

5 The paragraph in EST

5.1 Introduction

In chapters 1 through 4 I have attempted to establish the framework the rhetorical approach to teaching EST fits into. In this sense these chapters are introductory. The remaining chapters discuss the main elements that make up the rhetorical approach, stressing EST reading but also looking at writing. These elements are given in an order that our experience shows is most successful in working with university-level EST classes. However, the presentations do not mirror precisely those of the classroom: how much of a given topic is discussed and how much time is spent on each of the areas (rhetorical, grammatical, or lexical) depends to a great degree on the make-up of the individual class. For example, a group composed mainly of postgraduate students seldom needs as much time to grasp the basic principles of the rhetorical functions as does a heterogeneous class of undergraduates; on the other hand, this group may need considerably more time on the problems involved in writing EST discourse.

The elements that make up the rhetorical approach to teaching EST reading (and, secondarily, writing) are discussed in the following order:

- Chapter 5, The paragraph in EST
- Chapter 6, The rhetorical techniques
- Chapter 7, The rhetorical functions
- Chapter 8, The rhetorical-grammatical relationships
- Chapter 9, The lexical problems
- Chapter 10, Teaching the rhetorical process

Each of these topics is discussed in respect to its relation to the total process. Most of the examples are from our university classes. Each example is accompanied by a brief analysis designed so that it can be used as a basis for a classroom presentation of whatever rhetorical element is being illustrated. The discussion of the rhetorical process begins with the paragraph. This should receive quite detailed coverage since the students need a sound grasp of the concepts in order to be able to understand and use the other rhetorical features.

5.2 The EST paragraph

We chose the paragraph as the basic discourse unit for the analysis of written scientific and technical English because it carries information in clearly organized 'packets' and because it shows how the various pieces of that information are related. Also, it separates generalizations from specifics and from one another so that the trained reader can learn to differentiate easily between levels of generality.

To recapitulate, the key elements in the semantic unit of discourse that we call the EST paragraph are the following:

1. The paragraph is a conceptual concept and it may be realized in a group of sentences (or even in a single sentence) set off from other groups by spacing or indentation, or the demands on the way in which the information is most functionally organized may require two or more such groups of sentences.
2. The 'conceptual' paragraph is developed around the semantic element that we call the 'core generalization' or, simply, the 'core'. This is the generalization that is supported by the lesser generalizations and/or the specific statements that make up the information in the paragraph. As a rule, this 'core generalization' is the most general statement in the paragraph (but see example 5.1B for the 'exception to the rule'). When we refer to a particular core generalization that is realized in the text, we call it the core 'statement'. While this can usually be put in the form of a single sentence, it is often found as a clause or a phrase or a combination of several parts of different sentences. If our generalization is to be called the 'core statement' of a paragraph, its words must be found somewhere in that paragraph. Otherwise, we have an 'implied' core and we talk about the 'core' or the 'core idea' rather than the 'core statement'. While there is no rule concerning this choice of terminology, we find it more useful for class discussion to be consistent, if only to avoid confusing our students.

An illustration of a generalization that can be stated clearly in a single sentence and of its development in the form of lesser generalizations and specifics (that is, specific in relation to the generalizations that govern them) is example 3.1A (repeated below). In addition to the brief analysis made by the 'notes' in the right-hand margin of the example, we would add the following information to a classroom discussion:

As noted in chapter 3, the core statement is made up of parts of the first two sentences of the first physical paragraph: 'The components composing the urban system are the land use system and the transportation system.' This statement is the broadest generalization in the entire conceptual paragraph (made up, remember, of three physical paragraphs). Lesser generalizations are, in a sense, abstracted from the major generalization to provide the sub-cores for the remaining two physical

paragraphs: the first is 'Land use refers to the spatial configuration. . . .', and the second is 'The transportation system determines. . . .'. We find direct support for our major generalization (our 'core') given by the lesser generalization, 'These two categories interact with each other as well as with themselves.' The other two physical paragraphs then develop our core statement and its supporting generalization.

Each of the two sub-cores is supported by a mixture of lesser generalizations and specific information. An easily seen example is the way in which the sub-core 'Land use refers to . . . ' is supported. We have the first lower-level generalization ' . . . demand for interaction of opportunities . . . ' followed by more specific information: ' . . . located in institutional, commercial, and industrial areas.' The second lesser generalization 'The supply side of opportunities. . . .' is supported with even more detailed items of information.

[EXAMPLE 3.1A] ONE CONCEPTUAL PARAGRAPH COMPOSED OF THREE PHYSICAL PARAGRAPHS (ONE-TO-MORE-THAN-ONE CORRESPONDENCE)

The components composing the urban system can be categorized into two major categories. These are the land use configuration and the transportation system. These two categories interact with each other as well as with themselves.

Core of conceptual paragraph

Land use refers to the special configuration of supply and demand of opportunities: for instance, the demand for interaction of opportunities is located in institutional, commercial, and industrial areas. The supply side of opportunities is measured in terms of the intensity of attractiveness, which may be expressed by the number of jobs in the specific zone. The spatial location and quantities of these entities (supply and demand of opportunities) in relation to the others are the major attributes of the land use components of the urban system.

Sub-core no. 1

The transportation system determines the ease of interaction between the supply and demand configurations. The transportation system has two attributes. One is the transportation network, which determines the spatial coverage of its service, and the other is the level of service or quality of the transportation system. Both factors have an effect on the interaction between activities.

Sub-core no. 2

Because the idea of 'core' is so basic to the rhetorical analysis of EST paragraphs, I want to look closely at some of the other characteristics of this type of discourse. The first concerns a point we have already touched on – the placement of core statements. The fact that these are not always neat, single sentences handily placed at the beginning of the paragraph can at first cause problems for students (native or non-native) who were introduced to the concept of the paragraph by being given carefully constructed ones with their generalizations made up of the initial sentence. While EST paragraphs do sometimes have their core statements as the first sentence, these are in the minority. Examples 5.1A and 5.1B illustrate these points: example 5.1A has its core statement as the initial sentence; example 5.1B has its core statement as the second sentence, which is preceded by an even broader generalization than that of the core statement.

EXAMPLE 5.1A CORE STATEMENT IN FIRST SENTENCE OF PARAGRAPH

Soil physicists have characterized the drying of a soil in three stages. They are: the wet stage, where the evaporation is solely determined by the meteorological conditions; an intermediate or drying stage, where the soil occurs in the wet stage early in the day, but then dries off because there is not a sufficient amount of water in the soil to meet the evaporation rate; and the dry stage, where evaporation is solely determined by the molecular transfer properties of water within the soil. There is a striking change in the evaporation rate as the soil dries during the transition from the wet stages to the drying stage.

[T. J. Schmigge, 'Measurement of Soil Moisture Utilizing the Diurnal Range of Surface Temperature', *Significant Accomplishments in Science and Technology: Goddard Space Center, 1974* (NASA: Scientific and Technical Information Office, 1975, pp. 2–3. Quoted in Thomas Huckin and Leslie Olsen, 'Teaching the Use of the Article in EST', in Larry Selinker, Elaine Tarone, and Victor Hanzeli (eds.), *English for Academic and Technical Purposes* (Rowley, Mass.: Newbury House, 1981), p. 178.]

This paragraph is an almost classic example of paragraph structure organization of information: the paragraph (an example of a one-to-one correspondence) begins with a one-sentence core statement. This is supported by three statements which, while generalizations in themselves, are specifics in relation to the major generalization. The paragraph is neatly rounded off by a concluding sentence which also relates to the core statement but less directly than the preceding information. The paragraph is also an example of writing for a reader educated in another field of science or technology; it is, in this sense, similar to the level of writing found in the journal *Scientific American*.

The paragraph in EST

As noted above, core statements can be other than the first sentence in a paragraph or the most major generalization of that paragraph. Example 5.1B illustrates both of these points.

EXAMPLE 5.1B CORE STATEMENT IN SECOND SENTENCE OF PARAGRAPH

Physical comfort does not depend on temperature alone but on other factors as well. One of the major factors on which comfort depends is humidity. High humidity helps prevent heat loss from the body and makes even high temperatures less bearable. Dehumidifying the air helps the body to lose heat and thus bear higher temperatures. However, beyond certain limits, removing the moisture from the air becomes harmful to the body. The mucous membranes of the nose and throat can become dry, thus increasing susceptibility to respiratory diseases.

[Source: Submitted by a student; precise source unknown.]

That the core statement is the second sentence rather than the first in the above paragraph can best be seen by examining the information given in the supporting information: this information is concerned with humidity, not with the larger topic of physical comfort, of which humidity is one part. The first sentence is obviously the broader generalization and (as is so often the case with initial sentences) is a transition from the preceding piece of text.

Such structures as this can be very confusing to the non-native learner, especially to those who have been taught that the first sentence is the generalization (the thesis/topic sentence) of the paragraph and that all other information in the paragraph supports this generalization. Even when they learn that the subject of the paragraph is not necessarily found in the first sentence, many students continue to have trouble until they are able to differentiate between the several levels of generalization that a paragraph might contain and also between the general and specific information. The ability of students to make such distinctions and at the same time grasp quickly the subject matter of a paragraph is one of the bases for improved reading comprehension and speed and (as explained in detail in chapter 10) for a successful transfer of these reading skills to writing.

Another important characteristic of EST paragraphs is that the majority are deductive in structure. As both examples above illustrate, most EST paragraphs have their core statements near the beginning; that is, the governing generalization precedes most or all of the supporting information.

While this is the structure found in all examples given to this point, it is

not the only paragraph form found in EST. Prevalent enough to be worth discussing are three other structures: the inductive paragraph, the 'hybrid' paragraph, and the 'implicit' paragraph. This last is, of course, a misnomer as it is not the paragraph that is implicit but the core statement. Each of these structures is exemplified below.

The inductive paragraph has its core statement found at or near the end; that is, the supporting information precedes the generalization. This type of paragraph is found most often in the kinds of peer writing in which the events (physical or mental or both) leading to a discovery (or new hypothesis, etc.) are given chronologically with the results stated as a kind of climax. A second type of EST discourse in which we can frequently find inductive paragraphs is in a different part of our spectrum – in 'popular' scientific writing as in newspapers and books for 'non-experts'. This type of text is illustrated here in preference to an example of peer writing as it is less technical in vocabulary while at the same time retaining the essential elements of EST discourse.

EXAMPLE 5.2 A PARAGRAPH DEVELOPED INDUCTIVELY

The first uses of plastics were to replace natural materials such as metal, leather, rubber, and so on. Telephones came to be made of a plastic called 'bakelite'; the soles of shoes and, later, the uppers came to be made of various rubber and leather substitutes; and the Second World War brought about the development of 'butyl rubber' tires and innertubes. Although called 'rubber', things made of butyl were, and are, wholly synthetic. Without plastics we would not have many of the things we take for granted: we would not have several kinds of important electrical insulation nor would we have the wide diversity of photographic film available today. When we look back, we can see *how our lives have been changed by plastics*.

[The core statement of this synthesized paragraph is in the last sentence. It would not be difficult to make this a 'deductive' paragraph by a simple transfer of the core to the beginning of the paragraph and only the change of one word (e.g., 'If we look back, we can see *how our lives have been changed by plastics*.').]

Both inductive and deductive structures are found in the 'hybrid' paragraph, with specific statements leading to a core and then following from it. Since the core statement is usually in or near the centre of the paragraph, we have a kind of sandwich made up of specific information with the core in between. Example 5.3 illustrates a hybrid paragraph aimed at lower-intermediate-level students.

EXAMPLE 5.3 A 'HYBRID' PARAGRAPH

Date palms have grown prolifically in both Mesopotamia (modern Iraq) and Egypt for many thousands of years. Dates are rich in sugar and in such warm climates fermentation into a liquid containing alcohol took place fairly quickly. Thus, while our first records of *dates being made into wine* come from the period *3000 to 2000 B.C.*, we feel certain that it was made *much earlier*. Since the fruit itself houses the yeast fungus that causes fermentation, making date wine was a fairly simple process. The only pieces of equipment needed were a jar to hold the date 'must' (the dates and the liquid from them) and a strainer used at the end of the fermentation.

[Source: Adapted from Henry Hodges, *Technology in the Ancient World* (New York: Knopf, 1970), pp. 114-15.]

[The core statement is, as the italics indicate, 'Dates (were) made into wine much earlier [than] the period 3000 to 2000 B.C.']

A final type of paragraph development found commonly enough to be worth studying is the 'implicit' paragraph; that is, the paragraph which has its core implied by the nature of the information. In this type of structure, the writer seems to assume that readers can supply their own generalizations from the details presented. A paragraph with an implied core is illustrated by example 5.4, which is from a peer-level engineering report best used with advanced students.

EXAMPLE 5.4 A PARAGRAPH WITHOUT A STATED CORE

The spans over the water are made up of triple two-pin steel spandrel braced arches with their arch springings situated just above water level. The two spans over the land are continuous steel deck beams supported by portal type concrete trestles on rocker bearings that are located just above the ground level. The water spans measure 134 meters between arch pin centres, with each of the pins receiving a direct thrust of approximately 2,240 tonne. The land spans are 73 meters overall and they impose vertical loads of some 1,000 tonne on each of the rocker bearings that are under the intermediate support.

[Source: Extracted by a student from a 'British engineering report'; precise source unknown.]

In the following chapters most of the examples are in the form of deductive paragraphs.