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What Linguistic Conventions for Science Writing ?

Abstract

Research article writing is a critical issue for many non-English speaking scientists. If an article fails to meet the scientific community expectations, it is likely to get rejected. Recent research in applied linguistics and other fields has reported the existence of conventions that govern the research article genre. A considerable amount of studies has indicated that RA writing exhibits a conventional rhetorical patterning. Yet we do not know much about the linguistic conventions that govern the science article writing. The purpose of this paper is to shed light on some of these features, as revealed by the revision work which two papers -submitted for international publication- have undergone.

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ملخص

يعتبر العنصر اللغوي في ميدان الاتصالات العلمية محورا أساسيا. فبعد سيطرة اللغة الانجليزية على النشر العلمي العالمي أصبحت نسبة مشاركة الباحثين غير الناطقين بالانجليزية ضئيلة جدا.
ويرجع السبب أحيانا إلى عدم التحكم فيما يسمى بالقواعد المنهجية العلمية التي تتميز بهم كتابة المقال العلمي. ومن هذا المنطلق يناقش هذا البحث بعضا من المميزات النحوية واللغوية التي وجدنها في المشركات الجزائرية.

Overview

The language variable in scientific communication is a critical issue for many non-English speaking scientists, wishing to publish their research findings in Anglophone journals. English is, obviously, the publishing language of the scientific world, and English proficiency has become a recognized necessity for all scientists. In spite of this, research on how non English Speaking scientists produce their articles and what difficulties they encounter is not deemed great importance. For example, it has often been reported that research papers that have not been written in a conventional language and style, may get rejected even if the research is significant.

Three seminal works have revealed the existence of conventions that govern science writing. This line of research has shown that scientific discourse is grounded in the practice of scientific communities. Through the observation of scientists reading and writing, Bazerman (1988) has established the social construction of scientific texts. Swales (1990) has provided a discourse analysis model for the rhetorical patterning of the research article genre. And Myers (1990) has focused on the revision processes which the research papers of two biologists have undergone.

So far, research in written communication has documented us on some of the discursive and the non-discursive reasons that have prompted rejection (Sionis, (1995); Canagajarah (1996); but little is known about the linguistic norms that article writers are expected to meet. One way to do this is to investigate the revisions and study the proofs which successful papers have undergone. These revisions are likely to be revealing of both the conventions that govern written scientific discourse and the common pitfalls which must be avoided by non-English speaking writers. The present paper tries to discuss some of the linguistic and textual revisions which two submitted papers have undergone prior to their publication in international journals[1].

Previous studies on research paper revising (Ventola and Mauranen, 1991; Myers, 1990) have shown that textual revisions are mainly operated on the syntactic and lexical levels. In other words, the changes are concerned with both vocabulary and grammar. For some reason, a grammatical form or a lexical item might be more preferred than another. We hypothesize that these textual revisions are socially grounded. These might be determined by scientific considerations rather than by any linguistic ones. It is anticipated that the revision process of journal papers is a system which purges the language that is not consistent with the norms of scientific discourse.

The study

The purpose of the study was to examine the written products of two scientists who submitted their contributions to international journals. The papers won acceptance after extensive revision. A case study approach was used, including textual analysis. The published articles, the various drafts, and the editorial comments and revisions constituted our data. The study sought to answer the following questions:

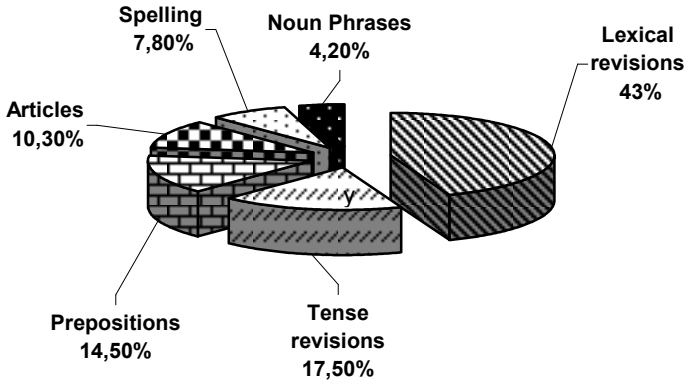
a. What type of linguistic items do specialist revisers operate on?

b. What significance do such revisions bear?

Analysis of the scientists' drafts and the revisers' annotated comments revealed that revisions covered a variety of lexico-grammatical categories. These cover a wide range, including prepositions, articles, spelling … But the most frequent are the lexical and tense choices. Together, these items account for more than 60 % of all total corrections (Figure: 1). These findings would seem to suggest that lexical and tense revisions are areas which are worth investigating.

[1] I would like to express my thanks to Dr. S. Mehanaoui and Dr. S. Zertal who provided data for this research paper.

Figure 1:Summary of suggested lexico-grammatical revisions



A. Lexical revisions

Godman and Payne (1981a) classify the lexis of science into two categories: *technical terms* and *non technical terms*. They define the technical ones as "those for which there is a congruity of concept between scientists, whatever the language used". Non technical ones, however, "consist of all other terms occurring in the language of science" (ibid).

The vocabulary of non-technical terms involves the terms of general language such as *subordinators, quantifiers, articles* etc. as well as the terms "that can be described as the basic list for usage in Science". Whereas general language terms remain unchanged in science writing; the terms of the "*basic list"* are widely used in all fields of science and have different and usually more restrictive meanings in scientific contexts than they have in general usage. In this study, we shall consider only this last type.

Lexical revision, therefore, is concerned with any substitution, or modification that any non technical term has undergone. However, the shades of meaning that the terms display are made clear, relying on the definitions and distinctions brought by the *Longman Dictionary of Scientific Usage* (1981b)

Consider the following pairs of examples, where (D) stands for the draft or the source text and (R) for the suggested editorial revision.

1. To **give** and to **administer**

   - a) (D)… lead was **given** to ewes

   b) (R)… lead was **administered** to ewes

   - a) (D) lead is reduced when **given** together with cadmium

   b) (R) lead is reduced when **administered** together with cadmium

   - a) (D) that is why we **gave** …orally for 21 days

   b) (R) that is why we **administered**…orally for 21 days

   - a) (D) when Pb and Cd **are given**

   b) (R) when Pb and Cd **are administered**

As can be observed, the verb **'to give'** in the four examples above, is replaced with '**to administer'**. Though the two terms could be used interchangeably in other situations, 'to administer' seems to collocate more appropriately with scientific terminology. In scientific usage, 'to administer' means to give a drug for a known purpose, making sure the quantity is correct, the time interval for giving the drug is correct and making sure that the drug is consumed. However, 'to give' does not carry such distinctiveness.

2. To **investigate** and to **look for**

   - a) (D)The aim of this work is to study …,to **look for** lead metabolism

   b) (R) The aim of this work was to study…, to **investigate** lead metabolism

Although the two verbs belong to the same cluster of terms; 'to **investigate'** is more precise than '**to look for'. '**To investigate' suggests a careful study by means of observations, experimental tests, and deduction from recorded facts, but to 'look for' is literally equated to 'to try to find' without any reference to the means being used.

3. To **derive** and to be **brought from**

   - a) (D) weekly intake **can be brought from** food

   b) (R) weekly intake **is derived** from

As in the previous example, '**to derive'** conveys a more scientific meaning than '**to bring from**'. While, 'to derive' implies to obtain A from B by a series of steps;' 'to bring from' does not suggest any experimental evidence.

4. To **produce** and **to induce**

   - **(D) a)…**and the possible variations of lead kinetics **produced by** Zn and Cd in order to mimic a very…

(R) b) …and the possible changes in of lead kinetics **induced by** Zn and Cd in order to model a very…

'**To produce'** implies achieving a possible change by a chemical reaction. The process is intentional, but '**to induce'** means obtain an effect in an object or organism in a manner where there is no apparent connection between the agent causing the effect and the object or organism in which the effect is observed. The focus is on the effect obtained.

5) To **expose** and to **treat** (S.11)

- a) (D) the ewes were divided in three **exposed** groups

  b) (R) the ewes were divided in three **treated** groups

'**To expose'** is to put an organism in adverse conditions generally; to leave without protection from conditions or circumstances. The focus is on the adverse effect of exposing. But '**to treat'** is to use any therapeutic substance or clinical method for a pathological condition, which seems to be the case in the study.

The corpus under study contains a great number of examples; we have selected those which, we believe; best illustrate the scientific statements and the contextual situation. As might be observed, the "verb" is the most prevailing category. This category is reported to be important because in many scientific contexts, only one verb is suitable; and the use of an inappropriate verb may result in the construction of an incorrect concept. Godman & Payne (op.cit. p.31.) called attention for such uses:

> When each one of a set of verbs in a lengthy scientific statement is misunderstood, or imperfectly misunderstood, the final elements in the realm of thought produce a vague final proposition. Incorrect or imperfect understanding of the function of the verb in a piece of text… is possibly one of the greatest obstacles to the comprehension of scientific statements

In the examples above, we have tried to show that the substitution of a lexical item by another (by the editorial revisers) indicates that a general language term is inappropriate, but not meaningless; the scientific context requires a more precise one. In other words, it indicates that although two terms may convey similar meanings in everyday language, only one is suitable in science. To the non-specialist, this does not make any difference; the words could be used interchangeably, but in science writing, a word conveys only the meaning for which it is intended.

B. Tense revisions

Textual studies of scientific discourse have established a certain relationship between grammatical forms and the rhetorical functions in science and technology writing. Lackstrom, Selinker and Trimble (1973) have related the rhetorical function of scientific claims to the use of articles as well as to the choice of tenses. The use of

either the present or the past tenses are made on the basis of the notion of "degree of generality" made by scientific statements. Oster (1981) has postulated the connection between the use of tenses and the reporting of past literature. More recent research (Day, 1995:105-6) has evidenced link between the scientific norms and the choice of tenses in a research paper. He explains:

> When a scientific paper has been validly published in a primary journal, it thereby becomes knowledge. Therefore, whenever you quote previously published work, ethics requires you to treat that work with respect. You do this by using the *present* tense…Your own work must be referred to in the *past* tense. Your work is not presumed to be established knowledge until it has been published.

In view of this convention of writing scientific papers, one would expect the revision of tenses to be determined accordingly. Rhetorical as well as scientific considerations would determine the revision of tense in the corpus under study. Moreover, it is reckoned that most revisions would occur in the introduction and discussion sections which necessarily require a shift from past to present tenses.

A thorough examination of the two papers shows a consistent pattern in the use of tenses. The article writers of both papers have moved back and forth between the past and present tenses. Whereas, the materials and methods and the results sections were written in the past tense (In these sections the authors reported on what they did and what they found); Much of the introduction and the discussion sections used the present tense because the authors reported on previous research. We note, however, their use of different tenses in the abstract. Whereas the ***toxicokinetics*** paper was fully written in the past, because it reported on present research; the ***Globin gene*** paper was mostly written in the present because the abstract restates some definitional concerns. Table 1 shows the tense revisions as they occurred in one of the papers.

Table 1: suggested revisions for tense choices (Globin Gene paper)

	Source text	Revised text
INTRODUCTION	When a β thalassemic gene **is** present …	When a β thalassemia gene **was** present
MATERIALS AND METHODS	Thirty two members of a family…**are** the subjects of…	Thirty two members of a family…**were** studied
	Age of the subjects **ranges** from 9 to 66 years	the subjects **were** aged between 9 and 66
RESULTS	RLFP analysis **shows…**	RLFP analysis **showed**
	C∅T mutation **is** linked …	C∅T mutation **was** linked
	Sequencing of the Gγ…**reveals** …and **cosegregates** with …	Sequencing of the Gγ…revealed …and **cosegregated** with …
DISCUSSION	Gγ globin chain **is** observed	Gγ globin chain **was** observed
	HbF levels **could be due**	HbF levels **result from**
	X*mn*I **had been** associated with	X*mn*I **was** associated with
	the HPFHs …**might produce**	the HPFHs …**may have produced**
	HbF levels **are** heterogeneous	HbF levels **were** heterogeneous
	a decrease of α globin chain **may** explain the decrease in HbFlevel as has been noted previously	a decrease of α globin chain **would result in** the decrease in HbF as **reported** previously
	Three sisters… **show** a large variation	Three sisters… **had** large differences

As shown in the examples above, the changes operated on the scientists' drafts are concerned with the verb form (present and past) rather than with its aspect (perfect or progressive). The verbs are revised from present to past in the materials & methods and results sections. In the Discussion section, however, revisions show a combination of forms. Depending on whether the author is referring to his own work or to others', the tense is chosen accordingly. In the introduction and abstract sections, not many modifications are introduced.

As anticipated, the revisions brought to the form of the verbs are essentially governed by the conventions of scientific writing. The choice of either the present or the past tense is determined by scientific ethics and rhetorical considerations.

Conclusion

The textual analysis in this study, has given support to our hypothesis. The linguistic revision process is meant to filter the language that is not consistent with the norms of scientific ethics and the attributes of scientific writing: precision and clarity. Lexical choices and tense usage in research writing are determined by scientific considerations rather than by any rules of general usage. Woolly and wordy language is replaced by clear and direct statements. General language terms give way to accurate and precise ones, and tense usage places the researcher's work in the scientific community scale, defying the general language grammatical rules that many English language teachers continue to value in their disciplinary classes.

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