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Writing Scientific Articles in English: Algerian Science Students' Needs, Problems and Solutions

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Abstract:

Scientific articles are of a great importance in the academic life of science students. Therefore, writing such articles in English is a must-have skill for these students to acquire. However, it is not an easy task and serious problems appear when writing. This article tries to dig in the sources of these problems in an attempt to remedy them. To do so, a questionnaire addressed to students was employed to have an overview on these difficulties followed by an analysis of their articles to get an in-depth insight on them. Results of the questionnaire and the analysis revealed that the students' needs were mostly to master both the reading and the writing skills; their writing problems were mainly around sentence structure, tenses and vocabulary. A training course on the most required aspects and the basics needed for them can be a convenient solution to overcome these problems.

Keywords: the scientific article, scientific writing, grammar, lexis.

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INTRODUCTION

English is considered the lingua franca of the world in business, science and technology. It is the dominant language in scientific and technological communication (Sekhar Rao, 2014) due to its flexibility and economy. Scientific articles are the most significant channel of communicating the recent discoveries and achievements in science. For that reason, it is crucial for science students to learn how to correctly write scientific articles in English, even though science students in Algeria are not familiar with writing in English because they had almost all their studies in French. English was taught as an extra module only. Due to the fact that there is not a curriculum for such a module, teachers provided some general principles about grammar and terminology in the best cases. Hence, students did not consider it as important as French until they found themselves in need to use it in order to read and write in their field of study which led them to have difficulties when writing scientific articles.

This paper intends to identify the difficulties that Algerian -PhD- science students have when writing their articles in English in order to understand and state their needs and provide suitable solutions for them.

The main problems of science students are: (*i*) the impact of French on their writing because science students have studied in French since they started university; (*ii*) their unawareness of the existence of English for Science and Technology (EST) as a field that concerns the specific style of English in different domains of science which could have saved them time and efforts in learning English; and (*iii*) the way they had English at university as undergraduate or graduate students which did not meet their needs and requirements.

On this basis, the best solution suggested by the researcher is to reconsider the way English is taught for this kind of students and adapt the content to be presented which must meet the learners' needs taking time into consideration. Therefore, a training course which contains the highlighted aspects is seen to be a suitable solution for post-graduate students.

1. The Scientific Article

A scientific article is a written and published paper that describes the findings of an original research or an experiment (Tischler, 2004). This paper has gained -due to several factors- a standard layout which is known as the IMRaD format (Carpenter, 2001; Sollaci & Pereira, 2004; Jameel, 2012). This acronym represents the initials of the headings: Introduction, Methods and Materials, Results, and Discussion. To these can be added: Title, Abstract, Conclusion and References.

The majority of scientific journals prefer this standard format because of its significance for both writers and readers. Besides, scientists, following this format are expected to express their ideas and findings in a well-organised and clear structure. A good and worthy idea in science could be ruined if it were poorly demonstrated (Johnson, Mikos, Fisher, & Jansen, 2007). Readers will easily understand the flow of data and knowledge being presented in the article. They will also find the type of information they are looking for in the expected locations every time they read a scientific article (Gopen & Swan, 1990). For instance, if students want to understand how a research or an experiment was carried out, they will have to check the Methods section; and in order to relate the work to a larger context, Introduction -with the literature review it contains- will help, and so on. Another advantage of a standard format can also be -as Lester and Lester, Jr. (2015) stated- to "uniform the numerous articles written internationally by millions of scholars" which facilitates the readability of such papers and simplifies the search for information.

2. Language Features in Scientific Articles

In addition to the format, scientific articles have a specific use of the language since scientific English is different from General English. The scientific writing style is unique because it is free from decoration and beautification like literary writing. It tends to express scientific facts; therefore, readers will not be concerned with the

beauty of the language but with the information being presented (Goldbort, 2001). Besides, scientific English demands clarity, preciseness, objectivity and economy (Goldbort R. , 2006). These aspects enable the content of articles to be understood and to avoid ambiguity; science is already difficult.

Moreover, the scientific style has particular types of vocabulary. In addition to ordinary words with ordinary meanings (including grammatical words: the, and, therefore, etc.), there are two other types: technical words which are purely technical; and semi-technical words which are ordinary in nature but technical in use (Trimble, 1985). For example, in chemistry: "alkane" is a technical word; it means "compound that consists entirely of atoms of carbon and hydrogen bonded to one another by carbon-carbon and carbon-hydrogen single bonds" (Speight, 2016). The word "transport" is semi-technical because in a general context it means: "move goods or people from one place to another" (Oxford Dictionary, 2011), but if used in chemistry (active transport), it is defined as "movement of a solute from a region of low electrochemical potential on one side of the cell membrane to a region of higher electrochemical potential on the opposite side" (Grassl, 2012). Semi-technical words usually cause the biggest problem to the students.

Not only lexis, grammar in scientific writing is also remarkable. There might not be specific syntactic rules for science writing but some points are more frequent than others unlike in general texts (Hutchinson & Waters, 1987). For example, the passive voice is commonly used in describing the methods through which the experiment was done because the performer of the action -scientist- is obvious and/or not important. The experiment, if done by any other scientist, would give the same results. For example, "the temperature was measured using a Celsius scale" is preferable to "we measured the temperature using a Celsius scale". However, in other sections, the active is rather used because it helps avoid ambiguity and reduce the number of words: "*we found that* …" is better than: "*it has been found that* …" (Griffies, Perrie, & Hull, 2013).

3. Methods and Materials

3.1. Population and Sampling

The target population is science students who are concerned with writing scientific articles in English. This study was conducted with a sample group of post-graduate science students in the Department of Chemistry at the University of Constantine 1, more precisely 13 PhD chemistry students. These students had to write and publish scientific articles in English, taking into consideration that they had almost all their studies in French. This population was seen appropriate for the current study due to two main reasons. First, their need for English which was to a certain extent urgent and this created problems for them regarding their low level in English. Second, they are supposed to write more than one article by each which made them motivated to participate in the experiment in order to gain knowledge about scientific English and enhance their performance in writing articles.

3.2 Description of the Questionnaire

The questionnaire was designed to detect the students' weaknesses and difficulties concerning scientific English and scientific articles. The students were asked about the way they had English at university. The questions were mainly around the content presented and the time devoted to English in addition to whether the lessons they had back then were useful for their current needs. They were also asked about their weaknesses in English when they read and write in their field of study. Reading and writing are important skills in their studies. Reading in their study is of a paramount significance not only to gain knowledge about their field of interest, but also to develop a better understanding of the language and increase their vocabulary knowledge. In addition to that, the students were questioned about the scientific articles' format and components, and the problems they encountered when writing them.

3.3. The Analysis of Scientific Articles

The questionnaire provided an overview on the students' problems and difficulties. Analysing scientific articles written by the students would help to gain an in-depth vision on these difficulties and understand their origins so as to come up with convenient solutions and helpful guidance.

The articles which were analysed were neither corrected nor submitted -yet- to any journal. They were first versions (drafts). This analysis intended to spot the linguistic problems of students. It also planned to check whether the students take into consideration the characteristics of scientific writing in their papers.

The analysis was systematic in which students' errors and mistakes were spotted, categorised, explained and then classified according to their frequency. This led to recognise the problems and the sources precisely. Gaining information about the sources of the problems enables to solve them with the most appropriate remedy.

4. Results and Discussion

4.1. Results of the Questionnaire

The questionnaire results revealed that almost all the students were unaware of the use of English for Science and Technology. They were familiar only with the general use of English (that they have learnt in middle and secondary education). They have also said that they can overcome these problems by learning General English grammar rules and technical words in chemistry.

Students’ answers evenly showed that the origin of their difficulties was in the way they learned English at university in early stages (as undergraduate and Magister students). They were taught terminology only. Teachers of English in the Department of Chemistry at the University of Constantine 1 did not include the several characteristics of scientific writing style or the grammatical aspects that are regularly used in scientific contexts.

The questionnaire also showed that the students -believing that they have problems and their writings are not completely correct- have their own ways of correcting the language of their papers. Some of them said they tried to correct their writing through imitating their supervisors' articles or comparing their papers with already published ones. Others thought that the best way is to use dictionaries and grammar books. They also suggested to check the Internet for help.

4.2. Results of the Analysis

The analysis of articles showed that students have committed errors in sentence structure in many parts of their articles. The most occurring error was using long sentences as shown in Table 1.

The first reason behind most sentence structure problems is the fact that students had written long sentences, particularly long subjects. In chemical contexts, the subject can rarely be a single word; it usually contains numbers, chemical symbols and formulas. Thus, this fact led most of the times to ambiguity and misleading in the meaning of the whole sentence. The reader might be lost in looking for what the writer really means. Therefore, students have to learn to write simple sentences instead of compound or complex ones; the terms used are already complex. They also have to express only one idea in each sentence so as to convey the exact meaning and make their writing clear.

The second error, which is also frequent in students' articles, was the use of passive voice. Students do not know whether they had to use active or passive voice and in which cases each voice is preferred. Examples of students' inappropriate use of active and passive voice are shown in Table 2.

The reason behind the excessive use of passive sentences is the students' intention to "sound scientific". Indeed, the passive voice is used with the purpose of achieving objectivity. However, it should be used only when required and appropriate. For example, in *Methods and Materials* section, it is recommended to use the passive rather than the active voice.

Nevertheless, the students have occasionally used active sentences in an attempt to change the use of the passive voice. This act, if done appropriately, is correct and applicable. However, students still make mistakes with active sentences especially when they use personal pronouns (*I, we*). In this case, the reader may be confused about the exact meaning of the sentence and cannot easily know the actual performer or receiver of the action (such as the last example in Table 2). In addition to the above examples, students appeared to have a difficulty with the use of tenses. The only tenses they are familiar with and used repeatedly in their writings were: present simple, past simple and sometimes present perfect. Another problem with tenses is inconsistency; they did not know that they have to use one dominant tense in the same block or section, and if they have to use more than one tense, they have to be careful about mixing tenses and the purpose of using each one. Moreover, they were not aware of which tense to use in each section. Table 3 represents the students' use of tenses in different sections of their articles along with the most appropriate tense(s) in each section according to Cargill and O'connor (2009).

A third problem that the analysis detected was types of words. Students, as they were not aware of the existence of scientific English, did not know that words in scientific contexts have several types also. The only type they are familiar with is terminology or technical words, or as they are called: jargon. The type of words in scientific writing that really creates a problem to science students is semi-technical words. They are ordinary words but have specific functions when used in a scientific context. Examples are in Table 4.

It was noticed that when they used a semi-technical word, students explained it afterwards because -they argued- they used to check the dictionaries and find only the ordinary use; so they believed that readers would not understand the technical use of the word, and then the best way to avoid misinterpretation was to explain it. However, semi-technical terms are supposed to be used without explanation because they are already known to have ordinary meanings and technical explanations. Therefore, if the readers of scientific texts find difficulties with semi-technical words, they have

to check subject-specific dictionaries (e.g. A-Z Chemical Terms) instead of ordinary ones (e.g. Oxford Dictionary).

Additionally, these students, as noticed, have a problem with phrasal verbs. They used to add the same preposition "*to*" to most verbs when they feel that these verbs need to be completed. Table 5 contains the most occurring phrasal verbs that science students usually misuse. The reason behind these errors is that most of them do not know the concept of *phrasal verbs* even though phrasal verbs are commonly used in scientific texts. They think that the use of any preposition would not change the meaning; they argue that "to" is widely used in English.

Another problem, which occurred very often in the students' papers, is *punctuation*. In an attempt to avoid ambiguity caused by long subjects (as mentioned above), they mistakenly use a comma between the subject and the verb. This action may cause more ambiguity and misleading because readers would be confused where the subject and the main verb of the sentence are.

5. Suggested Solutions

In order to overcome the problems that non-native science students usually confront with when reading or writing scientific texts in their field of interest, it is suggested to provide them with a training on the most required aspects. This training can be part of their under-graduate or post-graduate studies. The content of such a training course can be both theoretical and practical with aim for learners to gain knowledge and understand how to apply it. The following list is a suggested content which is seen to meet the students' needs. Yet, this list is not exhaustive.

1. Scientific English and Characteristics of Scientific Writing:

- Make the students aware of the existence of the specific use of English in science referring to the role of English in science communication.

- Familiarise the students with the specific features of scientific writing showing that writing about science is a distinct type of writing.

- Explain the importance of clarity, objectivity, impersonality and economy in language in writing.

2. Rhetorical Devices:

- Provide an explanation of the rhetorical functions and techniques which help students understand the scientific texts they read.

- Offer a framework of writing including the important elements in science writing.

3. The Scientific Article and Language Aspects:

- Present important features about the scientific article: the nature of this particular type of academic papers and why science students have to write it; the layout of scientific articles (for example the IMRaD format) and its significance in science communication; and, components and necessary details of each.

- Explain the occurrence of some language features in one section and/or their absence in another. For instance, the nature of details being included in Methods and Materials requires the past simple tense to be expressed.

- Provide students who have low level with extra lessons that contain the basics of general English, revising the most frequent lexical and grammatical aspects such as the active and passive voices structures, uses and differences, phrasal verbs and tenses.

CONCLUSION

This study was carried out in order to identify and analyse the problems and difficulties faced by Algerian science students (chemistry PhD students at the University of Constantine 1 as a case study) when writing scientific articles in English. The findings from the questionnaire and the analysis of articles revealed that students' major problems were with some grammatical aspects (sentence structure and tenses) and vocabulary (choice of words and semi-technical terms). To overcome these problems, a training course is suggested which highlights the major points related to students' needs about scientific English.

This study helped in identifying the problems of science students which allowed to suggest a convenient way to remedy these problems. Science post-graduate students need to learn English with an emphasis on scientific English characteristics and most frequent syntactic and lexical aspects in scientific contexts. Therefore, the way English is taught in science departments should be reconsidered to fit students' needs.

To sum up, English lessons designed for such students must be improved. They are recommended to highlight: first, the importance and role of the English language in communicating science; second, EST and scientific English features in addition to learners' needs; and third, the writing skill and all related aspects.

- **Tables**

Table N° 1
Students' Errors in Sentence Structure

Students' Sentence	Correct Sentence	Type of Error	Correction
-Recently, the investigations concerning molecular compounds featuring direct m–m bonds has gained a prominent position in organometallic chemistry and Transition-M Clusters mainly because of their importance in covalent interaction, including metal string molecules, bond valence and m-based infinite chains and networks.	-Recently, the investigations concerning molecular compounds *that feature* direct m–m bonds have gained a prominent position in organometallic chemistry and Transition-M Clusters. *This is* mainly because of their importance in covalent interaction, including metal string molecules, bond valence and m-based infinite chains and networks.	Long sentence	Divide the sentence
-We also have to take into consideration the fact that the supplies might change later. (15 words)	-We must consider future supplies' changes. (*6 words*)	Excessively wordy	Most of the words are not necessary

Table N° 2
Students' Errors with Passive Voice

Students' Sentence	Correct Sentence	Type of Error	Correction
-It is realised that the results of the bonding can be obtained by combining the two systems.	-*We realised* that the results of the bonding can be obtained by combining the two systems.	Ambiguity caused by passive voice	active is better: the performer is known
-I added hydrochloric acid (5 molL-1, 25 mL) to a warmed mixture of tin (12.5 g) and nitrobenzene (6.5 g) for 30 min.	Hydrochloric acid (5 molL-1, 25 mL) *was added* to a warmed mixture of tin (12.5 g) and nitrobenzene (6.5 g) for 30 min.	Active voice	Passive is used when necessary: the performer of the action is not important.
-Being covered with oil, I cleaned the bottle before adding the chemical solution.	-Because the bottle was covered with oil, it was cleaned before adding the chemical solution.	Ambiguous caused by active voice and personal pronoun.(was I covered)	Passive in this case is better; the sentence is clear. (The bottle was covered with oil.)

Table N° 3
Students' Choice and Correct Forms of Tenses in Scientific Articles

Section	Students' Choice	Appropriate Tense
Introduction	Present simple	Present perfect
Methods and Materials	Present simple + present perfect	Past simple
Results	Present simple	Past simple
Discussion	Present simple + past simple + present perfect + present continuous	Present perfect

Table N° 4
Semi-technical Words as Used by Students

Semi-technical Words	Students' Use	Chemical Context	Ordinary Meaning/Use
Basic	Basic with a pH > 7…	a solution having a pH > 7.	Forming the part of something that is most necessary and from which other things develop.
Bond	Bond (chemical bond)…	a chemical link formed between atoms in molecules and molecules and ions in crystals.	Something that forms a connection between people or groups.
Charge	Charge (chemical charge) …	a conserved property of subatomic particles determining their electromagnetic interaction.	The amount of money that somebody asks for goods and services.

Table N° 5
Students' Errors in Using Phrasal Verbs

Phrasal Verb	Intended Meaning	Students' Error
Aimed at	To plan, hope, or intend to achieve something.	Aimed to
Expand on	To give more details about something you have said or written.	Expand to
Result in	To cause something to happen.	Result to

References:

Cargill, M., & O'connor, P. (2009). *Writing Scientific Research Articles: Strategy and Steps.* Blackwell Publishing.

Carpenter, K. (2001). How to Write a Scientific Article. *The Journal of Paleontological Sciences*, pp. 1-9.

Goldbort, R. (2006, November). *Writing for Science.* Yale University Press.

Goldbort, R. C. (2001, March). Scientific Writing as an Art and as a Science. *Journal of Environmental Health.*, pp. 22-5.

Gopen, G., & Swan, J. (1990). The Science of Scientific Writing . *American Scientist, journal of Sigma Xi*.

Grassl, S. (2012). Mechanisms of Carrier-Mediated Transport: Facilitated Diffusion, Cotransport and Countertransport. In N. Sperelakis, *Cell Physiology Source Book* (pp. 153-165). Academic Press.

Griffies, S., Perrie, W., & Hull, G. (2013). *Elements of Style for Writing scientific Journal Articles.* Elsevier, Oxford UK.

Hutchinson, T., & Waters, A. (1987). *English for Specific Purposes.* Cambridge University Press.

Jameel, A. (2012, March). Stylistic Features of Scientific English: A Study of Scientific Research Articles. *English Language and Literature Studies* , pp. 47-55.

Johnson, P., Mikos, A., Fisher, J., & Jansen, J. (2007, December). Strategic Directions in Tissue Engineering. *Tissue Engineering*, pp. 2827-37.

Lester, J., & Lester, Jr., J. (2015). *Writing Research Papers: A Complete Guide.* Pearson Education Limited.

Oxford Dictionary. (2011). *Oxford Learner's Pocket Dictionary* . Oxford University Press.

Sekhar Rao, V. (2014, June). English For Science And Technology: A Learner Centred Approach. *English for Specific Purposes World*.

Sollaci, L., & Pereira, M. (2004, July). The introduction, methods, results, and discussion (IMRAD) structure: a fifty-year survey. *Journal of Medical Library Association*, pp. 364–371.

Speight, J. (2016). Organic Chemistry. In J. G. Speight, *Environmental Organic Chemistry for Engineers* (pp. 43-86).

Tischler, M. (2004). *Scientific Writing Booklet.* University of Arizona Press.

Trimble, L. (1985). *English for Science and Technology: A Discourse Approach.* Cambridge University Press.