

Grammar & Lexical of Scientific Writing

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Abstract: Many EFL learners wonders if English language has the same grammatical and lexical features in its various writings. Therefore, this paper will signal the grammatical and lexical features of scientific writing, and if these features differ from general English. We will try to identify and distinguish features of the scientific writing in order to understand its style and genre. This research will signals the most frequent structures that have been classified and explained by many researchers as a scientific style of writing, we will try analyse the set task in order to differentiate it from everyday writing. Finally, we will suggest some useful implications for teaching ESP.

Keywords: English language, scientific writing, scientific style, teaching ESP.

1. INTRODUCTION

Students who are new to study in a scientific field need to build and develop their knowledge of the grammatical and lexical features of their particular field. They need to write and read using the jargon of their subject, which might differ from everyday language. This paper, therefore, will discuss the grammatical and lexical features of scientific writing.

In the first section, we will focus on the grammatical and lexical features of scientific writing, considering first the grammatical and then the lexical features. Secondly, we will try to analyse the features of a scientific text deciding what kind of writing it is, and analysing its grammatical and lexical features. Finally, we will try to explain the pedagogical implications for teaching these grammatical and lexical features in ESP.

2. GRAMMAR & LEXICAL OF SCIENTIFIC WRITING

2.1 Literature review

Hutchinson and Waters (1980) claim that the most of the grammar and lexis of everyday language is used in science and technology; however, the only distinction between these types of writing is the usage of certain vocabulary and the higher frequency of some grammatical forms.

Halliday (1993, cited in Parkinson 2000), on the other hand, suggests that a text is considered as “scientific English” because of the shared effect of “clusters of features” as well as “the relations of these features throughout the text”. Lemek (1990 cited in Parkinson 2000) defines learning to “talk” science as “learning to communicate in the language of science and act as a member of the community of people who do as” which is done “by speaking it with those who have already mastered it and by employing it for the many purposes for which it is used”. While Wood (2001) characterises scientific English, not in terms of the usage of a particular type of lexis, but rather in terms of the fact that scientific writings have a particular type of rhetorical structure.

Parkinson (2000:4) believes that:

Students learn to produce scientific texts through being given the opportunity to produce prominent genres in science and through being given guidance both on individual features and on how to make their texts more closely approximate the target genre.

The following section discusses some of the grammatical and lexical features of scientific writing, which are quite different from those of general writing; this will enable us understand the different views about this issue.

2.2 Grammatical features of scientific writing

2.2.1 Voice

Does scientific or academic writing use the passive voice? Or is it just used more frequently than the active voice? Many scholars have argued about these questions; the earlier ones, as we can see, considered the idea that scientific writing uses the passive voice in its genre.

Herbert (1965, cited in Master 1991) wrote, "... you must remember that the majority of statements in technical writing are in the passive form, because the technical writer wants to be objective and impersonal." Quirk et al. (1972, cited in Master 1991) went further in explaining the passive by saying that:

The passive has been found to be as much as ten times more frequent in one text than in another. The major stylistic factor determining its frequency seems to be related to the distinction between informative and imaginative prose rather than to a difference of subject matter or of spoken and written English. The passive is generally more commonly used in formative than in imaginative writing, notably in the objective, nonpersonal style of scientific articles and news items.

Furthermore, Royds-Irmak (1975, cited in Master 1991) mentions that "In science, a sentence is often written in a passive form because the important idea is not who did something, but what was done." Hucken and Olsen (1983, cited in Master 1991) describe the passive as "chemical process, cause-and-effect relationships, and so forth."

However, researchers have recently considered a different view of the usage of the passive voice and active voice in scientific writings. Specifically, they claim that it is the active voice which is found to be common in scientific writing. Wingard (1981, cited in Master 1991) found that in his corpus of medical writing approximately 60 per cent of the verbs were in the active voice and 40 per cent in the passive. Thus, Dudley-Evans and St John (1998) explain that the choice of either active or passive is constrained by functional considerations; writers tend to use the active *we-form* when they describe their procedures, but they use the passive when 'standard' procedures are being described. An investigation into the usage of the passive and active voices in astrophysics journal papers, conducted Tarone, Dwyer, Susan and Icke (1981, cited in Swales 1988) shows that "the active voice is used more frequently than the passive" and they have made several generalisations that point out when writers use both the active and the passive voice:

1. Generalisation: Writers of astrophysics journal papers have a tendency to use the active *we-form* voice to show points in the logical development of the argument where they have made a distinctive procedural choice; the passive voice is used when the writers are following established or standard procedures.
2. Generalisation: When a comparison is being made between a writer's work and that of other researchers, writers use the active voice for their own work and the passive voice for the research that is being contrasted.
3. Generalisation: When the writers just cite other researchers' work, they use the active form of the verb.
4. Generalisation: When writers refer to their future work, they use the passive verb.
5. Generalisation: The usage of the passive or active voice in these papers is conditioned by the 'discoursal functions of focus' or by the length of certain sentence elements.

As we have seen above, both the active voice and the passive voice are used in scientific writings; however their usages differ from one to another. Nevertheless, in general English writing there are no constraining elements that prevent writers from using either the active or the passive voice. Also, in general writing, the active voice is more common, because it is easier to write and read.

2.2.2 Nominalisation

A grammatical feature of scientific writing that is more common in scientific writing than in general grammar was defined by Ravelli (1996, cited in Schleppegrell 2004:20), who points out:

"nominalization is usually associated with other, related linguistic features including... complex nominal group structure, with many pre and post modifiers, the use of embedded clauses, and lexical choices which are prestigious, technical and formal, rather than coming from a more everyday realm."

Furthermore, Schleppegrell (2004) points out that nominalisation is used in technical writing to explain extended technical procedures to be summarized, for example, "By *evaporation* and *precipitation of substances* like calcium carbonate, sedimentary rock can form" (adapted from Schleppegrell 2004:17).

The author uses the nominalisation "evaporation" and "precipitation of substances" to summarize the lengthy procedures for the evaporation of water. Thus, nominalization is used as a short cut, enabling the writer to avoid lengthy explanations that are already known to the readers, who are in the same field of expertise.

On the other hand, Dudley-Evans and St John (1998) explain that the use of nominalization enables complex information to be tied together into a phrase that is grammatically simple and that can be singled out in the theme of the following sentence. The following example is adopted from Dudley-Evans and St John (1998: 78):

“A high primary *productivity* is almost invariably related to a high crop yield. High *productivity* can be achieved by ensuring that all the light which falls on the field is intercepted by the leaves, and that photosynthesis itself is as efficient as possible. Great *efficiency* in photosynthesis could perhaps be achieved by selecting against photorespiration.”

As we can see from the example, the nominalised ‘productivity’ is the theme being singled out in the second sentence and clarifying the relation between the crop yield and the high production. Nominalisation is used in scientific writing more frequently than it is in general writing; it gives formality to scientific texts, and avoids the useless descriptions found in general writing.

2.2.3 Noun compound

This is a grammatical structure in which two or more nouns are linked together to imply a new term. This kind of structure is frequently used in scientific writing; and Master (2003) shows, they are common in ‘professional’ texts in technology, science, law, business, medicine and other areas of ESP. Furthermore, Ferguson (2006) explains why noun compounds are difficult for learners to understand and decode; Firstly, noun compounds work best in writing for specialists and it often takes specialist knowledge to understand the relationships between the nouns; therefore, it is suggested that learners should apply their specialised knowledge in their subject of study in order to interpret the noun compounds.

Also, a string of noun compounds is difficult to understand if the learner does not know the semantic relationships between the nouns. It is obvious that without the knowledge of the study field of the noun compounds it will be difficult to decode especially for the EFL learners in their first year majors. The following examples will show the usage of noun compounds in scientific writing:

- Neurosurgeons are developing a *map of the system of nerves in humans*.
- A *soil fumigant* made from *ethylene dibromide* has been recently tested.
- *The risk of lip and throat cancer* is higher for cigarette smokers.
- Researchers have located the site for *the binding of RNA*.

(adapted from Master 2003)

2.3 Lexical features of scientific writing

Scientific or technical vocabulary is related to a particular field of study and the lexis of certain subjects differ from one another. It is thus useful for learners of any subject to know its lexical features. Ward (1999, cited in Nation 2001) carried out research into engineering texts, which enabled him to create a corpus in that particular field. He found that the 2000 most frequent word families in the corpus achieved 95 per cent coverage of the texts, which was a tremendous result that would not be obtained from a combination of both a general service list and a general academic word list.

Furthermore, Nation (2001) explains the reason why it is important to distinguish technical vocabulary from a general one, is the need to identify words that will be useful for learners with ‘specific goals’ in language use, such as reading or writing reports in a specific field. However, there are degrees of ‘technicalness’; as Nation suggests, these degrees classify the technical terminology into four categories of which category 1 is the most technical vocabulary of the four categories and category 4 is the least technical. The categories are as follows:

Category 1: The vocabularies are restricted to the following fields.

Law: *jactitation, per curiam, closture*

Applied Linguistics: *morpheme, hapax legomena, lemma*

Electronics: *anode, impedance, galvanometer, dielectric*

Computing: *wysiwyg, rom, pixel*

Category 2: The vocabulary can be found in different fields, but with different meanings.

Law: *cite (to appear), caution (vb)*

Applied Linguistics: *sense, reference, type, token*

Electronics: *induced, flux, terminal, earth*

Category 3: The vocabulary is found in and outside this field, but the majority of its uses with a particular meaning are in this field.

Law: *accused, offer, reconstruction (of a crime)*

Applied Linguistics: *range, frequency*

Electronics: *coil, energy, positive, gate, resistance*

Computing: *memory, drag, window*

Category 4: the vocabulary is more common in this field, but there is little or even no specialisation of meaning, however a learner with knowledge of the field will know the meaning better.

Law: *judge, mortgage, trespass*

Applied Linguistics: *word, meaning*

Electronics: *drain, filament, load, plate*

Computing: *print, program, icon*

We conclude from these categories that vocabulary in technical writing differs from one field to another, and has different meanings among these fields. Therefore, technical vocabulary differs from everyday vocabulary in that it is particular to a certain field and has a special meaning that only a specialised learner in the same field would understand.

3. ANALYSING THE FEATURES OF THE TASK TEXT

The written text (see Appendix) is typical of scientific writing which can be singled by its grammatical and lexical features.

3.1 Grammatical Features

3.1.1 Voice

a) Active voice:

We can see from the text (see appendix) that this is a typical scientific writing, because the writer uses the active we- form to describe procedures that he/she have made. For example;

“We report a double blind” “We used a crossover study a.” (see appendix)

b) Passive voice:

Also the passive voice as we clarify in section two is a feature of scientific writing; therefore, the writer of the given text used the passive voice to describe standard procedures that is normal in scientific experimental operations. For example:

“Randomisation was carried out by the suppliers of the drug.” (see appendix)

3.1.2 Nominalisation

As many researchers stated above that ‘nominalisation’ is a significant feature of a scientific writing. Scientific writers use *nominalisation* for several reasons such as avoiding lengthy explanations. The following example from the given text (see appendix):

“What was given was *randomised*”

“*Randomisation* was carried out by the suppliers of the drug.”

The writer avoid explaining that the process of giving the treatment to the patients were carried out randomly; by using the ‘*nominalisation*’ structures.

3.1.3 Noun compounds

Another characteristic of the scientific writing is the noun compounds. We have signal some of the noun compounds that are significant in their meaning, which only a specialist in the medical field would interpret its meaning.

‘*Crossover trial*’, ‘*double blind*’, and ‘*crossover study*’ some of the noun compounds which were found in the text (see Appendix).

3.2 lexical features

3.2.1 Technical vocabulary

What distinguishes this text as a scientific writing is the usage of technical vocabulary that only used and found in the medical field. The following vocabulary will show the uniqueness of a scientific text’s vocabulary (see Appendix).

‘*Aniostensin*’- ‘*enalapril*’- ‘*blacebo*’-

These vocabulary will not be found out side the medical field; therefore, only a specialist in this field would understand its meaning.

3.2.1 Semi- Technical vocabulary

In scientific writing, there are Lexis that have a special meaning in its field, but also have another meaning in a different field of study or even in general vocabulary. This unique meaning is what makes the text (see Appendix) a scientific writing text.

‘*Converting*’- ‘*fluid*’- ‘*treatment*’- ‘*trial*’-

4. IMPLICATIONS FOR TEACHING IN ESP

It is a vital for both teachers and learners of ESP to recognise the grammatical and lexical features of scientific writing. We have suggested below several pedagogical implications that might be useful for teachers of ESP.

Teachers must be trained to deal with the grammatical and lexical features of scientific writing. They have to teach the students how to use, for example, the passive form, and when it is suitable to use the active voice. Also, teachers must at least comprehend the meaning of semi-technical vocabulary in order to clarify its ambiguous meaning for the students; however, it is not the duty and the responsibility of an ESP teacher to clarify technical vocabulary, because it is already known to the learners of that particular field. Teachers must use different activities and exercises to enhance the students’ knowledge of the lexical and grammatical features of their subjects. Teachers must train and encourage their students in independent learning, especially in terms of learning technical vocabulary, by providing them with useful techniques such as how to use a dictionary or words cards. Teachers must expose the students to various examples of scientific writing that will enhance their understanding of the genre that is being used in these texts, emphasising both the grammatical and lexical features of these texts. Teachers must be provided with the latest corpus in that field of study, which will be an essential resource for both the teacher and the learners of the vocabulary of a scientific field.

However, Dudley-Evans and St John (1998) suggest that students starting a new academic or professional course will need help with technical vocabulary that is new to them. The language teacher and the subject expert must prepare a glossary of new terms with uncomplicated explanations of the terms. Also, Ferguson (2006) points out a pedagogical solution for the usage of the passive in scientific writing:

- Explaining the discursal circumstances motivating the use of the passive voice
- Text study paying attention to active and passive verb forms
- ‘Replacement activities’ (altering/ rephrasing texts to monitor changing effects)
- Rewriting passive sentences in active form within a text

5. CONCLUSION

We have discussed some of the grammatical and lexical features of scientific writing, which will enable us to understand the differences between this kind of writing and the general writing. Also we have tried to analyse the given text in section three to distinguish its grammatical and lexical features. Therefore, practical pedagogical implications were suggested in section four that might be useful for both the teachers and the learners of ESP.

To conclude, approaching and examining these grammatical and lexical features of scientific writing can be both useful and helpful for two reasons:

- (a) Establishing a clear path for the ESP teacher and learner.
- (b) Developing the ESP courses to be more accurate and realistic.

Furthermore, using and developing new corpuses for each field of study would be an appropriate tool for understanding the grammatical and lexical features of scientific fields. However, new scientific vocabulary is being added to fields of study everyday; therefore, new research must be carried out in order to continue providing the students and our ESP courses with the accurate terminology they require.

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APPENDIX - A

The task text:

We report a double blind, placebo controlled, crossover trial of an angiotensin converting enzyme inhibitor, enalapril, in patients with chronic fluid overload receiving dialysis. [...] We used a crossover study and carried out procedure within the study according to the standards of the ethics committee of this hospital. Each patient was given either enalapril or a placebo in the first period of the treatment. What was given was randomised, with 13 patients receiving enalapril first and 12 the placebo first. Randomisation was carried out by the suppliers of the drug.