Monika Śleszyńska

Białystok University of Technology, Poland

e-mail: m.sleszynska@pb.edu.pl

ORCID: 0000-0002-4827-433X

HOW TO WRITE (SCIENCE) BETTER. SIMPLIFIED ENGLISH PRINCIPLES IN A SKILL-ORIENTED ESP COURSE

Abstract. Teaching writing to doctoral students or academics at a technical university is a challenging task. Because they need to publish their research findings in English to pursue academic careers, they are usually highly motivated and expect a lot of the class. Their language competences, however, very often lack enough proficiency and may contribute to manuscript rejection. The paper focuses on language issues based on the rules of controlled natural languages (CNLs) and guidelines of Plain English. It shows how employing these issues improves grammatical quality and readability of science-oriented written texts. The paper describes four principles: removing nominalisation and using the so-called strong verbs to make the message simpler and more direct; combining nouns in strings to express complex ideas economically; applying grammatical consistency for coordinate elements in sentences to make them less chaotic; and reducing wordiness to obtain a more precise and comprehensible piece of writing. Sample phrases and sentences from authentic student writing as well as their improved versions are provided to each of the guidelines so that a reader has a deeper insight into how the principles work in a specialist context. Because problems with, for example, research papers, grant proposals or reports are common to various disciplines and at various levels, the Author of the paper draws conclusions that these principles should be implemented not only in a technical but also legal, medical and business writing course offered by English teachers to both young researchers and experienced scientists.

Keywords: English for Specific Purposes (ESP), English-based natural controlled languages (CNLs), Plain English, simplified English, simple English, science writing.

1. Introduction

Both doctoral students and academics need to report their findings at international conferences and publish them in post conference or peer-reviewed journals, for it helps build their reputation and benefit scientific careers. Because English is a global language of science and technology in

the 21st century, teaching how to write effectively in the scientific/technical fields should be an essential component of an English course in tertiary education.

According to Alley (1996: 83), language in the sciences suffers a lot if it is needlessly complex. The Author strongly believes it makes sense to write about complex ideas without using complex grammar and vocabulary. Although jargon or ‘sciencespeak’ enable professionals in specialized fields to communicate succinctly, linguistic modes of expression should be chosen carefully. Simpler English may facilitate comprehension of a scientific text by anybody interested in the subject matter. Both general public and researchers who read English as a second/foreign language can take advantage of specialist publications if plain words and sentence structures are employed.

The idea of writing in a concise, unambiguous and more readable way has been present in science writing guides and style manuals for many years. In numerous publications linguists and practitioners (researchers and educators) have been campaigning for avoiding a pompous language and using words economically. The question arises, however, whether guides to effective scientific/technical communication are used regularly in an English class or whether they are overshadowed by general academic English course books. The Author has observed that simpler English, imposed by English-based controlled natural languages (CNLs), e.g. ASD-100 Simplified Technical English or recommended by Plain English, is not discussed in an English classroom. Even if it may be no news to numerous teachers of writing (especially native ones), an average non-native English teacher is unaware of its merits. As a result, his/her students do not know, for example, how grammatical consistency contributes to the text’s clarity, and they see no difference between using nominal phrases and strong verbs. They have never been instructed how to reduce verbosity in their written production or combine nouns to form understandable strings. Their manuscripts may be rejected due to ‘poor English’ and they are often unaware that the problem may lie in ignoring these language aspects also.

2. Meeting a need

The aim of the science writing course designed and run by the Author, a Polish teacher of English at technical university, was not to expand a range of technical vocabulary, for the attendees (research students and scientists of various engineering disciplines at the Białystok University of Technology)

were frequently well acquainted with the terminology of their subject matter. They were often not, however, prepared to express their research results concisely and unambiguously. A justifiable reason is: sophisticated words and a complex internal structure of sentences, not economy and clarity of expression, are often recommended and greatly valued, especially at higher levels of language learning. When either a written text or an oral presentation is analysed, general mistakes in grammar and pronunciation are usually discussed, but little attention is paid to unnecessary lexical and syntactic density that arises in words, phrases or clauses. However, as Yang (2006: v) puts it, researchers who wish to reach a wide readership must publish in English and write lucidly in a well-organized manner. Unquestionably, composing a well-written and readable text maximises the chances of publication, which is the primary aim of many scholars. That is why all scientists, beginners to seniors, should be provided with language training that – instead of focusing on academic English and specialized terminology – raises their language awareness and consequently, through extensive practice, upgrades their writing skills. Even if knowing the language does not necessarily coincide with an interest or need to know about it, the Author's experience confirms that adult (and well-educated) learners often wish to know more about the structure of English. They believe this knowledge (and adequate training) can positively affect their ability to control linguistic issues in writing. Consequently, it may also help them develop independently into more effective writers.

The Author became interested in CNLs and Plain English when she started teaching doctoral students regularly. Because the intake in the doctoral program was non-selective, both advanced students and beginners, as well as those in the middle, often found themselves in the same class. Therefore, catering for their learning needs became a challenge. The students' expectations (of the teacher and the classes) were very high, for they realized good writing helped progress their scholarly careers. Despite diverse language competences, they all wished to write well enough to avoid rejection in peer-reviewed scientific journals. Undoubtedly, grammar and style checking programs, machine translation or paid translation services can diminish this risk. Nevertheless, being a part of the global scientific community and not being able to contribute to it in a self-standing way is often considered a serious drawback in pursuing science as a career.

Since the students specialised in diverse fields and their language competences varied, introducing them to simpler English was a practical option. In the entrance survey they admitted that what they needed most was pro-

duction skills, especially writing. The Author prepared training materials with a variety of tasks that aimed at: introducing the students to the notion of plain language; discussing simplified Englishes and their principles; incorporating Plain English principles into written assignments (e.g. changing authentic phrases, sentences and text fragments into simpler forms); and finally, analysing errors and correcting samples of students' own writing (e.g. abstracts, extracts from research manuscripts, presentation slides). The students practised the gained knowledge and skills by completing other written assignments (e.g. consumer recall notices, operating manuals and informative abstracts).

The linguistic content of the course did not need to be arranged according to any specific gradation guidelines because the students' command of English, based on pre-university language learning experience, was good enough to discuss and practise the intended subject matter. The end-of-course feedback (questionnaires and interviews) confirmed the validity and effectiveness of the course, and encouraged the Author to conduct writing classes for academics too.

3. Components of the writing course

The syllabus of the writing course designed by the Author for the doctoral students and academia at the Białystok University of Technology encompasses principles based on CNL rules and Plain English guidelines. Because applying all the rules indiscriminately may be disputable and unnecessarily rigorous, as the vocabulary is limited in controlled Englishes, the Author selected the principles that brought observable benefits to her students' writing. They are classified according to categories proposed by O'Brien (2003: 106). The principles selected for this paper address the following lexical (a), syntactic (b, c) and textual (d) issues:

- a) removing nominalisation and using the so-called strong verbs instead in order to make a message clearer and more direct;
- b) combining (no more than three) nouns in strings in order to express complex information economically;
- c) applying grammatical consistency in order to combine ideas in a less chaotic way; and
- d) reducing wordiness in order to obtain more precise and comprehensible writing (Gowers 1973; Charrow and Erhardt 1986: 95–136; Alley 1996: 268–269; O'Brien 2003: 106–108, 113–114; Cutts 2013: xxxi–xxxii; Greene 2013: 12–43, 60–66; Crabbe 2017: 69–87).

These guidelines help organize vocabulary, sentence structure and organisation of the written text no matter if it is legal, commercial, official or scientific/technical. The Author's course materials are science-oriented to match the interests of the participants but the principles are not limited to English for Science and Technology. In fact, they are general writing rules which can be successfully implemented in any ESP syllabus.

Sections 3.1.–3.4. describe each principle in detail and provide examples of its application. The examples are original (if not stated otherwise) phrases and sentences collected from the Author's students' abstracts, journal articles and presentation slides. Their improved versions and translations from Polish into English are made by the Author.

3.1. Using strong verbs

The so-called strong verbs can stand on their own and do not need the support of other words to carry the meaning. 'Strong' neither means here historical irregularity in the formation of tenses, e.g. *shake, shook, shaken* (Jespersen 1956: 189) nor refers to a verb which forms the past tense and the past participle by a change in a vowel, e.g. *begin, began, begun* (Richards et al. 1985: 275). It means being necessary and more informative (Blackwell and Martin 2011: 74). Favouring verbs over nouns is believed to add some dynamics or vigour to the sentence (Greene 2013: 40; Yang 2006: 17; Alley 1996: 97); it keeps writing vivid (Shreeve 2006: 144). Although nominalization, a grammatical process of forming nouns from other parts of speech, is a part of the language, it should not be overused, as it freezes the action (Cutts 2013: 73). For Alley (1996: 104) burying a verb as a noun in a weak verb phrase (i.e. containing weak verbs like *do, make, give*) saps the verb's strength. He believes "the smaller the verb phrase, the stronger the verb phrase" and suggests replacing *make a decision* with *decide* (Alley 1996: 272). Lindsay (1997: 48–49) and Yang (2006: 17) admit that replacing the nouns with the verbs is a very powerful way to keep writing clear and direct. Because a verb derivative serves its purpose well and does not change the meaning of the sentence, it can satisfactorily substitute the noun. The examples below show how the nominal bias of the scientific language can be removed.

- a) Original: *The thesis is an attempt to find answers to few questions.*
Improved: *The thesis attempts to answer few questions.*
- b) Original: *The verification of determined parameters was based on laboratory tests.*
Improved: *Laboratory tests verified the parameters.*

- c) Original: *Johnson's theory provides an explanation for the fluctuations in the figures.*

Improved: *Johnson's theory explains the fluctuations in the figures.*

Another valuable characteristics of less noun-heavy writing is that the authors can avoid prepositions such as *of*, *in*, *for* or other function words (e.g. articles). Eliminating them shortens the sentences and reduces the uncertainty which article to use (*a/an*, *the* or *the zero article*), which is often appreciated by non-native writers. Lastly, the verbs can be weakened by changing them into infinitives (d, f) or *-ing* forms (e) because such changes require adding another verb (d, e) or an adjective (f), e.g.:

- d) Original: *The auger is used to drill holes for tree seedlings, shrubs, etc., and also for fence posts or road signs.*

Improved: *The auger drills holes for tree seedlings, shrubs, etc., and also for fence posts or road signs.*

- e) Original: *It contributed to improving the compressive strength by approx. 14%.*

Improved: *It improved the compressive strength by approx. 14%.*

- f) Original: *Al-Mufti and Fried have confirmed it is possible to replace gravel aggregate with recycled (reclaimed) asphalt in a new concrete.*

Improved: *Al-Mufti and Fried have confirmed gravel aggregate may be replaced with recycled (reclaimed) asphalt in a new concrete.*

Clearly, reducing nominalization and avoiding weak verbs affect the word count, which may be of primary concern, for example, in abstracts, and when limits on the manuscript's length or the number of mandatory words in the manuscript's highlights are imposed.

3.2. Combining nouns in strings

Noun combinations (e.g. *construction material*, *tyre pressure gauge*, *helium-neon gas laser*) are short ways of giving information and expressing complex ideas economically. The combinations capture important issues in a specialist text in a concise way, so they are often chosen as keywords accompanying an abstract or a full journal paper.

The compounds are composed of one or more modifiers and a head noun. The modifiers can be classified according to the following criteria: material, operation, purpose, location, time, shape/form and inventor/professional

engagement (Sager et al. 1980: 235; Master 2004: 147). As a result, we get respectively: *steam separator*, *friction bearing*, *flow indicator*, *building layout*, *night shift*, *snake drill* and *Bunsen burner*. It should be remembered that the writer cannot indiscriminately put nouns in front of each other. The Author's teaching practice and revising experience show that less advanced learners use the noun combinations scarcely or often use them erroneously because they are unable to decide on the order of the nouns. Clearly, *company car* differs in meaning from *car company*, *access road* from *road access* or *flue gas* from *gas flue* but sometimes the students incorrectly attach different labels to the same notion (e.g. *łożysko ślizgowe* [in Polish] becomes both *friction bearing* and *bearing friction*). Similarly, experts see the difference between *surge current* (*prąd udarowy* [in Polish]) and *current surge* (*udar prądowy* [in Polish]), so the phrases cannot be used interchangeably. There are, however, instances where the order of the nouns does not change the meaning of the compound, e.g. *bonobo female* and *female bonobo* *orgorilla male* and *male gorilla*. The Author recommends choosing one option and using it consistently throughout a text to avoid confusing readers.

Although, as Jespersen (1956: 182) claims, there are no written rules how to combine the nouns, certain combinations are fixed and native speakers know intuitively how to create a correct and understandable cluster. They do not say, for example, *mass destruction weapons* but *weapons of mass destruction* (Wallwork 2016: 30), even if for a non-native speaker the compound sounds very English-like. Jespersen (1956: 182) declares that any language user can form a composite noun when a need arises. Such free compounds may be composed of a few consecutive words, e.g. *heat gain*, *fuel intake port*, *heat exchange surface assessment*, *membrane liquid-solid separation process*. Master (2004: 203) reminds, however, that abstract generic descriptive noun phrases are always in the form of the compounds, so, for example, *blood test*, *gas insulator* or *heat exchanger* should not be replaced by *a test of blood*, *an insulator of gas* and *an exchanger of heat*.

When the students practise composing their own strings, they are reminded of another 'rule'. According to Fowler's *A Dictionary of Modern English Usage* (1965: 399), putting a noun, not an adjective in front of the other noun is acceptable when a convenient adjective is unavailable. This is why we can say: *fuel socket*, *limb prosthesis* or *master cylinder*. It is, however, much clearer to employ available adjectives in a composite phrase or to link two words together with *of* rather than to use the noun attributively, i.e. acting as the adjective. Consequently, it can be assumed that

destructive test or *compressive strength* sound more natural in English than *destruction test* or *compression strength*.

Moreover, scientific/technical compounds can become a source of ambiguity even if they are well-composed. This results from the fact that non-expert readers may not be able to interpret the compounds, as not all strings are read in reverse, e.g. *a heat transfer area* is *an area for transferring the heat*, but *a carbon dioxide detector* is *a detector of carbon dioxide*. To reduce ambiguity, the compounds can be hyphenated. As *small-bird flock* or *digital-data sampling* differ from *small bird-flock* or *digital data-sampling*, the hyphen helps the writer compose the intended string and the reader identify its intended meaning (Heatwole 2008: 160–161).

Even if untying the strings, especially longer ones, is recommended by CNL rules and Plain English guidelines (Cutts 2013: 73; Crabbe 2017: 29, 33, 35, 38), the Author believes that a well-combined and verified (on e.g. Google Scholar) compound can be well understood by professionals and most non-experts (see the text below).

Road safety is the issue for **automobile designers**, constructors and users. Having conducted numerous **crash tests** and extensive research on traffic-related injuries and deaths, experts admit that **seatbelts**, padded **dashboards**, **air bags** or **driver assistance systems** play a crucial role in **vehicle safety**. As a result, **car manufacturers** fit their products with detectors or controllers that are supposed to minimize the occurrence and consequences of **auto collisions**. Although a steady reduction in **fatality rates** should become noticeable, the **death toll** on Polish roads is still increasing. Statistics shows that it results from **road conditions**, driving under the influence of alcohol or drugs as well as from exceeding **speed limits**. Our hypothesis is, however, that more drivers rely too much on automatic **crash avoidance systems**. They believe that these systems will not only warn them but also take remedial actions if the car drifts out of its lane or reduces a safe distance from the vehicle in front. The aim of our study is to prove that a **lane departure warning system** or a smart adaptive **cruise control** may relax the driver's vigilance and, if they unnoticeably fail to work properly, contribute to a higher **road death toll**.

The passage (written by the Author and included in the training materials to exemplify and practise the use of noun combinations) is believed to be good scientific prose, as the composite nouns do not hinder the text's comprehension. Conversely, they capture important issues in a passage in a concise way; they are clear and easy to understand. They also contribute to a better flow of ideas, so the text reads well.

3.3. Applying grammatical consistency

Grammatical consistency (or parallelism) is an important stylistic rule in English writing. It refers to using the same grammatical pattern when authors join, compare or contrast comparable ideas within the same sentence or in consecutive sentences, e.g.:

- a) *The information was used for the configuration and parametrization of the converter.*
- b) *The information was used for configuring and parametrizing the converter.*

The sentences are well-organized because both predicates are followed by nominal phrases (a) or verbs with an *-ing* form (b), and the listed items are not mixed within each of the sentences. According to Forman and Kelly (1990: 821), parallelism strengthens the equal importance of coordinate parts in a statement; it should be used when any sentence elements are linked by coordinating (*and, or, but, etc.*) or correlative conjunctions (*both ... and, not only ... but also, either ... or, etc.*), e.g.:

- c) *She analyses fetal electrocardiography (ECG) morphology, beat-to-beat fetal heart rate variability and the electro-hysterogram of the uterine muscles.*
- d) *At present time, air pollution is controlled through laws passed not only to reduce the pollutants at their sources but also to set up acceptable standards of air quality.*

The coordinated elements are all nouns (c) or infinitives (d), which makes the list less chaotic and produces more readable writing. Cutts (2013: 83) agrees that “when statements with different grammatical structure are mixed haphazardly, the reader has to stop and backtrack”, which unnecessarily slows down reading.

Grammatical consistency is not limited to joining words and phrases, though; it can be used to join clauses or simple sentences too. For example, if the structure begins with a clause, it must keep on with remaining clauses without changing to another pattern or changing the voice of the verb from active to passive or vice versa. If there is a sequence of independent clauses which are uniform in construction (the word order in its parts is the same), they can be combined to form the so-called balanced sentence (Maclin 1994: 229; Olson et al. 1985: 47). This is what the sentence below exemplifies.

- e) *I design modern multimedia systems, I implement them in concert halls, theatres, conference and teaching facilities, and I also give users training in operating these systems.*

When the authors put their thoughts in sentences and the sentences in a paragraph, they should also structure them in a parallel manner. The examples below follow (f) and violate (g) this advice.

- f) *The above method of separating the hardened cement mortar from the coarse aggregate and disintegrating this mortar, as well as the device for applying this method will:*
- *simplify the existing recycling technologies of reinforced concrete structures,*
 - *increase the efficiency of production lines,*
 - *significantly improve the environmental protection conditions, and, above all,*
 - *allow to obtain the recycled aggregate of very high quality.*
- g) *The following assumptions were made in order to simplify the circuit analysis of the proposed converter:*
1. *Magnetic components are ideal with the exception of the leakage inductance of the tapped inductor.*
 2. *A constant current in magnetizing inductance L_m during one switching period.*
 3. *A voltage drop on diode D and resistance $R_{DS(on)}$ of transistors are neglected, parasitic parameters of all elements are omitted.*
 4. *Capacitor C voltage during one switching period is constant.*

Replacing Sentence 2 in (g) by: *A current in magnetizing inductance L_m during one switching period is constant* improves the paragraph's smoothness because none of the listed statements stands out from the others in a grammatical sense. If there are more items in a list, it is much easier to keep consistency by, for example, tabulating them.

In addition, parallelism should be considered in creating titles for sections in articles, books and presentation slides. Students should be reminded that if the first subsection title is a noun phrase, all the subsection titles of the same section should be noun phrases (h). Analogically, a participial phrase should be used throughout the section if the first subsection title is the participial phrase (i):

- h) 1. *Structural analysis*
1.1. *X-ray diffraction (XRD)*

1.2. Differential thermal analysis

1.3. Scanning electron microscopy (SEM) and optical microscopy

i) *2. Syntactic principles*

2.1. Combining nouns in strings

2.2. Applying parallel structure

2.3. Favouring the active voice

Also, when presenters list their ideas in a slide, they are advised to employ the grammatical consistency. The following examples – taken from the students' presentations – show how parallelism positively affects the list (j) and how its lack produces a converse effect (k):

j) *High temperature of sliding components in the contact zone may result in:*

- reduction of braking power*
- excessive wear*
- thermal cracks*

k) *What you could learn:*

- Capturing sponsors*
- Time management*
- Learn about secrets of social media*

The principle of parallel construction can be helpful when each item in a list is preceded by an article or a preposition. The Author's revising experience shows that very few learners know to overcome this problem. The solution proposed by Strunk (1979: 27) is: the function word must be either only before the first listed item or it must be repeated before each item. The examples below follow this advice.

l) *Christine Thrett is a full-time doctoral student, happy mother of the twins and keen supporter of telemedicine.*

m) *Christine Thrett is a full-time doctoral student, a happy mother of the twins and a keen supporter of telemedicine.*

n) *Hominids' social structures are determined by females' sexual selectivity or opportunism, their perceptivity and estrus signaling.*

o) *Hominids' social structures are determined by females' sexual selectivity or opportunism, by their perceptivity and by estrus signaling.*

Because the parallel structure creates a recognizable pattern and reads much more smoothly, the reader/listener can concentrate better on the meaning and remember the information better. Non-parallel structure

creates no such pattern, so it may distract and confuse addressees (Greene 2013: 60; Wallwork 2016: 144). It should be emphasised, however, that failures of parallelism are not grammatical errors (Maclin 1994: 229; Garner 1995: 637).

3.4. Reducing wordiness

Wordiness means taking more words than necessary to convey information. It may be particularly apparent in the written language, although padding in speech often dilutes core information and irritates listeners. If the author uses a wordy style, writing becomes weak and vogue (Master 2004: 193). Conversely, when science writers eliminate the wordiness in their manuscripts and communicate more succinctly, what they get is more concise writing which almost always improves readability (Yang 2006: 3). It shows respect to the reader as reading an article without excess words takes less time. A less wordy style provides fewer opportunities for misinterpreting facts too.

Reasons for the wordiness are numerous. Non-native authors may use it too much because they may be unaware of the exact meaning of the words they put their thoughts into. The authors may also not find a more concise equivalent, they may write and revise the text indiscriminately or wish to repeat the words for emphasis (Barrass 1978: 73–74). They can avoid plain language intentionally, for they think of it as simplistic (i.e. lower quality) and less learned. Alley (1996: 85) claims, however, that choosing simpler words does not make the scientist's writing simplistic, as his/her ideas are conceptually difficult and complex enough to surpass this label. Similarly, Heatwole (2008: 161) believes that “the use of complicated phraseology does not make a paper appear more scholarly, just the opposite is true.” Nevertheless, for some authors, French- or Latin-based words appear more sophisticated and elegant (Barrass 1978: 75). Writing in the sciences has little to do with elegance, though. The texts are to inform, not to enchant with elaborate constructions or grandiloquence (Alley 1996: 97). Their strength lies, above all, in clarity and precision.

According to Barrass (1978: 68, 70), science writers should avoid circumlocution: they do not need to use many words where few would do better. A well-structured sentence should neither be too long nor too short; each word should play its role there. Orwell (1963: 335) also recommends: “[i]f it's possible to cut a word out, always cut it out.” In *The Elements of Style*, Strunk (1979: 23) gives the following advice: “[a] sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a ma-

chine no unnecessary parts.” The examples in this section show how to act on this advice.

First of all, verbose writing may result from numerous word or phrase level inconsistencies. One of them is repeating the words which are self-evident; it is called tautology or pleonasm. Tautologous expressions are common in legal writing but engaging them is often considered a fault of style (Burchfield 1996: 764). According to Crystal (1997: 390), the use of tautology in English results from the past influence of different languages. A French or Latin legal term was used alongside an Anglo-Saxon one (e.g. *will and testament; power and authority; build, erect and construct*), and this manner is still present, even though its original practical purpose is no longer valid. Pleonasms are not restricted to English; repeating words that add nothing new is observable in other languages too. The Author’s revising experience of Polish and English texts proves that both young researchers and experienced scholars use semantic pleonasm. An awkward *graficznie zilustrowany na Rysunku 1* (in Polish) is often translated, because of the first language interference (or transfer), into *graphically illustrated in Figure 1* instead of *illustrated in Figure 1*. Other examples of tautology include, e.g. *agricultural tractor, architectural building* and *building structure*. In student writing such instances are frequent, e.g.:

- a) Original: *The experimental part of the research was successfully completed.*

Improved: *The experimental part of the research was completed.*

Secondly, redundancy in science/technical writing is manifested by an awkward repetition (Garner 1995: 745). Repeating the words related in meaning contributes to lexical errors, e.g.:

- b) Original: *The field study was carried out for two years of study.*

Improved: *The field study was carried out for two years.*

- c) Original: *It may be assumed that there is another additional the source of pollution.*

Improved: *There may be an additional source of pollution.*

Improved: *There may be another source of pollution.*

- d) Original: *However, on the other hand Vegas et al. [22] have stated that due to high absorbability of fine aggregates they can be replaced by up*

to 25% of natural aggregate (sand), which does not affect the mechanical properties of the composites.

Improved: *On the other hand, Vegas et al. [22] have stated that due to high absorbability of fine aggregates they can be replaced by up to 25% of natural aggregate (sand), which does not affect the mechanical properties of the composites.*

Improved: *However, Vegas et al. [22] have stated that due to high absorbability of fine aggregates they can be replaced by up to 25% of natural aggregate (sand), which does not affect the mechanical properties of the composites.*

Similarly, the words can be unnecessarily qualified by adding another word if only one is needed. The phrases like *conical in shape* and *small in size* should be replaced by single words (i.e. *conical* and *small*). Unnecessarily qualified words occur at times in students' texts, e.g.:

e) Original: *However, the structure of the aggregate in contact with the cement paste is sometimes developed by a layer of adhering paste, which becomes yellowish in colour.*

Improved: *However, the structure of the aggregate in contact with the cement paste is sometimes developed by a layer of adhering paste, which becomes yellowish.*

A lot of wordy phrases abound in high-level (academic) writing because they are believed to be more sophisticated. They are, in fact, grammatically correct, so the need to eliminate them is objectively baseless. Whether they stay in the specialist text or not depends only on the writer. One of such instances is redundancy connected with adverbs. Many adverbs of manner can be used as single-word terms rather than prepositional phrases, e.g. *clearly* instead of *with clarity* or *in a clear manner*, *rapidly* instead of *at a rapid rate*. Similarly, each of the linking phrases can be expressed by one word, not a phrase, e.g. *however* instead of *on the other hand*, *so* instead of *for this reason*, and *also* instead of *in addition to*. If the word count in a scholarly text has to be observed, such changes lead to substantial cuts in the overall length of a piece of writing.

Another way of word reduction is when the authors choose nouns and verbs with condensed information load, e.g. *plummet* instead of *fall suddenly* or *soar* instead of *increase quickly*. Finding a replacement depends on a student's language proficiency. This is why instructing students to pay careful

attention to more ‘meaningful words’ should be included in any vocabulary practice.

Wallwork (2016: 82) notices that if a native language adopts an English word, it may require an additional associated word to complement it. If so, instead of saying *skype* or *email*, a learner may copy a native language pattern and say *make a skype call* or *write an email*. Moreover, numerous authors inflate writing by using lexical bundles (or compound constructions) even though they can be easily replaced with shorter substitutes, e.g. *a sufficient number of*, *in view of the fact that* or *for the following reason* instead of *enough*, *since* or *because* respectively (Flesch 1946: 82; Barrass 1978: 72; Eagleson 1992: 60; Maclin 1994: 388; Wydick 2005: 11, 13; Greene 2013: 42). Sometimes compound propositions or compound conjunctions (e.g. *in the case of*, *with regard to*, *on the basis of*) can be omitted without the loss in meaning, e.g.:

f) Original: *The substrates exhibit different characters in terms of magnetism.*

Improved: *The substrates exhibit different magnetic features.*

Visibly, in such phrases function (or empty) words outnumber content (or full) words. On a sentence level keeping this proportion leads to wordiness (Flesch 1946: 81; Wydick 2005: 7). A solution comes from choosing single words over phrases and phrases over clauses. The compounds, however, are very popular in science writing and a chance of eliminating them from manuscripts is minimal. Also, in many cases they are needed to meet the grammatical requirements of the language, for they account for almost 50% of the running words in any text (Nation 2013: 231). The statistics prove popularity of the empty words – they are the most frequent words in written and spoken English according to the British National Corpus (Leech et al. 2001: 120, 144).

Another way to a less wordy style is avoiding ‘expletives’ such as *there* or *it* which serve as the so-called empty subject markers. If the real subject starts the sentence, it is more concise and effective, and the meaning remains intact (Charrow and Erhardt 1986: 128; Forman and Kelly 1990: 78; Maclin 1994: 152; Master 2004: 193). The sentences below show how the revised statements improve (in quality and length) on the ones with the expletives.

g) Original: *There are a few difficulties which the non-uniform sampling needs to face.*

Improved: *The non-uniform sampling needs to face a few difficulties.*

- h) Original: *It is likely that many researchers raise questions about this methodological approach.*

Improved: *Many researches might question this methodological approach.*

In addition, verbosity increases when the authors avoid adjective compounds and choose longer, defining clauses. The compounds, however, are useful in science/technical writing and take many forms, e.g. *100-Watt bulb, A-shaped roof, self-cleaning glass, well-adjusted temperature*. If the compounds are used, the sentences are more concise and accurate (see the examples below). It is no surprise that they deserve a special attention in an English class.

- i) Original: *It consists of two squares which have the same shape and size.*

Improved: *It consists of two same-size squares.*

- j) Original: *The mould consists of two parts which have the shape of letter L.*

Improved: *The mould consists of two L-shaped parts.*

Finally, science writers – beginners or seniors – ought to realize that a verbose style serves to cloud sentences' meaning and "the extent to which the reader perceives the text as coherent and manageable is, as with all aspects of writing, the writer's responsibility" (Coupland 1984: 56). That is why teaching the students how to write should definitely involve teaching them how to put thoughts together in an orderly manner. A solution to verbosity may come from clearer thinking and writing in a native language. This may gradually enhance standards of writing literacy in both native and second/foreign languages, e.g.:

- k) Original: *Plakaty o treści społecznej, a także tematyce historycznej stanowiły istotny element propagandy.* [Posters with social issues as well as historical issues were an important element of propaganda.]

Improved: *Plakaty o treści społecznej i historycznej stanowiły istotny element propagandy.* [Posters with social and historical content were an important element of propaganda.]

- l) Original: *At the end, a summation of the work which was done as a part of this thesis is placed and basing on this, the appropriate conclusions were formulated.*

Improved: *The thesis ends with a summation of the completed tasks and conclusions.*

m) Original: *The hypothesis of the reason of the collapse of the roof was snow load.*

Improved: *The roof might have collapsed due to snow load.*

This section includes thirteen sentences written originally by PhD students and university teachers of various engineering disciplines, and their revised versions. The total number of words amounts to 212 lexical items (in original sentences) and 129 items (in improved sentences), which means the improved sentences are almost 40% shorter than the original ones. Not only are they shorter, but they are clearer and more accurate as well. A closer look at the sentences confirms that applying word saving techniques can simplify the sentence construction without breakdown in meaning. And because writing less means making fewer mistakes, teaching how to cut down redundancy should be an indispensable component of any writing course.

4. Conclusion

Writing a scientific text that reads well and carries the intended meaning is a demanding task, no matter whether it is written in a native or second/foreign language (Blackwell and Martin 2011: 1). Because less and less writing goes on in school, university students and graduates may display a certain lack of competence in writing. Their stylistic clumsiness or syntax faults in the native language indirectly lead to poor performance in the written second/foreign language. Too little practice and being less equipped for writing often result in ungrammatical sentences and imprecise vocabulary choice. However, texts can become much clearer and approachable when the writers simplify English and start writing concisely. This is what the CNLs and Plain English emphasise. The Author's teaching practice proves that simple English takes an important role in improving the quality of scholarly texts in the sciences. To master writing skills, students should remember that favouring verbs over nouns, putting the nouns in strings carefully and paying more attention to the grammatical form when joining coordinate ideas help present complex information in a more understandable way. Lastly, taking fewer words to make a point definitely contributes to crispier sentences. If these principles are followed, readers can read the texts faster, understand the information better and remember it longer.

Because problems with writing research papers, grant proposals or reports are common to various disciplines and at various levels, the Author assumes that the guidelines can be discussed and practised not only in a technical but also medical, legal and business English writing class developed by ESP teachers for both young researchers and experienced scientists. This assumption resulted in a massive open online course (MOOC) entitled 'How to write (science) better' the Author has prepared for any learner of English who wishes to put his/her thoughts into writing effectively. The course is available at navoica.pl.

REFERENCES

- Alley, M. 1996. *The Craft of Scientific Writing*. New York: Springer.
- Barrass, R. 1978. *Scientists Must Write: A Guide to Better Writing for Scientists, Engineers and Students*. London: Chapman and Hall.
- Blackwell, J. and J. Martin. 2011. *A Scientific Approach to Scientific Writing*. New York: Springer.
- Burchfield, R. W. (ed.). 1996. *The New Fowler's Modern English Usage*. Oxford: Clarendon Press.
- Charrow, V. and M. K. Erhardt. 1986. *Clear Effective Legal Writing*. Boston: Little, Brown and Company.
- Cuopland, J. 1984. 'Writing texts: cohesion in scientific and technical writing' in R. Williams, J. Swales and J. Kirkman (eds.) *Common Ground: Shared Interests in ESP and Communication Studies*. Oxford: Pergamon Press.
- Crabbe, S. 2017. *Controlling Language in Industry. Controlled Languages for Technical Documents*. Cham: Palgrave Macmillan.
- Crystal, D. 1997. *The Cambridge Encyclopedia of Language*. Cambridge: Cambridge University Press.
- Cutts, M. 2013. *Oxford Guide to Plain English*. Oxford: Oxford University Press.
- Eagleson, R. D. 1992. *Writing in Plain English*. Canberra: Australian Government Publishing Service.
- Flesch, R. 1946. *The Art of Plain Talk*. London: Harper & Brothers Publishers.
- Forman, J. and K. A. Kelly. 1990. *The Random House Guide to Business Writing*. New York: McGraw-Hill, Inc.
- Fowler, H. W. 1965. *A Dictionary of Modern English Usage*. London: Oxford University Press.
- Garner, B. A. 1995. *A Dictionary of Modern Legal Usage*. New York: Oxford University Press.
- Gowers, E. 1973. *The Complete Plain Words*. London: Her Majesty's Stationery Office.

- Greene, A. E. 2013. *Writing Science in Plain English*. Chicago: The University of Chicago Press.
- Heatwole, H. 2008. 'A plea for scholarly writing.' *Integrative and Comparative Biology*, (48) 2: 159–163.
- Jespersen, O. 1956. *Growth and Structure of the English Language*. Garden City: Double Day Anchor Books.
- Leech, G. N., P. Rayson and A. Wilson. 2001. *Word Frequencies in Written and Spoken English: Based on the British National Corpus*. Harlow: Pearson Education Limited.
- Lindsay, D. 1997. *A Guide to Scientific Writing*. Melbourne: Longman.
- Maclin, A. 1994. *Reference Guide to English: A Handbook of English as a Second Language*. Washington: United States Information Agency.
- Master, P. A. 2004. *English Grammar and Technical Writing*. Washington DC: United States Department of State.
- Nation, P. I. S. 2013. *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.
- O'Brien, S. 2003. 'Controlling controlled English. An analysis of several controlled language rule sets.' *Proceedings of EAMT-CLAW*, 3: 105–114.
- Olson, G. A., J. DeGeorge and R. Ray. 1985. *Style and Readability in Business Writing*. New York: McGraw-Hill, Inc.
- Orwell, G. 1963. 'Politics and the English language' in L. F. Dean and K. G. Wilson (eds.) *Essays on Language and Usage*. New York: Oxford University Press.
- Richards, J. C., J. Platt and H. Weber. 1985. *Longman Dictionary of Applied Linguistics*. Harlow: Longman.
- Sager, J. C., D. Dungworth and P. H. McDonald. 1980. *English Special Languages: Principles and Practice in Science and Technology*. Wiesbaden: Brandstetter.
- Shreeve, J. 2006. 'Narrative writing' in D. Blum, M. Knudson and R. M. Henig (eds.) *A Field Guide for Science Writers*. New York: Oxford University Press.
- Strunk, W. 1979. *The Elements of Style*. New York: Macmillan Publishing Co.
- Wallwork, A. 2016. *English for Writing Research Papers*. Basel: Springer.
- Wydick, R. C. 2005. *Plain English for Lawyers*. Durham: Carolina Academic Press.
- Yang, J. T. 2006. *An Outline of Scientific Writing: for Researchers with English as a Foreign Language*. Singapore: World Scientific Publishing Co. Pte. Ltd.