# 科技英语的写作技巧

高级科技英语教程

# EST-WRITING SKILLS

AN EST COURSE FOR
ADVANCED LEVEL

上海外语教育出版社

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戴炜华　陈文雄　王　琪　编著

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1988

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# 前　言

《科技英语的写作技巧》是综合性高级科技英语教程的第三册，旨在帮助具有中上英语水平的理工科大学生提高写作水平。

本教程共三册：《科技英语的特点与应用》，《科技英语的阅读技巧》和《科技英语的写作技巧》。这三册书既可依次使用，也可独立使用。

整个教程的起点为英语中上水平，即学员已经掌握基础英语语法以及4000左右的词汇。

《科技英语的写作技巧》旨在指导学生获得和提高科技英语写作技巧和熟能，它可用作教科书，亦可作为参考书使用。对于那些为科技交流用英语写作而需要一本自学参考书的科学家及工程师来说亦不无帮助。

本书分两个部分：第一部分对写作的基本原理及方法都尽可能具体地作了介绍，并配有很多实用的例子。第二部分介绍了科技英语的写作技巧，着重介绍了科技英语语篇写作的功能方法，并对科技英语语篇的修辞、修辞功能及修辞技巧作了简明的阐述。对报告及论文、各种直观手段及科技英语语篇中的复合名词等也分别一一作了说明。

本书提供了大量练习以提高学生的写作技巧，特别是科技英语的写作技巧。书后附有练习参考答案。不提供答案的练习可能有几种答案。

在编写本书时我们参考了不少科技英语原著(见参考文献)。我们曾借鉴这些原著中的一些观点，在此谨向原作者表示感谢。

在编写过程中，戴鸣钟教授仔细审阅本书手稿，并提出了宝贵的建议，任教于我系的美国教师贝弗莉·琼·本奇女士也认真地审读了全稿，在此一并致以衷心的感谢。

编者

一九八六年于

上海机械学院科技外语系

# Preface

*EST — Writing Skills* is the third volume of the advanced integrated course, designed to help science and engineering students at intermediate/advanced level to improve and develop their writing skills.

This integrated EST series consists of three volumes: *EST — Features and Application*, *EST — Reading Skills* and the present volume, *EST — Writing Skills*. The three books could be used in sequence, or independently.

The whole course starts at intermediate/advanced level. It is assumed that the learner has a fairly satisfactory mastery of basic English grammar and a vocabulary of about 4,000 English words.

*EST — Writing Skills* is designed to guide the students in the acquisition and the improvement of skills and strategies of writing in scientific English. The book is to be used not only as a course book but as a reference work as well. Thus, this book seems also helpful to the scientists and engineers who need a self-instructional reference book in written English for technical communication.

The entire book is divided into two parts: General Writing Skills and EST Writing Skills. In the first part, the basic principles and the methods of the General Writing Skills are introduced as concretely as possible, with many practical examples. The second part introduces specially EST writing skills, with an emphasis on functional approaches to writing EST discourse. The rhetoric of EST discourse, the rhetorical functions and the rhetorical techniques are introduced with simple and clear explanations. Reports and theses, various kinds of visual aids and nominal compounds in EST discourse are also discussed.

The book provides many exercises which seek mainly to enhance students' writing skills, especially EST writing skills.

Suggested answers to the exercises will be found in a key. Exercises to which the key is not given can be answered correctly in a variety of ways.

In preparing the book we utilized a lot of original writings on English for Science and Technology (See Literature). We wish to express our thanks to those authors from whom we have borrowed ideas.

We would like to thank Professor Dai Mingzong, who has read the whole work in draft with endless patience and made many valuable critical comments. We are also grateful to Ms. Beverly J. Butcher, an American teacher working in our Department, who



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has been serious enough to read the manuscript and made a lot of constructive suggestions.

Dai Weihua, Chen Wengxiong, Wang Qi
Department of Foreign Languages
for Science and Technology, Shanghai
Institute of Mechanical Engineering, 1986

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# Unit One

# EST and Writing

## 1.1. EST and Writing

The term EST (English for Science and Technology) used in this book is a cover term for the written discourse of English for science and technology. It covers that area of written English which extends from the 'peer' writing of scientists and technically oriented professionals to the writing aimed at skilled technicians.

EST is regarded as specific linguistic realizations of the English language which express certain concepts, facts, processes and procedures pertaining to scientific and technical discourse. EST is an institutional reality which has only been established over recent years. The student entering higher education to study a scientific or technical subject is already familiar with these concepts, facts, processes and procedures. He already knows a good deal of how scientific communication is carried out. What he learns is how it is carried out through the use of a particular linguistic system in English. Therefore, he should perfect these communication skills.

Integrated skills in the language programme are very important, and language teachers today are fully aware of the benefits to be derived from the use of the four skills — reading, listening, speaking and writing — as a means of presenting, practising and extending one and the same set of language forms and functions. But the importance of writing is coming to be more and more recognized. Writing is important in two senses: it is through the written mode that links with the outside world are formed, and paradoxically, we can only improve our spoken language by improving our writing skills.

Our modern society is a business-industrial one. New advances and technological processes, new equipment and inventions are constantly emerging. Technicians, engineers, scientists, businessmen, executives and government officials must spend over fifty percent of the workday communicating with others. Some fields require much oral communication, but others demand more paperwork. In the fields of science and technology a great deal of written communication is required.

Some scientists and engineers take trouble with their writing because they recognize the importance of writing in their work. Others know that they write English poorly, but they do not astonishingly worry about this. Certainly they are mistaken because they don't realize that writing is particularly important in science and technology. Perhaps

you may already appreciate the importance of writing in your daily activities. Perhaps you know that you must be able to write good English if you are to be effective as scientists or engineers. In fact, writing skills must be considered a professional tool, ranked equally with your other professional skills and knowledge.

Many students of science and technology are unable to communicate their knowledge and ideas effectively. They need help with their writing. Unfortunately, they receive no formal instruction in the art of writing. Thus, language teachers, including EST teachers should help their students by telling them why they need to write and how they should write. If they write well, they will be better students and better scientists and engineers.

**Exercise 1.1.1.**

Before you continue with this unit,try writing for twenty minutes about the various reasons you have for studying English for Science and Technology.

**1.2. EST Writing and GE Writing**

The basic writing skills of EST are no more specific than those of GE (General English). As a technical writer you have to work toward correctness in spelling, punctuation, grammar and vocabulary. Whatever skills you have acquired in making your general writing effective will improve your technical writing. Effective technical writing is built upon the foundation of writing skills in general. On the other hand, the general writing skill does not in itself guarantee satisfactory technical writing. This is because technica writing is a matter of special concern. It often calls for special forms, and requires familiarity with some special techniques. Nevertheless you will find it necessary to review some basic writing skills when you undertake technical writing.

Let's take a sentence for example. A sentence may be considered a set of words complete in itself, having either expressed or understood in it a subject and a predicate, and conveying a statement or question or command or exclamation. For correct communication, every word of a sentence has to be filled into its pattern. The following sentence is a tangle:

'Here is John Smith, a system engineer of the firm than whom no other engineer was more surprised by the decision of the firm manager.'

As we can see, the clause is tied to the main sentence by the word 'whom', from which an invisible string leads to Smith, seven words back. To reach 'whom', however, we have to jump over 'than' which in turn is tied to 'more surprised', five words ahead. Therefore, the sentence should be revised as follows:

'No other engineer was more surprised by the decision of the firm manager than John Smith, a system engineer of the firm.'

Sometimes a sentence may be very long. This causes difficulty in reading. Usually, very easy are the sentences containing 8 or less words. The sentences containing 29 or more words are considered very difficult. The average sentence length in words is as follows:

| | |
|---|---|
| Very Easy | 8 or less |
| Easy | 11 |
| Fairly Easy | 14 |
| Standard | 17 |
| Fairly Difficult | 21 |
| Difficult | 25 |
| Very Difficult | 29 or more |

An average reader will have no difficulty with an average sentence of 17 words. Literary English runs to about 20 words a sentence, while scientific English to about 30 words. If a sentence is very long, look for the links in its construction and cut it into smaller pieces until it is of the right avarage length.

**Exercise 1.2.1.**

Rewriting the sentences:

1. As we know, scientists, who are eager to win their arguments, also often button hole their readers with long sentences. The following is a long sentence. Rewrite it more convincingly, with several short sentences:

Learning a language need not be dull, if we fortify our efforts by scientific curiosity about the relative defects and merits of the language we are studying, about its relation to other languages which people speak, and about the social agencies which have affected its growth or about circumstances which have molded its character in the course of history.

2. Sometimes a sentence is unclear because it contains too many unnecessary words. Try to cut and revise the following sentences:

1) All of my courses which I am taking in this university will prove to be extremely valuable in my plan for the future when I hope to become a scientist.

2) Giving the ball a really solid kick, a player on the soccer team that was losing the game succeeded in getting the ball through the opposing team's goal post.

## 1.3. Basic Requirements in EST Writing

Although the basic writing skills of English for Science and Technology seem no more specific than those of General English, there are some basic requirements in scientific writing.

EST writing should reflect the way scientists and engineers think and work, and should therefore be in accordance with the special requirements of the scientific method.

The purpose of EST writing is mainly to explain the natural phenomena. A scientist in his writing must answer such questions as: What is it? What does it look like? How does it work? For what is it used? What has he done? Why and how was it done? What has he found?

In stating the problem, in formulating the hypothesis upon which the work is based,



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in planning the work and in its implementation, in giving the definition, and in arguing something, there must be presented clear thinking. This clarity of mind should be reflected in the technical writing and illustrations.

Every statement or argument should be complete. Each line of statement or argument should be followed through to a logical conclusion.

If there are any assumptions underlying the statement or argument, it is necessary to make them clear to the reader, for if these are incorrect the conclusion may also be unacceptable. A scientist should neither omit evidence that is against the hypothesis, nor undervalue the findings of other scientists when these seem to contradict his own. Thus, any assumption should be based on sufficient evidence and should be in accordance with all that is known on the subject.

In technical writing, impartiality in the statement or argument should be reflected, and the sources of error and probable errors in the data should also be indicated.

Any information and ideas should be presented in a logical order. Only in this way can the reader find the message easily accessible.

The scientific method depends upon care in observation, precision in measurement, care in collection and study of information deemed to be relevant, care in proposal concerning a hypothesis or solution, precision in giving a definition, and care in recording what has been observed, measured and tested through experimentation. Every experiment should be repeatable and every conclusion should be verifiable. Thus, in technical writing care should be taken in the choice and use of words in order to achieve accuracy.

In science, every statement or argument should be based on sufficient evidence. The scientist should avoid unsupported opinions and excessive qualifications. In other words, he should not reason from lack of evidence against a hypothesis, or state an opinion as a fact. Thus, words and phrases such as *perhaps*, *possible*, *probable*, and *it is likely to* are expressions which enchain the scientist to think the matter again.

The scientist's task is to explain something. In choosing between hypotheses, he is advised to choose the simplest explanation which is in accordance with the evidence collected.

Simplicity is the outward sign of clarity of thought. The scientist should write direct and straightforward prose, free from the use of too many words and distracting elaborations.

Thus, explanation, clarity, completeness, impartiality, order, accuracy, objectivity and simplicity are regarded as basic requirements in EST writing.

**Exercise 1.3.1.**

The following is a list of unnecessary qualifications of words. Give the correct form of each expression;

1. absolutely perfect

2. not actually true
3. conclusive proof
4. cylindrical in shape
5. the smallest possible minimum
6. deliberately chosen
7. green in colour
8. an actual investigation
9. few in number
10. almost unique
11. in virtually all sectors of the environment
12. if at all possible
13. mechanisms of a physiological nature
14. on an experimental basis
15. not longer than 300 to 350 words in length
16. on a theoretical level
17. in the school environment
18. working towards a unanimous situation
19. to show the same high level of application
20. over a period of the order of a decade

# Unit Two

# Unity and Logical Thinking

## 2.1. Avoidance of Ununified and Illogical Sentences

An ideal sentence is structually unified and logically correct. All its parts are related to each other and are combined to show a clear idea or impression. And the whole sentence is well thought out. It contains no slips or weakness of logic.

A sentence which lacks unity may fail to include all the material needed or may contain extraneous material. Sometimes, certain facts may be presented as either one sentence or more than one, but this does not justify inserting into a sentence facts that are not related to its subject. Thus, the ideas in a sentence must be correlated. Each sentence must be written to indicate clearly the relationship between the ideas. Consider the following two sentences:

a) The internal environment of a modern building can be a comfortable one, in effect, the external environment is uncomfortable.

b) The internal environment of a modern building can be a comfortable one no matter how uncomfortable the external environment is.

The ideas contained in sentence a) are unrelated, whereas the ideas in sentence b) are related.

Sentence unity demands that the end of one sentence and the beginning of another be put at a logical place. Consider the following sentences:

The machine is simple in structure and easy to operate, but it is extremely noisy. Also it is somewhat bulky.

Here there are two good features and two bad ones. The first of these sentences contains two good features and one bad one. The second names another bad feature. Thus these sentences must be revised in such a way that the good features should be placed in one sentence and the bad ones in another sentence, as shown in the following sentences:

The machine is simple in structure and easy to operate. But it is extremely noisy and somewhat bulky.

In order to make the central idea clear a writer must strive to omit excessive details. Of course, length alone does not make a sentence ineffective. Many sentences, though quite long are often clear because of their simple construction. But there are many times when shorter sentences could make some piece of writing clearer and easier to read.

Here there is excessive detail:

The earth on which we live is about 150,000,000 kilometres or 93 million miles away from the sun, a burning star in the sky which the earth goes round and from which it receives light and heat, — one astronomical unit in the language of astronomers who study the stars scientifically.

Here there is adequate detail:

The earth is about 150,000,000 kilometres away from the sun — one astronomical unit in the language of astronomers.

**Exercise 2.1.1.**

Rewrite the following sentences to make the sentences shorter in length, simpler in structure and clearer in meaning. Omit the excessive details which are unnecessary.

1. Southern industry was much more limited in scope and structure. Much of it was of artisan character whose inefficient and relatively high cost of production was only possible under the shelter of a high tariff wall and a paucity of communications that gave almost a monopoly in local markets.

2. We must convince the teacher of history or of science, for example, that he has to understand the process by which his pupils take possession of the historical or scientific information that is offered to them; and that such an understanding involves his paying particular attention to the part language plays in learning.

3. If a man who sets out to write does not show some respect for his medium, he immediately condems himself in the eyes of the people who have to read what he has written.

4. In 1788, when Andrew Jackson, then a young man of twenty-one years who had been living in the Carolinas, still a virgin country, came into Tennessee, a turbulent place of unknown opportunities, to enforce the law as the new prosecuting attorney, he had the qualifications that would make him equal to the task.

5. The purpose of these general notes is first to assist authors in the writing of scientific papers on an acceptable style and secondly to suggest the introduction of greater uniformity in the general approach to the preparation of scientific papers for publication.

**2.2. Avoidance of Fragments and Comma Splices**

When a sentence lacks unity it may be a mere fragment, or it may contain the error which is called a 'comma splice.'

A fragment is not a complete sentence because it lacks some element necessary for grammatical completeness. Consider the following examples:

1) The water quality from all wells is good. *With the exception of the anomalously elevated manganese found in Test Well 2.*

Here, the italicized expression is a prepositional phrase rather than a sentence.

2) Some of the expenses were increasing. *Overhead, for example, and the cost of raw materials.*

Here, the italicized expression has no verb; it is used in apposition to some of the expenses in the preceding sentence.

In order to remedy these errors we must join fragmens into a sentence with which it is natually connected, or change it so that it may stand by itself as a complete sentence. Thus, the above examples should be rewritten as:

1) The water quality from all wells is good, with the exception of the anomalously elevated manganese found in Test Well 2.
2) Some of the expenses were increasing. Overhead, for example, and the cost of raw materials were higher than before.

Sometimes a sentence contains two independent clauses without a coordinating conjunction. In this case a semicolon must be used. Use of a comma instead of a semicolon on this occasion is the serious error which may be called comma splice, e. g.

Comma Splice: All main points of a discussion should be supported, of course, by details, conversely, all details should support main points.

Correct: All main points of a discussion should be supported, of course, by details; conversely, all details should support main points.(Correction by change in punctuation.)

Correct: All main points of a discussion should be supported, of course, by details, and, conversely all details should support main points. (Correction by using a coordinating conjunction.)

Correct: All main points of a discussion should be supported, of course, by details, which, conversely, should totally support main points. (Correction by change in construction.)

In English, the only coordinating conjunctions are *and, but, for or, nor, so* and *yet.* They are different from conjunctive adverbs such as *however, therefore, consequently, conversely, moreover, furthermore, instead, rather, actually, nevertheless,* and many others. Such conjunctive adverbs may be buried within the clause that it introduces. They might come elsewhere than between the clause it connects. In this case, a semicolon rather than a comma is used, e.g.

I have read the manual; *however,* I shall be glad to read it again.

Here, *however* is a conjunctive adverb, and a semicolon must be placed between the clauses.

**Exercise 2.2.1.**

Correct the following comma splice by changing the punctuation and sentence construction, and also by using a coordinating conjunction.

Comma Splice: We shall be forced to find a new route, the grades on the one

suggested are too severe.

1) Correction by changing the punctuation:
2) Correction by changing the construction:
3) Correction by using a coordinating conjunction:

**Exercise 2.2.2.**

Join the following fragments or rewrite them so that they are structurally complete.

1) The volume grew lower and lower. Finally becoming so slight as to be inaudible.
2) The company was losing money steadily. Although sales were as high as in previous months.

**2.3. Avoidance of Mixed or Awkward Constructions**

In order to write unified sentences we must avoid mixed or awkward constructions. The following are mixed constructions:

When he arrived in Chicago found only one friend in the airport.

Here there is an adverbial clause plus a predicate. Thus, we should complete the sentence by adding some elements or by changing the structure of the sentence:

When he arrived in Chicago, he found only one friend in the airport. (adverbial clause + main clause)

(or) Arriving in Chicago, he found only one friend in the airport. (subject + predicate)

To avoid awkward or obscure sentences, every construction must be completed very clearly, e.g.

Obscure: An example of discrimination is a cafe owner's, especially after he has refused to serve foreigners.

Clear: An example of discrimination is a cafe owner's refusal to serve foreigners.

Awkward: A fluke is when either of the 2 broad flat ends of the anchor let down to the bottom of the sea to stop a ship from moving.

Correct: A fluke is either of the 2 broad flat ends of the anchor let down to the bottom of the sea to stop a ship from moving.

**Exercise 2.3.1.**

Revise the following sentences to avoid mixed or awkward constructions.

1) Banishing a man is where he is driven out of his country.
2) When Mr. Smith plays the hypochondriac taxes his wife's patience.
3) A car is when a vehicle has 3 or usually 4 wheels and is driven by a motor.
4) Though a computer wades through a problem at 100 million steps per second may be in a losing race with the scientist or engineer applying his or her ingenuity to complex problems.
5) We are in the midst of an energy crisis is obvious to everyone.



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