. Liblau (2001). *Journal of Neuroimmunology 131*:5-20.

1.a.7) Effect of *Lactobacillus johnsonii* La1 and antioxidants on intestinal flora and bacterial translocation in rats with experimental cirrhosis, M. Chiva, G. Soriano, I. Rochat, C. Peralta, F. Rochat, T. Llovet, B. Mirelis, E.J. Schiffrin, C. Guarner and J. Balanzó (2002). *Journal of Hepatology 37*(4):456-462.

1.a.8) Neurotrophins: from enthusiastic expectations through sobering experiences to rational therapeutic approaches, H. Thoenen and M. Sendtner (2002). *Nature Neuroscience 5*:1046-1054.

1.a.9) Tenascin-C aptamers are generated using tumor cells and purified protein, B.J. Hicke, Ch. Marion, Y.-F. Chang, T. Gould, C.K. Lynott, D. Parma, P.G. Schmidt and S. Warren (2001). *Journal of Biological Chemistry 276*(52):48644-48654.

1.a.10) Molecular analysis of the interaction of LCMV with its cellular receptor –dystroglycan, S. Kunz, N. Sevilla, D.B. McGavern, K.P. Campbell and M.B.A. Oldstone (2001). *Journal of Cell Biology 155*:301-310.

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2. Title Constituency

2.a) *Identification of IV and DV*

2.a.1) In the titles that you have labeled as cause-effect titles, which is the IV and which is the DV?

2.a.2) Give support to your answers.

2.b) *Identification of title components*

2.b.1) Indicate the words and their corresponding grammatical category through which the relationship between DV and IV is accomplished.

2.b.2) What type of words are they?

2.b.3) Which are the most frequent content words in the cause-effect titles you have identified in 1.a)? Say why do you think this is so.

2.b.4) Are there any verbs in the cause-effect titles you have identified in 1.a)?

2.b.4.1) Which are they?

2.b.4.2) Which is the verb tense that prevails in the cause-effect titles you have identified in 1.a)?

2.b.4.3) Why do you think this is so?

2.b.5) Are key words present in those that are cause-effect titles?

2.b.6) Say in what way the key words you identified contribute to establishing a cause-effect relationship.

3. Title paraphrasing

3.1) Turn all the cause-effect titles you have identified in 1.a) into full sentence titles.

3.2) Turn all the cause-effect titles you have identified in 1.a) into compound titles.

3.3) Say whether semantic differences arise as a result of such conversions.

4. *Title and abstract reading*

4.1) Choose three of the cause-effect titles you have identified in 1.a) and read their corresponding abstracts.

4.2) Do these abstracts make the cause-effect relationship they present effective? Give support to your answer.

5. Title and full-paper reading

5. Through cause-effect titles in science, readers are promised to be informed on this relationship. Do the full papers chosen in 4.1) successfully accomplish this promise?

6. Title reading and genre

6.1) Are the conversions you propose in 3.1 and 3.2 crucial to the genre of the papers to which they belong? Give support to your answer.

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6.2) Decide whether the cause-effect titles you identified in 1.a) belong to a RP or to a review paper and discuss whether or not there is a relationship between the title construction and the genre of the titles selected.

The rationale for the order of the above-listed activities derives from an equilibrated distribution of increasing difficulties which are carefully graded from the title microstructure (activities 1-3) to the title macrostructure (activities 4-6). In parallel, grammar and syntax issues are not taught explicitly as points out of context but analyzed by the students themselves through *a priori* planned activities and under the guidance of the teacher. In the stage of title microstructure work, drilling exercises, specially drills around content and function words to report cause-effect relationships, are useful supplementary tools as they secure internalization of concepts and of grammatical resources to convey such concepts. On the other hand, in agreement with Urquhart and Weir (1998), our proposed activities show i) that the linearity of all the texts that form part of a paper is not followed, ii) that readers are guided to sample texts to extract data necessary to answer specific questions to help them see cause-effect relationships, iii) that reading, which can be done both at a local level and a global level, is in all instances a selective process, and iv) that this selective process –if carefully guided by the teacher– is crucial to plan reading activities whose purpose is to make students see cause-effect relationships in titles.

Results on students´response to the above-listed set of activities are preliminary and at present they are locally restricted to experimental teaching work at the Instituto de Investigaciones Bioquímicas de Bahía Blanca (INIBIBB), Argentina, whose young non-English speaking researchers, fellows and Ph. D. students must read highly advanced scientific literature written in English on a daily basis. The INIBIBB is a non-profit research body depending on the Universidad Nacional del Sur (UNS), our local university, and the National Scientific Research Council (CONICET). Research at the INIBIBB covers the disciplines of molecular neurobiology, lipid biochemistry, neurochemistry, biophysics of cell membranes and neurotransmitter receptors, and some aspects of biotechnology and molecular genetics. As linguistic expertise in English is a must especially within the academic community, its non-English speaking members have, in fact, serious problems varying from poor competence in English to difficulties in appropriately decoding and encoding academic rhetorics. The presence of a teacher and translator of English as a staff member at the INIBIBB is therefore a privileged condition with respect to other research centers in Argentina which do not have a specialist in this field. The INIBIBB is therefore not an ordinary teaching classroom context but a sui-generis environment within which experimental English teaching can be perfectly accomplished.

A major result derived from our proposed activities concerns students´ raising awareness not only of proper title reading in terms of cause-effect relationships but also of proper title writing. Interestingly, the proposed activities yielded very positive outcomes particularly on title writing thanks to previous work on cause-effect title reading. In parallel, title reading and title writing awareness among the young scientific community was not restricted to cause-effect title structures but was extended to other title structures that convey other meanings apart from those related to cause-effect relationships. The dual effect observed (i.e. on title reading and title writing), which is mediated by activities like the ones proposed, merits further research between test and control groups in the field of ESP.

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4. Conclusion

That reading science is a must to members of the research community irrespective of their lines of investigation has been a general truth for long and still is. The main obstacle nowadays falls on the pressure to read (i.e. consume knowledge) fast to be able to be up-dated and to respond to the "publish or perish" imperative that prevails in scientific settings. Therefore, clever expeditious title reading organization demonstrates to be a very useful tool to fastly cope with this imperative.

The limited scope of our present work restricted to a set of a low number of examples from our title database has been a prudent deliberate choice because of the scarce available literature on title cause-effect structures and their implications for appropriate title reading (Nahl-Jakobovits and Jakobovits 1987; Azabache Puente 1996). In spite of this limitation, our research note paves the way towards a planned academic and scientific reading pedagogy and could contribute to:

- considering titles as perfect authentic sample texts for reading activities as, in spite of their brevity compared to other sections of scientific papers, they can be exploited for a very rich variety of reading activities;
- showing that making cause-effect relationships in scientific titles explicit is a useful reading strategy to untrained non-English speaking readers;
- carrying out in a short time the compulsory reading demanded in scientific settings; and
- identifying discourse conventions that secure substantial titles, which, in turn, attract readers.

It can also be concluded that in order to address non-English speaking advanced university students´, Ph. D. fellows´ and researchers´ needs as readers of highly advanced scientific papers, a comprehensive reading pedagogy must be strategically planned to include titles.

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