Instructing Japanese Learners in the Rhetorical Approach to English Technical and Scientific Writing

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Chapter 1

Introduction

Since World War II, English technical and scientific writing has grown by leaps and bounds. And therefore, tremendous scientific and technical documents have been appearing. With the rapid advance of technology, the chances of reading a paper to a learned society have increased more than ever. The technical report has also been used by industry to communicate significant and complete research results. Style manuals describing theory and practice in technical report preparation; publication manuals covering such factors as design, layout, and type style; and copies of technical reports were obtained from industrial, academic, governmental, and research organizations. Based on an analysis of these documents, criteria were established for the report components, for the relationship of the components within the report context, and for the overall report organization. With the advent of tremendous technical and scientific documents, the necessity of studying the clear and effective scientific and technical documents has naturally come about.

In this paper, I explain some common weak and unfamiliar points for Japanese learners of English technical and scientific documentations. I forge one of the most appropriate approaches for Japanese learners and teachers who want to acquire the quintessence of English technical and scientific writing. This study is based on the assumption that rhetoric and linguistic areas are essential to the foundation of English technical and scientific writing teaching in Japan. This study also demonstrates the need for Japanese instructors in this field to develop and cultivate English technical and

scientific writing in Japan, which few Japanese to my knowledge have tried to study.

1.1 Deficiencies in the Teaching of English Technical and Scientific Writing in Japan

Perhaps at no time in history has English been as important to people all over the world as it is today. With countries being swept into the turmoil of international affairs, to say nothing of business and technical people, any person engaged in social or governmental work has discovered that the best way to keep afloat is to have a good command of English. English has become a global language. To explain our study, to explain our idea, to explain our products, we must now use English to communicate with people in other countries, and therefore, we can say we cannot survive in this Webbed world without English.

As we have plunged into the IT (Information Technology) age, the rapid and immense increase in technical intercommunication using English calls for intense and interesting research in the area of language study called English for Science and Technology (EST) which has been increasing enormously. Writing does not occur only in school, and is not used only for schooling purposes; writing is now studied in many professional and technical contexts, as well as in the workplace (William Grabe and Robert B. Kaplan 1997,147). And Grabe and Kaplan suggest that "in order to understand this seeming prejudice in writing instruction, it is necessary to review certain guiding assumptions in technical writing instruction" (148).

Now in the United States, in fact, more than two-hundred colleges and universities provide instruction in technical and scientific writing and offer degrees in this field (Appendix A). The University of Washington offers not only English technical

communication but even a technical Japanese program (http:www.uwtc.Washington.edu).

In Japan, although several colleges and universities offer technical and scientific writing classes, no institution offers a degree in this field. Furthermore instruction in this field is more narrowly focused than it is abroad although Japan is now said to have become a technical superpower. In almost all universities and special associations which provide English technical writing classes or projects, Japanese teachers and instructors teach how to translate from English into Japanese and vice versa. Although there are classes labeled "Technical English," they are concerned with the translation of short Japanese sentences, almost always only one sentence, into English rather than with original composition in English. Given this situation, the students and company people do not get training in paragraph or essay-length English writing.

It goes without saying, then, that few Japanese in the business-engineering world know what rhetoric is, or how to apply it to English writing. As a result, while Japanese are on the whole strong in English grammar and vocabulary, they are weak in what I call "situational English." English technical and scientific writing, English business letter writing, speed reading and management training all need to be taught. There should be a shift in emphasis from general school English (GE) to Special Purpose English (SPE).

Though the Japanese people themselves recognize that Japan is a country influenced by science and technology, technical and scientific writing is little known, or even unknown and more importantly, unrecognized. Unfortunately, no universities or colleges have set up any department for a Bachelor, Master, or Ph.D. degree yet. However, several colleges and universities offer technical and scientific writing classes. Most of these teachers are not willing to

teach the discourse analysis or rhetoric which is the essence of technical and scientific writing, but are teaching only English grammar, technical words, and reading skills. If the teachers' background is English, they tend to teach English grammar and reading, while those whose background is science or engineering is apt to end up explaining technical terms and reading only.

Just as we would not attempt to build a house without a blueprint, we should not start to write any document without at first acquiring a clear conception of its organization. At this point, we must keep in mind that too many sophisticated blueprints should not be drawn up or foisted upon our specialists and students. Too many complicated theories more often than not perplex the specialists and students. In addition, as each nation has its individual character and history, Japanese specialists and students have their common weak areas as well as strong ones in learning English. Therefore I believe that instructors must understand these areas and must approach both of them in order to achieve good results in teaching English technical and scientific writing. Professor J.C. Mathes stated in his class that technical writing is not English grammar, but organization. I completely agree with him, but we should always remember that nonnative speakers of English are strongly influenced by English knowledge, vocabulary, and grammar.

Documents may be compared to products. When we manufacture any product, we need the specifications appropriate to the product. Without such specifications, very few products can be produced at all. Therefore almost all documents have specific rules when produced. I should add that, similarly, all documents must have an organizational protocol. If we fail to pay attention to such a protocol, the document often loses its direction, which may cause trouble to the reader or render it difficult to understand. A problem such as this could

potentially ruin a company's reputation.

Writers or translators may complain that they are too busy to be trained after graduating from the university or college and may resign themselves to the present situation. But if the present state of affairs continues, the documents issued from Japan to foreign countries will continue indefinitely to be unsatisfactory. One potential and very tangible result of such ambiguous and inadequate documents could well be in the form of product liability brought against the companies in question, but the more common result would be a loss of information, wasted time, and wasted money caused by ineffective technical and professional communication.

Three groups are concerned with the international communication in industry and research. For convenience, I will call them “the specialist group,” “the university student group,” and “the lower-level group.” There certainly are different methods of teaching technical and scientific writing to these groups, but in this paper, I will focus on “the specialist group” and “the university student group.” They are usually people who have some knowledge of the subject matter, either from their reading or from familiarity with English documents in business, science, technology, medicine, or other professional subjects.

1.2 Finding the Proper Name for English Technological Discourse

As the various names listed in **3.1 Overview** indicate, authorities give English technological discourse various denotations. The most appropriate explanation for naming this field is given by Alice I. Philbin and John W. Presley (1989). They distinguish “technical communication” from “technical writing.”

Technical communication – a universal expression that refers to the written documents, videotapes, slide shows and other illustrated learning aids, demonstrations, and electronic messages created by professional writers and designers. Because this field changes rapidly, "communication" is more generic than writing, and "technical" more comprehensive than "scientific." For example, a user manual for a word processing software package and a flight simulation program for training pilots are technical communications.

Technical writing – printed or electronically transmitted messages. These include instructions, manuals, procedures, statements of policies, articles for publications, and various other technology-related communication designed for publication. The magazine *Fine Woodworking*, with its numerous feature stories and regular columns on woodworking technology is an example of technical writing.

Scientific communication – again, a general term for all the kinds of communication about various fields of science. The television program *Nova* is an outstanding example of scientific communication.

Scientific writing – printed or electronically transmitted messages, including laboratory reports, experimental results for publication, and scientific discussions of specific theories and applications, designed for public reading. A classic example is *Scientific American.* (5)

Their definitions state that "communication" includes "video tapes, slide shows, other illustrated learning aids, demonstrations, and electronic messages created by professional writers and designers"(5). They also define "communication"' as "more generic than writing." In this paper, I will exclude these areas and will not regard the scope of my study as "more generic than writing." About "technical" and "scientific," they explain that "technical" writing includes "instructions, manuals, procedures, statement of policies,

articles for publications, and various other technology-related communication designed for publication" and that "scientific writing" includes "laboratory reports, experimental results for publication, and scientific discussions of specific theories and publications, designed for public reading"(5). From these explanations, the term "technical and scientific writing" (TSW) is best applied through this paper.

1.3 ESP and English Technical and Scientific Writing

The increasing specialization of content in English teaching curricula since the early 1960s can be traced to a number of factors. Christopher Candlin in *English for Specific Purposes* (1977): explains that an international meeting of specialists was held in London in December 1960 on second language learning as a factor in national development in Asia, Africa and Latin America. Candlin summed up the meeting as follows:

> The language problem in development stems from at least three communication needs which are increasingly being recognized both in the developing countries themselves and in other countries aiding in their development: internal communication, transmission of science and technology, and international communication. (vi)

R. Mackay and A.J. Mountford (1978, 2) explain that when English ceases to be an examination subject and assumes the role of instrument of communication, acronymic variants of general ELT (English language teaching) have arisen: ESP (English for Special Purposes) and EST (English for Science and Technology). They have identified English for Science and Technology (EST) as a major sub-division of the field of teaching English for Special Purposes (ESP) (6).

There has been a response to the EFL science and technology

focus. In EFL contexts, a major response on the part of applied linguists has been to provide various types of ESP programs, and, in particular, EST courses. ESP syllabi have been the source of considerable controversy when applied to situations for training advanced level students in sophisticated English language skills (Grabe and Kaplan 1997, 157-158).

John M. Swales, when he was Head of the English Department, Faculty of Engineering, University of Libya, admitted the existence of TSW without actually defining it in his *Writing Scientific English* (1971) which was written for the purpose of giving practice of structured contexts through which Arabic students of physical sciences and engineering could develop their ability to express their scientific and technical knowledge in English. He emphasized "dimensions and properties, definitions, descriptions, table and graphs, relative clauses, compound nominals, and other grammatical elements"(Preface). This book is useful for students in English as a Second Language (ESL), but unfortunately it contains examples that consist of only single short sentences. Thus, even if those in ESL master all of them completely from his book, the learners in this field will find difficulties or be unable to edit any complete paragraphs and documents of TSW.

John Kirkman (l980), when he was Director of the Communication and Studies Unit, Department of English, University of Wales Institute of Science and Technology, Cardiff, focused on the choices of vocabulary, phrasing and sentence structure that produce readability. Various types of TSW are quoted as examples, and evidence drawn from surveys is used to demonstrate the stylistic preferences of many scientists and engineers.

Interestingly enough, these types of ESP books were published in Great Britain prior to the United States. At this stage, more than

ten books, including *Scientists Must Write: A Guide to Better Writing for Scientists, Engineers and Students* (1978) by Robert Barrass, were published in Great Britain

In the field of English for Academic Purposes (EAP), we can say that we should instruct in translation techniques because the students and practitioners usually have some documents written mainly in their mother tongue.

If ESP is concerned with successful performance in work, work in which the English language plays an auxiliary role, this idea can applied to native speakers of English. For the nonnative, ESP might mean the teaching of English as an essential means to a clearly identifiable goal. This goal is explained and discussed in Chapter 4 and Chapter 5.

Mackay and Mountford state: "English in Workshop Practice or English in Agricultural Science, including the field of study being dealt with; or we can talk of English for Academic Purpose (EAP) and English for Vocational or Occupational Purposes (EOP)" (4). They also suggest that a major sub-division of ESP is English for Science and Technology (EST). We can easily consider EST as both an occupational and an educational use of English. The former is when we are considering the needs of computer programs, specifications, technical proposals, manuals, etc.; the latter when we consider not only writing research papers by specialists and students, but studying any field of science and engineering through the medium of English.

Mackay and Mountford also explain that ESP is generally used to refer to the teaching/learning of a foreign language for a clearly utilitarian purpose of which there is no doubt (21).

While H. G. Widdowson (1990) makes the case that scientific and technical prose is identifiable as a distinct genre type, he argues that many of the skills and strategies for more general language learning

transfer directly to the study of technical information; therefore, a larger EAP orientation to language learning provides a good foundation for students in technical fields of study (53-54). The teaching method of ESP does not require a strong separation for more general language training of an EAP orientation. As Grabe and Kaplan also explain, whether we employ a general curriculum or a curriculum including technical and scientific materials makes little difference in language teaching (159-160).

It is well established that English is the primary world language of science and technology. Specialized English writing skills are important for Japanese students. A large percentage of the professional and academic population of Japan needs English TSW skills. This explains the rise of ESP and, in particular, of EST (Grabe and Kaplan 1997, 174). The technical writing perspective represents a general movement to respond to student needs and enter the workplace and the professional environment.

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The purpose of this paper is to present what we have to teach in TSW to the Japanese learners in this field, not to discuss how to teach it. What's more, the purpose is to recommend that teachers of TSW to Japanese students and specialists include the contents explained in this paper. The contents to be applied to teaching TSW are the fruit of my almost forty years of teaching experience and what I have learned at the University of Michigan over twenty-five years.

Through conducting English technical and business in-house seminars at more than one-hundred leading companies in Japan and having taught TSW to university students for more than forty years, I have found the common pitfalls these Japanese writers encounter when they produce industrial documents and technical research

papers. Although there are many areas, this paper discusses the most common weak areas: vocabularies, style, and logic in the technical and scientific documents.

Its goal is to help the Japanese students and practitioners in this field learn to communicate TSW effectively in English. I believe my suggestions will also be helpful in teaching this field of English to Japanese professional business people, technical translators, engineers, scientists, and teachers.

Professors J. C. Mathes and Dwight W. Stevenson at the University of Michigan found results similar to mine. They used an analytic checklist produced by the candidates for the composition questions on The Technical English Proficiency Test of the Joint Program in Technical communication of the University of Michigan and Waseda University (TEP Test) 3. The differences between the top

Insert Figure 1

Figure 1 Comparison of Scores on TEP Test 3, First Level Composition Question

6 successful candidates in the test and the bottom 7 successful candidates were primarily in terms of the writers' effectiveness in segmenting and arranging the information on the paragraph level.

A comparison of the top 6 candidates and the bottom 7 indicates that the two groups – though different in scores – were similar in areas of relative weakness – paragraph and details. (Figure 1)

The professors write: "This finding is similar to that of an earlier TEP Test" (9). It suggests areas for further study by Japanese technical writers, whatever their relative skill levels.

We can now consider the principal factors involved in designing course materials relevant to learners in the field of technical and scientific writing. Mackay and Mountford classify the factors involved in designing EST courses under four headings: sociologies, linguistic, psychological and pedagogic (6).

About pedagogic factors, which elements should the learners be taught: "technical and scientific knowledge" or "rhetorical resources"? The former is not a linguistic problem. Therefore if the problems are taught in a person's native language, learners will acquire the knowledge easier than if they are taught in English. Teachers of native speakers of English mistakenly believe that the Japanese students' and practitioners' English is strong in English grammar. But I should say that their English grammar is not strong, only stronger than other areas. That is to say, Japanese students and specialists are usually more concerned with correct grammar than with whether the message is really comprehensible to the intended user.

In order to teach ESP in Japan, we should mainly pay attention to the rhetorical resources, based on the technical and scientific discourses.

Concerning "rhetoric," Jack C. Richards, T. Platt and H. Platt

(1992) describe:

> ...the study of how effective writing achieves its goals. The term "rhetoric" in this sense is common in North American college and university courses in rhetoric or "rhetorical communication," which typically focus on how to express oneself correctly and effectively in relation to the topic of writing or speech, the audience, and the purpose of communication.
>
> In traditional grammar, rhetoric was the study of style through grammatical and logical analysis. Cicero, the ancient Roman orator and writer, described rhetoric as "the art or talent by which discourse is adapted to its end" (316).

In this paper, the thought of "the study of how effective writing achieves its goals" is applied.

Teachers should focus on the rhetorical resources by applying the technical and scientific discourses. Furthermore the need for appropriate preparation for teachers about to embark on the teaching of special-purpose courses is evident.

EST consists of many areas such as specifications, proposals, catalogues, manuals, business·engineering letters, research papers, newspapers, magazine, etc. (See page 62.) However, this paper deals with the fundamental, essential, and common elements for all the learners in this field because they have hardly had a chance to be taught during their school days.

Chapter 2

If a TSW study is to have validity in foreign countries, the investigator must be aware of the history of TSW that existed in the sociological setting within which the technical and scientific

communication took place. In Chapter 2, a brief history of English TSW is introduced from the origins to the present as well as the present situations in the United States and in Japan. This chapter attempts to discover and present technical and scientific potential that exists in that human activity known as science. The investigation reveals that there are grounds for viewing TSW as essentially a social activity that is dependent for its success on the cohesiveness brought about through shared beliefs, and that consequently the technical and scientific process is of fundamental importance to it.

The first step in the investigation is to indicate the grounds for viewing TSW as a distinct human society activity, and the second step, to indicate how to bring TSW to this century.

Chapter 3

In this IT age, we must define what comprises TSW and grasp the genuine meaning in order to use it to teach Japanese learners in this field.

Even though Japan surpasses many other nations in modern technology, the terms used to represent developing technology have not been clarified in Japan. This is because even if this field is important, instruction about this field is more narrowly focused than it is abroad because there are few proper instructors in this field in Japan.

Many professors and authorities define TSW in various ways. The definitions are designed to help familiarize us with TSW from the viewpoint of culture that produces the definition. Then, the first step is to seek for proper teaching areas for TSW based on the definitions of TSW provided by native speakers of English. In Chapter 3, I seek the proper area to teach English TSW to Japanese

learners in this field through the various definitions by authorities of English TSW. We find examples of English TSW, but where are the examples of technical communication found? Is technical communication on computers? Is technical communication in a research paper? Is technical communication a form of speech? These questions cannot be answered easily or quickly. This is the reason many books in this field provide a wide array of titles that are recognized as reference works. In Chapter 3, more than thirty-five different titles are given, and through these books and literature in this field indicate the three major categories: subject matter, linguistic approach, and thought-process approach. There is, however, no clear consensus in the field about the areas and methods of instruction. However, if I summarize what I have acquired while studying TSW in the United States, the following points should always be kept in mind: heading, purpose, summary, audience, selection of data, organization of paragraphs, appropriate paragraph patterns, clear sentences, appropriate choice of words, visuals, and formatting.

Chapter 4

This chapter is the heart of my endeavor. The quintessence of English TSW to Japanese learners in this field is explained in this chapter. I explain the weak areas that Japanese specialists and students reveal when they write in the context of specification, proposal, catalogue, manual, instructions, research paper, technical and scientific newspaper, technical and scientific magazine, etc.

Through conducting English TSW seminars at more than one-hundred leading companies in Japan as well as in the United States, I have found the common pitfalls that the Japanese writers in this field encounter when they produce industrial documents and

technical research papers.

Rhetoric, style, and communicative grammar, however, have similar and common genres even if documents are diverse. According to my experiences of company teaching, a large number of employees in industry are required to write extremely important messages in English almost every day. Almost all Japanese workers in industry have difficulty in writing these documents because of an ignorance of a clear cognitive frame of English TSW. They are usually engrossed in producing English documents without a knowledge of any rhetoric of writing in this field. For this reason English TSW in schools is also perceived as useful. It does help students' writing practice in a number of standard genres in technical and scientific documents.

Today in Japan, almost all of the associations in this field are active to a limited extent only because they lack proper leaders and instructors, and their seminars are not longer offered. Therefore some associations and companies have invited American professors for their in-company or out-company seminars. However, these professors usually have stopped after twice over a period of two years because their methodology for teaching TSW is not suitable for Japanese learners in this field. The way to arrange ideas in teaching English TSW is culturally specific. Therefore we have to train the proper instructors suited for Japanese specialists and students because Japan as one of the big industrial countries urgently needs them

Although there are many areas, this chapter concentrates on the most common weak points: vocabularies, rhetoric, grammar, and format in industrial documents and research papers.

Chapter 5

Through the knowledge acquired in the detailed explanations of the common weak areas in the previous chapter, Chapter 5 shows the real and effective methodology needed to edit English technical and scientific documents of both the business-engineering world and the academic area.

All the examples, except the research papers I edited, were sent from Japan to the United States to share with Americans. Some materials were corrected through interviews with American managers or supervisors. Others were corrected and edited by using the method explained in Chapter 4. All examples were written on the basis of reader's responsibility. Oddly enough, few grammatical errors were found in the research papers though clear sentences, appropriate paragraph arrangement and organization were missing. Ambiguous sentences and inappropriate paragraph patterns were also remarkable in the documents.

To quickly approach the volume of each chapter, Figure 2 is useful.

Chapter 2 is an overview of the origins and development of English TSW and considers the question of how English TSW fits into the general landscape of English language teaching.

Chapter 3 is concerned with the various definitions of English TSW. Figure 2 shows that Chapter 1 and Chapter 2 are almost the same volume.

Chapter 4 considers the basic principles and techniques in English TSW for Japanese learners. The largest part is spent on this chapter because those principles and methods are the most important elements in English TSW.

Chapter 5 is concerned with the practical application of the case

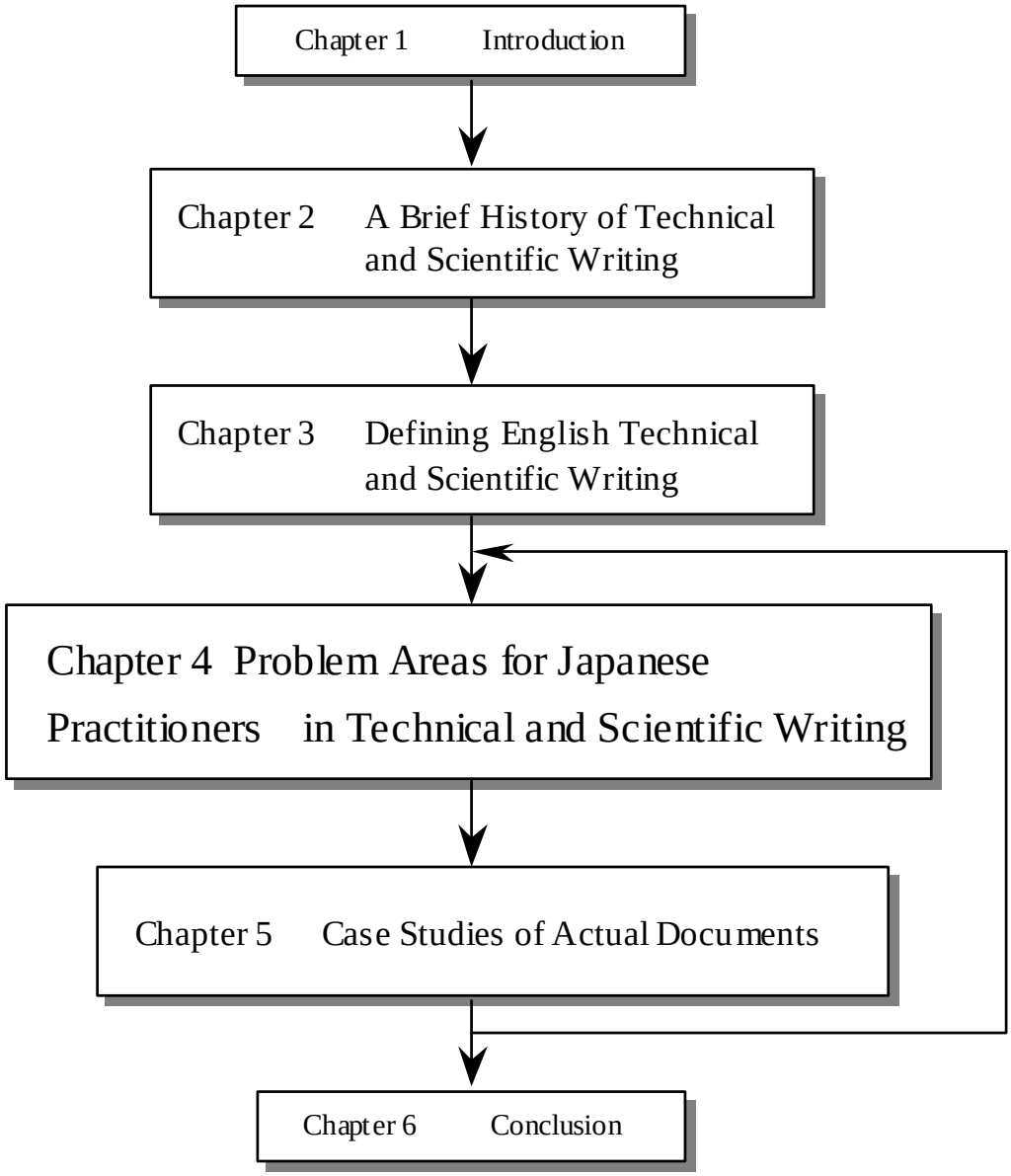

Figure 2 Outline of This Paper Expressed
in the Amount of Pages and in the Approach to the Content

studies. The second largest part is spent on this chapter.

Chapter 6 is the Conclusion.

The arrow from Chapter 5 to Chapter 4 means that, to really understand and grasp my teaching methodology of English TSW, one should re-read Chapter 4 and Chapter 5.

Technical practitioners and teachers must master the essential elements of style and rhetoric in English TSW in addition to the fundamentals of English. Thus, the first half of this paper focuses on the areas of common sense. The second half is intended to be very much a practical guide that is the essence of English TSW for Japanese learners and teachers in this field.

In English TSW courses, as I explain in Chapter 4, Japanese learners should practice extensively important elements such as vocabulary, style, sentence construction, paragraph arrangement, and organization in English technical and scientific documents. Instructors must stress the need for clarity, concision, and logical organization. These elements are recognized as basic skills. English teachers should also teach English and some specific matters. If teachers do not understand content, they should ask the students. Teachers should always keep teaching the methodologies I explain in Chapter 4 and communicative grammar.

As the world has been changing and becoming more of a technical society, English departments in the United States increasingly provide TSW classes for students in science and engineering, business, government, and other fields (Wicklen 2001, 219). To communicate effectively, the principles of composition and rhetoric are essential for TSW. As a natural consequence, an increasing number of men and women must know how to write effectively. This paper, which applies certain principles of composition and rhetoric to TSW, is helpful to those learners, teachers, specialists, and technical translators who are either inexperienced or less effective than they would like to be.

Finally, I must express my sincere appreciation to Professors J.C. Mathes and Dwight W. Stevenson of the University of Michigan.

Since 1975, I have been visiting the University of Michigan and receiving informative and heartfelt instructions from both professors every summer. I have been teaching English TSW these fifteen years at the university. Without their help this paper could not have been accomplished.

Chapter 2

A Brief History of Technical and Scientific Writing

2.1 Overview

In recent decades technical and scientific writing (TSW) as a field of study has emerged as new and complex areas of study in science and technology have developed. Now in the United States, in fact, more than two-hundred colleges and universities provide instruction in TSW (see Appendix A). TSW, however, is by no means solely a product of the twentieth century. It has a long history, which can be traced back to ancient times. TSW has actually been around for all of recorded history.

2.2 Origins and Early History

Michael G. Moran (1985) observed: "the history of technical and scientific writing has not yet been written, so there exists no coherent body of material to cite" (25). Indeed, the historiography on TSW may be slim. But there is abundant data available upon which researchers can draw to begin putting together a history of TSW.

We can trace the origins of TSW to early human beings. In what is now France and Spain, for example, early humans recorded their techniques for hunting buffalo in cave paintings (Weisman 1985, 4). The earliest cuneiform inscriptions of the Akkadians and Babylonians also served technical and scientific purposes, the ancient Babylonians leaving written records of their astronomical and mathematical knowledge. Technical instructions for producing beer are preserved in the New York Metropolitan Museum on a clay tablet from about 2000 B.C. (Moran 1985, 88). Egyptian technical writing in medicine and

mathematics appears on papyrus from about 500 B.C. The writings in mathematics, the physical sciences, biology, and psychology by the ancient Greeks are more than a historical curiosity. Euclid, Archimedes, and Hippocrates influence present-day mathematics, physics, and medicine. The literature of Aristotle can be recognized as technical writing (Weisman 1985, 4).

2.3 Developments in Europe: Before the Twentieth Century

Elizabeth Tebeaux (1999) recently noted that "English technical writing clearly emerged during the Renaissance and the first decades of printing" (209). Indeed, in Europe in general during the 15th and 16th centuries when knowledge in science – or natural philosophy, as it was called – dramatically exploded, Renaissance scientists discovered that their modes of discourse were crucial to their larger success. Communication techniques were not only important but indispensable for providing emotional and psychological relief by means of style. Their styles were genuinely a "physick of the understanding"(Stephens 1983, 188). Leonardo da Vinci certainly was writing technical and scientific documents when he made notes on his drawings of mechanical wings. Georg Bauer (1494-1555), the father of mineralogy, wrote the first mineralogy textbook, *De re metallica,* in 1556. This book is said to join technology and news science (Goldsmith 1963, 46). Likewise, the writings of Paracelsus (1493-1541), Copernicus (1473-1543), Galileo (1564-1642), and Kepler (1571-1630) can also be considered TSW (Miller 1975, 198-216).

Early TSW in English can be found in a range of disciplines, not only agriculture, medicine, and science, but major trades and crafts. In seventeenth-century England, The Royal Society of London for the Promotion of Natural Knowledge, founded under the auspices of

Charles II in 1662 for the advancement of science, sought to use scientific discourse to solve major social, military, and economic problems while seeking to expand understanding of nature (Goldsmith 1963, 48). "The oldest scientific journal – incidentally, the oldest periodical of any kind – published in Britain is the Philosophical Transactions of the Royal Society, which started in March 1665" (Goldsmith 121). The journal became official in 1752. TSW in English over this time period emerged as a distinct form of discourse. As Tebeaux has written, "…during the 1641 – 1700 period technical writing gained credibility and prestige." She added: "The most common forms of seventeenth-century technical books were instructions, descriptions, proposals, and specifications. Many of these technical books show techniques in style, organization, or format that seem decidedly modern" (210). The prose of Francis Bacon (1561-1626), William Harvey (1578-1657), Robert Boyle (1627-1691), and Isaac Newton (1642-1727) can be considered TSW (Hicks 1961, 1).

During the Industrial Revolution, as more complex tools and machinery were developed, the need for explanations of mechanical processes grew rapidly (Shelton 1994, 2). In his *Writing for Engineering and Science* (1961), Tyler G. Hicks points out that "engineers and scientists from the earliest days of recorded history have written reports, proposals, and other documents about their work" (2). But much of the world's best-known TSW was done by outstanding engineers and scientists in the recent past including such important figures as Robert Stevenson (1772-1850), William J. M. Rankine (1820-1872), Henry John Smith (1826-1883) and Earnest Rutherford (1871-1937). Studies show that, in general, the greater humankind's engineering or scientific achievements, the more diverse and sophisticated TSW discourse has become. The eighteenth and nineteenth centuries saw this dynamic clearly at work.

2.4 The Twentieth Century

Last century an activity that played an especially important role in the development of TSW was military warfare. As late as World War I, weaponry was relatively unsophisticated technologically. Therefore if instruction manuals were inadequate, military users usually could still master a weapon through trial and error (Weisman 1985, 3-9).

During World War II, with the advance of elaborate electrical and hydraulic systems, advanced and sophisticated weapons made effective and readable instruction manuals more necessary (Shelton 1994, 2). Communications developments during this time allowed the spread of technical documents more than ever before. The Second World War brought a tremendous speed-up in research and technology, culminating with the invention of nuclear bombs. As engineering and science burgeoned so did rhetoric – in form and style – to discuss the work.

The discipline of modern TSW truly emerged during World War II. Increasingly sophisticated technical processes were used to manufacture weapons. With the start of World War II, as aircraft, naval vessels, tanks, and a variety of other weapons became complex, millions of young soldiers were assigned duties covering the operation or maintenance of them (Hicks 1961,1). Effective written instructions were needed. Indeed, World War II speeded up tremendously research and technology. A quick and efficient method to explain new scientific devices and weapons to ordinary soldiers who were going to use them was needed. In order to make these soldiers effective users and repairers, instruction manuals were devised (Weisman 1985, 3-9). Within a few years a huge volume of training and instruction literature was developed. Communications developments during this time allowed the spread of technical

documents more than ever before.

With the end of World War II as high-tech products became a standard part of everyday life in mainstream society, complex, comprehensive written instructions for their use became essential. Industry, to meet this need, needed to take a new approach to how it produced its technical literature. Until the start of World War II, most engineers and scientists did most of the TSW related to their projects. Engineers prepared instruction manuals, maintenance brochures, specifications, part lists, and similar material. Scientists wrote reports covering their research findings, results of investigations, and other related documents. The only major area in which engineers and scientists did not write extensively was industrial advertising. But even in this field engineers and scientists were often asked to check copy and verify technical facts. Thus, there were few qualified technical and scientific writers in any field. But as high technology proliferated in the decades following World War II, more writers with an expertise in science and technology were needed. The introduction of nuclear energy, missiles, satellites, space probes, transistors, and a variety of other new technological devices and products tremendously increased the need for specialist writers who could prepare technical literature.

In general, after World War II, as the aerospace and electronic industries expanded, extensive specialized documentation – prepared by trained writers – was required by private companies and government. The very term "technical writer" encapsulates these developments. "The term first came into use after the Second World War. At that time, the title 'technical writer' was being used to describe people with a technical background whose main function was to present the results of technical progress to non-technical people" (Goldsmith 123).

An especially great surge in TSW, since the end of World War II, came with the computer revolution. Since the development of the first powerful mainframe computers in the 1960s, instruction, description, and documentation within the high-tech arena have become crucial to every facet of our work and home lives. As James H. Shelton, in *Handbook for Technical Writing* (1994, 2), notes, everything from automobile-owner manuals describing computerized dashboards to the instructions for booting up personal computers floods us with technical information.

The advent of the computer has indeed greatly changed the preparation and understanding of English documents. As Kenneth Houp and Thomas Pearsall observed in *Reporting Technical Information* (1984), in the 1970s instruction in technical writing grew rapidly and steadily. Exact figures are difficult to obtain. But according to the sale of textbooks in the field, in the United States alone, the number of students per year taking technical writing jumped from about 25,000 in 1968 to over a quarter million in 1982 (v).

In recent decades, other developments besides the surge in high technology, in particular computers, have contributed to the growth of TSW. For example, there is an organizational and management element which is in part responsible for the growth. TSW is a technological product, a residue of technological management. Management insists that "private companies – multinational companies – are likely to be the most effective mechanisms for the spread and development of useful technology. Technical writing as a profession is a result of such management logic" (Dobrin 1983, 242).

Also, quite recently, as technological products have become more and more sophisticated, hazardous problems have often occurred. The best way to eliminate hazards is to design foolproof products. But

this is usually not possible. Therefore, accurate, correct, understandable documents for consumers and workers are required. Hazard communication is the method of informing consumers and workers of the dangers inherent in the materials which they use or the environment in which they work, with the goal of averting health problems and accidents. In industrial countries the right of workers to this information has only recently been established under law. Laws about product liability are indeed relatively new. TSW is a critical element in the implementation and enforcement of laws protecting consumer and worker rights.

TSW has certainly become a specialized and integral part of the modern world. No where is this more true than in the high technology center of the world, the United States.

2.5 Technical and Scientific Writing in the United States

Although TSW did not originate in the United States, the United States is now the world leader in TSW. The rapid growth of science and technology in the contemporary United States has led to significant changes in the nation's scientific and technical information activities. These changes include, besides the widespread formal instruction in writing for purposes of science and technology, new methods of publishing, disseminating, storing, and retrieving scientific and technical information. Leading organizations of technical communication in the United States are the Society for Technical Communication (Appendix B), the International Council for Technical Communication, and the Association of Teachers of Technical Writing. Understanding the scope and aims of these professional organizations provides a good window on the current state of TSW as a field in the United States.

In 1953, two separate organizations, both interested in improving

the practice of technical communication, were founded in the United States: the Society of Technical Writers and the Association of Technical Writers and Editors. In 1971, these organizations merged and took the name the Society for Technical Communication (STC). STC is now the world's largest professional organization serving the technical communication field, with a total of more than 24,000 members and 144 chapters in 39 countries.

STC's mission is to improve the quality and effectiveness of technical communication for audiences worldwide. Its goals:

- Encouraging research in technical communication
- Developing programs for self-improvement of technical communicators
- Developing programs for in-plant training of technical communicators
- Developing college curricula for the education of technical communicators.
- Granting scholarships in technical communication.
- Recognizing excellence in the products of technical communicators.

(*STC Facts*, STC-39-80)

The International Council for Technical Communication (INTECOM) was founded in 1970 by communication societies in the United States, Great Britain, the Netherlands, and Sweden. INTECOM now represents or has established contacts in all countries where technical communication societies exist.

Its main objectives can be summarized as follows:

- to improve the standards of writing, speaking and graphic

communication in all applications of science and technology.

- to promote understanding of the importance of technical communication.
- to foster the formation of technical communication societies in countries where they do not yet exist.
- to facilitate the exchange of information and experience among member countries.
- to carry out projects of mutual interest to member countries.
- to assist member organizations in international matters.

(*This is INTECOM*)

The Association of Teachers of Technical Writing (ATTW) was formed in 1973 to encourage dialogue among teachers of technical communication and to develop technical communication as an academic discipline. Its international membership includes over 1,000 teachers and professional communicators.

A telling statistic on the professionalization of TSW as a field of endeavor in the United States is as follows: of the more than two-hundred colleges and universities in the United States which offer instruction in technical communication, eighty universities and colleges offer master's degree programs in the field, and nine offer Ph.D. programs.

2.6 English Technical and Scientific Writing in Japan

English TSW is just emerging in Japan. There are practitioners but the field's professionalization has advanced more slowly than in other leading industrial nations.

The nation's first technical and scientific writing organization

was the Japan Society for Technical Communication (JSTC) (Appendix C), established in 1980, at the request of the Japan Management Association (JMA). JSTC's original main goals were similar to the main goals of the Society for Technical Communication and the Association of Teachers of Technical Writing. JSTC's original main activities were as follows:

To encourage research in technical communication.
To develop technical writing trainers.
To develop correspondence education on technical writing.
To conduct in-house training in technical communication.
To publish a quarterly professional journal.
To conduct seminars on English technical communication.
To publish English standards for technical writers.
To test once a year proficiency in English technical writing.
To conduct a yearly general meeting.
To conduct international conferences in Japan.

In 1983, the Japan Association for Technical English Communication (JATEC) was founded. With some one-hundred fifty members, JATEC is one of the leading organizations for technical and scientific English in Japan today. JATEC prepares and administers the Technical Proficiency Test (TEP Test). Since 1983, JATEC has sponsored a summer seminar for Japanese technical and business English specialists, held at the University of Michigan.

Among universities in Japan, Waseda has been especially active in advancing the field of technical and scientific English. Besides originating, in 1987, the TEP Test, in conjunction with the University of Michigan, Waseda sponsors the test. The University offers course instruction in English TSW. Also, since 1988, Waseda has sent

students, for a seminar in technical and business English writing, to the University of Michigan in the summer.

There are, in Japan, today, other leading organizations for promoting technical and scientific English. These organizations include the Japan Association for Technical Communicators, the Japan Association for Translators, and the Manual Study Group.

There are, in Japan, today, still no undergraduate or graduate degree programs in English TSW.

Chapter 3

Defining English Technical and Scientific Writing

3.1 Overview

The need for definition always arises when ambiguous and complex terms are introduced. This situation describes well the current state of meaning in relation to the term "technical and scientific writing." Authorities define technical and scientific writing (TSW) in various ways. Some sense of the range of meaning connected with TSW can be gotten from the titles of texts used in the field. Sample titles include:

Business and Technical English, Engineering English, Engineering Writing, English for Engineers, *Professional Technical Writing, Report Writing, Reporting Technical Information, Science and Engineering Communication, Science and Technical Writing, Scientific Communication, Scientific English, Scientific and Technical Communication, Scientific and Technical English, Scientific and Technical Papers, Scientific and Technical Writing, Structure of Technical English, Technical and Business Writing, Technical Communication*, *Technical Correspondence, Technical Editing, Technical English, Technical and Professional Communication, Technical Report Writing, Technical Writing*, *Technical Writing and Communication, Technical Writing and Professional Communication, Technical Writing for Social Scientists, Technically-write, Writing for Engineering and Science, Writing for Science and Technology, Writing for Technical Professions, Writing for Technicians,*

Writing in the Technical Fields, Writing Scientific English, Writing Technical Articles, and *Writing That Works.*

The Cambridge Encyclopedia of The English Language (1995) does not speak of "*technical writing,*" "*technical and scientific writing,*" or "*technical communication*," but includes instead entries for "*Scientific English*" and "*English for Science and Technology (EST)*."

What, then, is technical and scientific writing? If there is no universally-shared definition of TSW, what are some main points generally agreed on by practitioners? Fred H. Macintosh (1975, 23-33) suggests that we should define TSW by collecting many pieces of TSW and finding the characteristics they share, and he lists about forty different purposes and forms of TSW. Is there a general consensus in the field on these forty items? More to the point, how should TSW be understood – and approached – by nonnative speakers of English? That is, does the field lend itself to study and application by native speakers and nonnative speakers in a similar manner? Becoming familiar with TSW from the viewpoint of culture may prove instructive. Teaching TSW, after all, is not a culturally neutral act. Instructors and students alike make sense of and use TSW in the context of their own cultures. How do native speakers of English approach TSW? How do nonnative speakers approach the field? Some inquiry into these questions can help TSW instructors in Japan know how best to help students conceptualize and become active participants in the field.

3.2 Native-Speakers-of-English Approach

3.2.1 Introduction

How is TSW understood by native speakers, in particular in the

United States and in the United Kingdom? What common ground is there among native speakers in defining the field?

W. Earl Britton (1975) divides TSW into four categories: subject matter, linguistic approach, type of thought process, and purpose (9-14).

Joseph Dagher (1978) distinguishes technical communication from other types of communication as follows:

> General communication is the use of effective language to express a message to achieve a predetermined purpose. Technical communication is the use of effective language to express a *commercial, industrial, or scientific* message to achieve a predetermined purpose (italics in original) (1).

His definition contains three main elements: language, message, and predetermined purpose. Not mentioned is the importance of organization, rhetoric, or syntax.

Kenneth Houp and Thomas Pearsall (1984) maintain that technical writing includes three elements:

1. A problem or subject matter that is not popular knowledge but rather is specialized in that it belongs to art, science, medicine, engineering, or the like.
2. Study, investigation, observation, analysis, experimentation, and measurement to obtain accurate and precise information about the problem or subject matter.
3. The organization and presentation of the information thus gained so that it will be clear and meaningful to the person or persons for whom it is intended (4).

Houp and Pearsall give examples of non-technical writing and technical writing:

Example	*Commentary*
…the very nice plant my mother had on her table in the front hall.	Everyday, homey diction; much depends on the reader's imagination.
… in a shaft of yellow sunlight, a white-flowering begonia in a red clay pot.	Pictorial, vivid, sensory; "shows" rather than "tells about."
… a twelve-inch begonia propagated from a three-inch cutting; age, 42 days.	Specific, "technical"; factually informative.

(5)

Houp and Pearsall conclude that "…a reporter of technical information … has to use all of these 'languages,' … to convey … message to … intended readers" (5). Like Britton, they emphasize the importance of subject matter. But what is subject matter? Even if we could agree that "technical" implies "subject matter," is there agreement on which subjects are "technical" and which are not? As Gordon Mills and John Walter (1986) point out, "one of the obvious characteristics of technical writing is its technical subject matter, but most admittedly there is the difficulty of saying precisely what a technical subject is" (5). Houp and Pearsall also suggest the importance of paragraph construction, vocabulary, sentence structure, signs, symbols, formulas, and audience analysis. They mention little rhetoric or thought process.

Besides subject matter, Mills and Walter speak of TSW as being defined by the following three categories:

1. to be characterized by certain formal elements, such as its scientific and technical vocabulary, its use of graphic aids, and its use of conventional report forms.
2. to convey information accurately and concisely and the absence of any attempt to arouse emotion.
3. to be involved in the tasks of description of mechanisms, description of a process, classifications, and interpretation (4-5).

David Dobrin (1983) defines TSW as follows: it contains specialized subject matter; scientific and technical vocabulary and objective style; and specific rhetorical modes and formats (242-246).

Marva Barnett (1987) defines TSW as nonfiction. Barnett defines it, at one extreme, as any nonfiction, at the other extreme, as a highly academic writing style used by scholars in various sciences for scientific papers written only for other scholars. And, to eliminate most common communication problems, Barnett sets out the following eight basic principles:

1. Understand the reader.
2. Know the purpose of each report.
3. Know the subject matter.
4. Organize the material.
5. Write objectively.
6. Use standard English.
7. Use correct format.
8. Adopt ethical standard (5).

Theodore Sherman and Simon Johnson (1975) present the

following views on the field of study:

> **Technical communication** is both a process for and a profession of presenting information and reports facts, process, or results of process in terms familiar to a well-defined audience.
>
> **Technical writing** tends toward objectivity, often follows careful specifications, is usually graphic writing, is frequently numeric, is often symbolic (7).

These definitions may be helpful. But it is fair to raise the question about how clearly and precisely they distinguish between technical communication and technical writing.

William Pfeiffer (1997) suggests that "technical writing is a generic term for all written communications done on the job – whether in business, industry, or other professions." He writes: "It is particularly identified with jobs in technology, engineering, science, the health professions, and other fields with specialized vocabularies. The terms technical writing, professional writing, business writing, and occupational writing all mean essentially the same – writing done in your career" (7). Pfeiffer presents the following main characteristics of TSW:

- **Purpose**: Getting something done within an organization (completing a project, persuading a customer, pleasing your boss, etc.)
- **Your knowledge of topic**: Usually greater than that of the reader
- **Audience**: Often several people, with differing technical backgrounds
- **Criteria for evaluation**: Clear and simple organization of

ideas, in a format that meets the needs of busy readers (7).

Pfeiffer contrasts TSW with academic writing:

1. Technical writing has a practical role on the job, whereas academic writing aims only to display your knowledge.
2. Technical writing is done by an informed writer conveying needed information to an uninformed reader, whereas academic writing is done by a student as learner for a teacher as source of knowledge (7).

TSW is often aimed at many readers, whereas academic writing is often aimed at a single reader.

* * * * *

This sampling of the literature sheds light on how native speakers of English define the field of study. The definitions are various and clearly cover a range in their scope, character, precision, and focus. Yet if the definitions are distinguished by their differences, they also do share common ground. Three elements included in many definitions are subject matter, linguistic approach, and thought-process approach. These elements are discussed further below, in a larger review of the literature which includes the surveying of more than one-hundred textbooks and sources in the research literature.

3.2.2 Definitions by Subject Matter

Almost all authorities on TSW classify it by subject matter. In total, one-hundred and five sources on TSW were examined. Of these sources, seventy-three (some seventy percent) contain subject

matter in defining TSW.

Joseph Ulman and Jay Gould (1972) wrote that TSW requires "one certain clear specific purpose to convey information and ideas accurately and efficiently, specific audience, and framework for the parts" (5-6). This definition is rather ambiguous, but they clearly target TSW as subject matter.

John Mitchell (1962) used the term "technical communication," not "technical writing," and observed that "The specific formulas of technical writing are premised on the fact that technical communication is essentially as "technical" as the amount and type of detail it contains" (2). He defined TSW as the content area (or subject matter) as well as the style and audience.

Fred H. Macintosh (1975, 23-33) wished to impress upon English teachers the importance of the variety of TSW, and listed more than forty different purposes and forms of TSW. His conclusion, however, is incomplete because he mixed pieces of technical writing with those of non-technical writing.

Rebecca E. Burnett (l994) explained: "technical communication was defined initially as writing that dealt primarily with scientific and technical fields; but subject matter – although certainly relevant – proved to be insufficient to define technical communication. More recent definitions focus on the collective characteristics of technical communication – characteristics such as purpose, subject matter, approach, and audience" (5-6). With minor adjustments, these characteristics apply to all modes of TSW – whether oral presentations, written texts, or visuals. The following summarizes the collective characteristics Burnett discusses.

Characteristic	Explanation
Purpose	informs and persuades

Audience	addresses identified readers who often have multiple needs
Need	fulfills specific, identified needs; material and approach adjusted to audience needs
Interpretation	recognizes that multiple interpretations are possible
Subject Matter	conveys technical aspects of any field; adjusts the technical content to the audience
Timeliness	becomes easily dated
Approach	tries to be straightforward; differentiates opinions from verifiable information
Graphics	convey content; aid understanding and decision making
Format	often uses standard formats to take advantage of audience expectations
Style	uses clear and direct language without unnecessary complexity; often uses short-to-medium-length sentences, subject-verb-object word order; stylistically varied but simple
Design	contributes to ease of reading (6)

Burnett's explanation contains problems. She ignores that catalogues, manuals, and research papers have different audiences.

In TSW, subject matter is extremely important. Indeed, in the early years of this field, during the 1950s and 1960s, many scientists and engineers, not English teachers, edited textbooks and references on TSW which included subject matter in science, engineering, and business to improve the TSW abilities of science students (Blickle and Passe 7). But subject matter alone does not define TSW. If it did, then poetry, essays, and novels would be considered TSW if they dealt with

the same subject matter as TSW.

3.2.3 Definitions by Linguistic Approach

Ninety-eight books out of the one-hundred and five sources checked (some ninety-five percent) contain linguistics in defining TSW.

A. R. Moon (1961) wrote that "teachers of English who have taught in colleges of technology and technical schools know that their students touch the outside world at many points, not the least of which is that of literature" (3). Moon covered choice of words, sentence problems, paragraph development, style, letter writing, and oral and written communications, while not including subject matter, functional English, rhetoric, or audience. Reflecting the trends of the age at the beginning of TSW, he quotes several lines from great writers like Horace Walpole, Charles Lamb, Percy Bysshe Shelly, John Keats, Charles Dickens (10). Early instructors in TSW appear to have felt compelled to quote "great writers" to provide their works with a sense of dignity.

R. A. Close (1965) lamented the poor writing skills of science and technical students and practitioners. He commented about "scientific English": "it has certain distinct characteristics with regard to vocabulary, syntax, and morphology" (3).

John Kirkman (1980) focused on the choices of vocabulary, phrasing and sentence structure that produce readability. He presented various types of TSW as examples, and used evidence drawn from surveys to demonstrate the stylistic preferences of many scientists and engineers.

Michael H. Markel (1988, 5-9) emphasized five basic characteristics in relation to TSW: clarity, accuracy, accessibility, conciseness, and correctness. However, these are important linguistic

elements not only for TSW, but for almost all pieces of writing.

Robert A. Day (1992) distinguished creative writing – poetry, novels, dramas, and essays – from scientific writing. The former deals chiefly with feeling, emotion, opinion, and persuasion. According to Day, the language used in this field uses extraordinary beauty and complexity, with fascinating metaphors and other figures of speech. The latter field emphasizes the dispassionate, factual recording of the results of scientific investigations (1-5). For Day, TSW should use "prosaic words of certain meaning, organized simply into precise phrases, clauses, sentences, and paragraphs" (1-5). He further draws a distinction between "scientific writing" and "science writing." Day notes: scientific writing is "writing written by scientists for an audience of scientists, whereas science writing is written for an audience of nonscientists. Therefore the vocabulary, tone, and complexity of these two types of writing differ" (2). His definition, however, misleads us into believing that a written "proposal" does not belong to scientific writing. On scientific or technical problems, proposals should be written by scientists, non-scientists, engineers, or non-engineers.

David Crystal (1995, 119) surveyed early British TSW instruction. He noted that it included grammar and sentence structure. He found, however, that the instruction emphasized vocabulary. The distinctiveness of TSW, he observed, lies in its lexicon.

3.2.4 Definitions by Thought-Process Approach

An important principle in communication is organization. TSW, to be effective, must employ specific organizational elements (e.g. paragraph structure, logic, transitions) and follow traditional formats. Detailed strategies are required for selecting and arranging material within the discussion of technical documents. TSW is highly

structured writing. It is a kind of writing which usually entails much planning – forethought and ongoing critical assessment. TSW is the product of careful thinking. Such a "thought-process" approach puts an emphasis on structure and reasoning as the writer invents, drafts, and edits.

Robert Zetler, a functional English specialist, and W. George Crouch (1961) observed: "this process of analysis and organization is basic to any kind of writing, but good technical writing, in particular, needs to rest upon firm organization of thought" (1).

John S. Harris and Reed H. Blake (1976) called for a "technical" rhetoric which would strive for prose as rigorously objective and clear as the science that it serves (23).

Howard Hirschhorn (1980) focused on practical ways to write the specialized documents needed by modern industry, science, research, and technical management. He provided step-by-step, detailed procedures for achieving "technical" rhetoric.

J. C. Mathes and Dwight Stevenson (1990) see TSW as the outcome of systematic processes. They suggest that the format and design must take into consideration audience, purpose, the role of writing within organizations, and the relevance of research in organizational behavior. They suggest that writers need to approach deliberately and to prepare systematically effective technical documents.

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Native speakers do not agree on the definition of TSW. Indeed, there may be as many definitions as there are practitioners. Parameters, aims content – these elements of the field are not universally agreed on. The field, for native speakers, is in flux. In *A Guide to Technical Writing* (1908), an early, widely-used textbook, T.

A. Richard focused on usage, with chapters on abbreviations, numbers, hyphens, relative pronouns, titles, page specifications and the like aimed at helping engineers write more accurately, concisely, and precisely. In contrast, Mathes insists that TSW is not grammar or vocabulary, but organization.

TSW challenges conceptualization for native English speaking practitioners. Subject matter, linguistics, thought process, each alone or in some combination, which commonly includes other areas of study, often is at the center of inquiry (Figure 3).

Audiences:	66%
Readability	5
Organizing Your Ideas	13
Collecting Data	21
Titles and Headings	8
Purpose	19
Abstracts and Executive Summaries	26
Rhetoric (Discussion Patters)	
Persuasion (Argument)	26
Problem/Solution	19
Cause and Effect	20
Comparison or Contrast	22
Analysis (Classification)	48
Description (Partition)	52
Process or Instructions	48
Investigation	15
Definition	56
.....	
Formats	38
.....	

Editing Paragraphs	46
Editing Sentences	70
Spelling	3
Grammar	93
Clarity	64
Conciseness	73
Word Choice	85
Location of Modifiers	2
Redundancies	4
Style	87
Tone	12
.....	
Conclusions	2
Proofreading	10
Visuals	58
Multinational Context	5
Legal Responsibilities	6
Electronic Communication Tools	8
.....	
Writing for Technical Magazines (Journals)	19
Manual	41
Contracts	35
Proposals	67
Specifications	43
Resumes	65
Letters	69
Reports	92
Minutes	4
Catalogs	3
Sales Brochures	3

Technical and Scientific Books	3
Article and Paper (Research)	64
Numbers, Units of Measure, Symbols	53
.....	
Oral Presentation	66

Figure 3 Suggested Items to be Studied (as a percentage of the 105 sources examined)

How do nonnative speakers understand the field? What approaches are recommended for them? (See Appendix D)

3.3 Nonnative-Speakers-of-English Approach

3.3.1 Nonnative Speakers as a General Population

The recent literature includes at least three main different approaches in setting out TSW for nonnative speakers.

One approach can broadly be called intercultural. How does culture influence communication? How can members of different cultures communicate – for purpose of science and technology – across culture effectively? Nancy L. Hoft (1995) poses a fundamental challenge in this regard, noting that individuals from different cultures might have different communication expectations in similar organizational settings.

A second approach focuses on user deficiencies. What are the main problems nonnative speakers have in relation to English TSW? How can these problems be categorized? M. Casady and L. Wasson (1994, 36-40), as an example, surveyed writing done by two-hundred and twenty-one international companies in the United States. Their major findings were as follows: the most frequently cited writing deficiency among the international companies surveyed was

"mechanics." The second most cited writing deficiency was "content." The third most frequent writing deficiency was "style and tone." The following presents the study's total findings.

Total Factor Responses		% of Companies	
185	*Mechanics*		
	Spelling	47	
	Grammar	43	
	Punctuation	33	
	Proofreading	18	
	Format	14	
143	*Content*		
	Sentence structure	40	
	Organization	31	
	Composition/Wordiness	24	
	Paragraph structure	22	
	Creativity	2	
60	*Style and Tone*		
	Word choice	19	
	Tone/Psychology	12	
	"You" approach	12	
	Clarity	4	
	Limited vocabulary/ stilted phrases	3	
35	*Other*		
	Illegible writing	29	(38)

A third approach, closely tied to the second approach, is editing and composing skills development. What particular drafting skills do nonnative speakers need to produce effective technical documents in English? In E. H. Weiss' words: "there are hundreds of small, precisely identifiable tactics for reducing the risk of misinterpretation in an international English transaction" (1998, 13). Weiss' tactics include the following:

1. Adopt a controlled vocabulary.
2. Choose words with one or few meanings.
3. Choose the most common meaning of words with many meanings.
4. Avoid verbs having two or more words.
5. Use the simplest verb forms.
6. Use indicative mood and active voice.
7. Define all special terms in a glossary.
8. Choose words that are easy to pronounce.
9. Do not coin words that are not needed.
10. Avoid wordy expressions for time, place, and relationship.
11. Avoid nominalizations.
12. Use standard grammar.
13. Form words in standard ways.
14. Beware of the several Englishes.
15. Avoid illogical or arbitrary idioms.
16. Avoid figurative language, especially sports and military images.
17. Avoid regionalisms and slang.
18. Avoid humor, wit, sarcasm, or irony.
19. Construct simple sentences.
20. Use optional words.

21. Punctuate aggressively.
22. Use accessible layout.
23. Use lists instead of paragraphs.
24. Use tables instead of prose.
25. Be polite. (1998, 11-15) (Appendix E)

3.3.2 Japanese Practitioners and English Technical and Scientific Writing

How does the literature in – or about – Japan treat English TSW? How do Japanese practitioners approach the field? To answer these questions more than one-hundred textbooks used to teach English TSW in Japan were examined.

The approaches used to TSW in other nonnative English speaking countries are also found in Japan. English TSW, in Japan, is treated from an intercultural point of view. John R. Kohl et al. (1993, 62-73), as an illustration, have noted that "we have gained a reasonably accurate conception of the key factors that influence Japanese technical communication: the ambiguity of the Japanese language, Japanese attitudes toward ambiguity, the influence of ambiguity on Japanese communication, and use of English for technical communication" (63).

The user deficiency and practical drafting skills approaches have also been adopted in Japan. These twin interests – identifying common textual errors and prescribing practical remedies – inform the "Practical English Technical Course" (1987) conducted by the English Education Foundation of Japan, which is supported by the national department of education.

Part I Writing Point Review

Unit 1 Basic Five Sentence Structures

Unit 26　English Letters (1)
Unit 27　English Letters (2)
Unit 28　English Letters (3)
Unit 29　Telegraphic and Telex Messages
Unit 30　Advertisement

Figure 4　Contents of *Practical English Technical Course,* English Education Foundation of Japan (1987)

Besides the above three approaches, other approaches to English TSW are taken in Japan. For some practitioners, English TSW is an act of translation, with the original Japanese being converted into English. An especially common understanding of the field is "literary."

In surveying the English TSW literature in Japan, 134 textbooks were checked. Their main foci were as follows:

Table 1　Instructional Focus and English TSW Literature in Japan

Instructional Focus	Number of Textbooks
・Reading on scientific and technical topics:	132
・Reading and translation of Japanese short sentences into English using scientific and technical topics:	7
・Reading, grammar, and translation of Japanese short sentences into English using scientific and technical topics:	9
・Audio-lingual approach to technical English:	2

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Technical and scientific writing, it can be argued, has defied definition. There is no clear consensus in the field about areas and methods of instruction. Native speakers do not agree on these matters. Not surprisingly, therefore, nonnative speakers as well are not all of the same opinion.

How can English TSW be taught to Japanese learners? What instructional methods, materials, aims work with this group? The chapters that follow lay out one approach to answering these questions.

Chapter 4

Problem Areas for Japanese Practitionersin Technical and Scientific Writing

4.1 Overview

Few American or British instructors or specialists have grasped the weakest areas for Japanese students, specialists, and translators in technical and scientific writing (TSW) (Appendix E). Over a period of almost forty years, I have analyzed more than 40,000 pages of English technical samples written by Japanese specialists and professionals in TSW from more than one-hundred different companies in Japan. I have come up with several observations about lexicons, syntax, style, rhetoric, format and the like. The following main factors are identified as possible explanations for the limited writing success for these people.

Based on my experiences and the definitions I explained before, my definite goal on English TSW is more concrete and concise. I have found a shift in emphasis from general English (GE) to Special Purpose English (SPE) which, since 1978 I have referred to by the abbreviation, SPE. After that, however, John Swales and his colleagues used English for Specific Purposes (ESP), which has gained a wide reputation. My definition of TSW is achieved by indicating the difference between GE and ESP. This difference can be explained as follows (Figure. 5).

The GE area has become something of a “natural reserve,” a kind of paradise, for Japanese professors and instructors who stay in this area are very reluctant to leave this Garden of Eden for the rather more dynamic, real world of English as it is spoken and applied in

real-life situations. If I use another metaphor, this situation might be likened to a small, quiet lake, in which the fish suffer from an

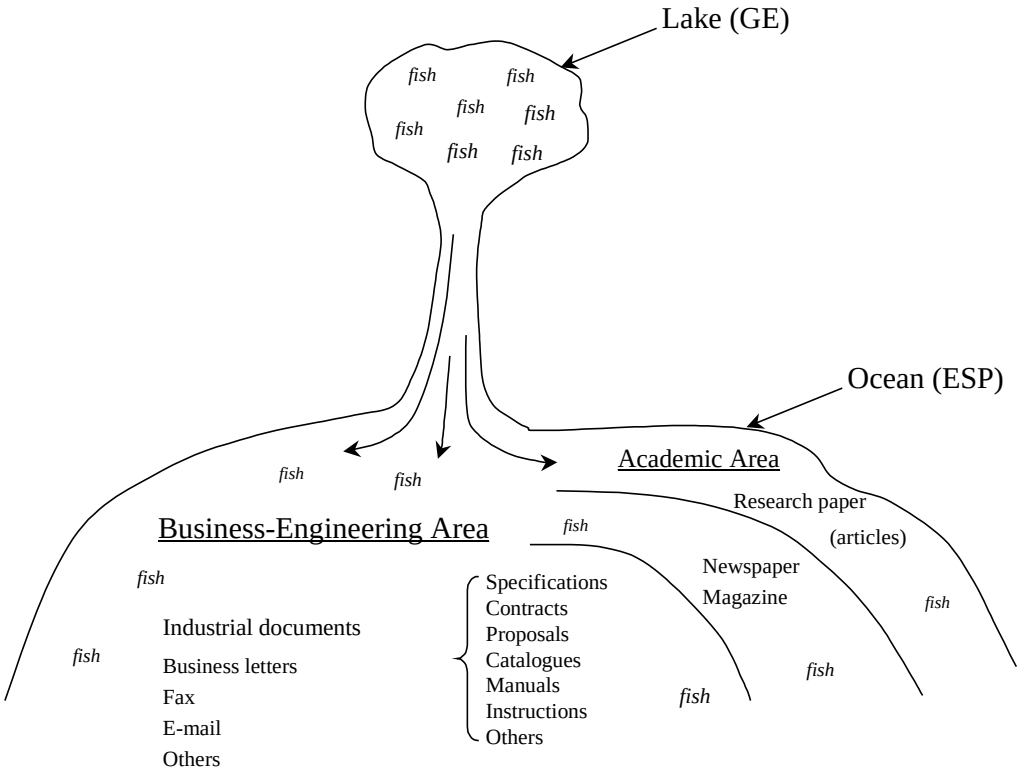


Figure 5 Different regions between GE and ESP

excess of oxygen.

This lake is likened to a small world with an overemphasis of English grammar, syntax, and literature. Few fish want to stay in real world English, but most Japanese who have studied English like to remain in this small, quiet world. The fish in the lake would not come out of this lake and go into the ocean. They do not seem to be aware that this lake is contaminated by an excessive amount of oxygen and that is the purpose of the entrance examination to universities or colleges. They study more than enough English grammar, syntax, and literature. Sadly enough, they are compelled to study these areas even after they enter universities or colleges or real

world. This lake can compare to a grammar-, translation-, and literature-oriented world.

Will some of our fish be able to find their way out of this placid little lake? Will they find a vast ocean – a far more dynamic, expansive environment – of research papers, technical letters, business letters, specifications, proposals, catalogues, manuals, resumes – in short, the real world English? Some fish will find a region such as specifications, some catalogues, and so on. Strangely and sadly enough, most Japanese instructors, specialists and students of English TSW have the least idea of this real-world English though they need these abilities.

At this point, I would like to take a look at some of the common weakest points for Japanese specialists and translators in English technical documentations.

From these experiences of mine with real-world English, it is my assumption that the following four areas will always require our special attention.

Vocabulary
Rhetoric
Grammar
Format

While this chapter addresses all four areas, the focus is on vocabulary and rhetoric as I consider them to be the most important. The end of this chapter discusses grammar and format briefly.

4.2 Selecting Correct Vocabulary

R. R. Jordan explains in *English for Academic Purposes* (1997) that, regarding the writing difficulties of overseas postgraduates

attending writing classes at universities in the United Kingdom, questionnaires filled out by students and academic staff showed the following results:

students		staff		
vocabulary	62%	style	92%	
style	53%	grammar	77%	
spelling	41%	vocabulary	70%	
grammar	38%	handwriting	31%	
punctuation	18%	punctuation	23%	
handwriting	12%	spelling	23%	(46-47)

Vocabulary, style, and spelling appear to cause the students a higher level of difficulty, while style, grammar, and vocabulary appear to cause the staff a higher level of difficulty. Vocabulary problems occupy the larger percentage. On these questionnaires, the nationality of the respondents is unknown, but we can observe that one of the weakest areas for them is "vocabulary." From *English for Academic Purposes*, S. Jenkins, M. K. Jordan and P. O. Weiland (1993) conducted a survey of the role of writing in graduate engineering programs in six engineering faculties in American universities which had a large number of nonnative speakers of English students. The results are as follows:

Grammar/sentence structure	25%	
Appropriate vocabulary	24%	
Overall writing ability	21%	(49)

Vocabulary problems also occupy higher percentage. "Appropriate vocabulary" means a difficulty of word choice.

The definition of TSW in Chapter 3 reveals that one aspect of TSW features "vocabulary." Many of the words we encounter in our daily documents are extremely technical, and, we may feel, unnecessarily so. William F. Buckley Jr. complains in *The Right Word* (1996): "I note among the Christmas advertisements lying around, one for a new radio receiver: "There's 150 watts IHF power, a loudness compensating switch, power output/heat sinks, IF/FM multiplex decoder, FM muting, FM Stereo" (27). He insisted that as the vocabulary is expanding, we must accept it and that we must not be afraid to use words and terms which are demanding to communicate with each other effectively.

As science and technology have progressed, there are several reasons why a specialized vocabulary is desirable. Technical terms allow for economy of language while still maintaining precision of meaning. It is much shorter to write or say "orifice" than "an opening or window in a side or end wall of a wave guide or cavity resonator, through which energy is transmitted," just as "H_2O" is a shorter means of expression than "two atoms of hydrogen and one of oxygen"(Ayers 1965, 238). Science needs new words because it works on frontiers.

Due to the rapid expansion of science and technology that English-speaking countries have experienced in the last few hundred years, specialized vocabularies in English are relatively numerous and large – every scientific discovery or technological innovation, every new theory or methodology gives rise to new vocabulary. Therefore, regarding vocabulary, it is said that "success in our lives depends on how many words we can use in the real world." From the words representing objects the reader can see, hear, touch, taste, or smell. Therefore we will have to store as many words as we can in order to survive in the real world. As the saying goes, "Nothing

comes out of nothing." And we have to use the right word in the right place.

Concerning vocabulary, through the years, various ways have been devised for classifying, or grouping, the words in the English language. One method, introduced by structural grammarians, is to divide the words in the language into two main groups: content words (words that primarily carry meaning) and function, or structure, words (words that primarily show relationships). The content words are words which refer to a thing, quality, state, or action and which have meaning when the words are used alone. Therefore content words are mainly basic general words, semi-technical terms, and technical terms. Function words are words which have little meaning on their own, but which show grammatical relationships in and between sentences (Richards, Platt and Platt 1992, 81,151).

Vocabulary { Content words { Basic general words / Semi-technical terms / Technical terms
Function words

Basic general words are defined here as being taught for 3 ＋3 ＋ 2 (or 4) years in schools in Japan. Therefore these words have been taught to Japanese specialists and translators repeatedly with result that they can manipulate them easier than semi-technical and technical terms.

Among these categories, Japanese specialists and translators in English for science and technology (EST) are weakest in "semi-technical terms and technical terms." The "semi-technical terms" can be defined as the ones we have to use in our daily lives in the technical world. I usually define the semi-technical terms as the terms which start with originally technical terms and later infiltrate

into our daily lives. Originally, such words as *allergy, cellular phone, compute, DDT, fiber, floppy disk, flowchart, fluorescent light, inflammable, illumination, mainframe, transistor,* etc. were technical terms. But after several years, these words invaded our daily lives, and then they become semi-technical terms. Therefore, there is no clear distinction between semi-technical terms and technical terms. O. Jespersen suggested in *Growth and Structure of the English Language* (1956): "If the thing to be named is one of everyday importance, national convenience should certainly be considered before international ease"(129), but the reality completely ignores the suggestion by Jespersen. *Midbrain* is a better name than *mesencephalon*, and foreigners who know English enough to read a medical treatise in it will be perplexed.

Technical terms usually have only one meaning whatever situations they are used in. But, when basic general words are used in some situations, the readers often fail to grasp the real point of the writing because the reader cannot picture correctly and precisely what the writer wants to convey. In addition, basic general words are sometimes used in additional meanings that a word or phrase has beyond its central meaning. These meanings show people's emotions and attitudes toward what the word or phrase refers to. In effect, they are almost always ambiguous. Readers should not have to waste time on words and phrases that do not contribute to meaning. TSW must be concise to be clear.

Most English technical terms are internationally understood and are neither ambiguous nor obscure; they are common throughout the world and as clear as bugle calls (Britton 12). A technical term is, in another word, a kind of "tag," which is firmly set. Therefore, if someone uses such a term in another setting, the reader misunderstands. In effect, the writer fails to convey the idea. A

technical term also should not be paraphrased because the intended meaning is sometimes lost. If the exact technical term does not pop into our head, we should look for it in a technical-term dictionary.

These terms can be said to be coined on an almost daily basis with the rapid development of technology. Indeed, we are surrounded by numerous semi-technical terms in our daily lives. Without them, our communication does not proceed smoothly and completely. We sometimes face some troubles with semi-technical terms because few of the dictionaries we use for study and work contain semi-technical terms such as "size AA battery," "answering machine," "cellular phone," "telephone pole," etc. Almost all English Japanese dictionaries explain only the basic aspects of function words and basic general words, few include semi-technical terms or technical terms.

Therefore as far as learning "semi-technical terms," there is no way except by asking the help of native speakers of English in the field or newly published English-English dictionaries.

4.2.1 One Meaning in One word

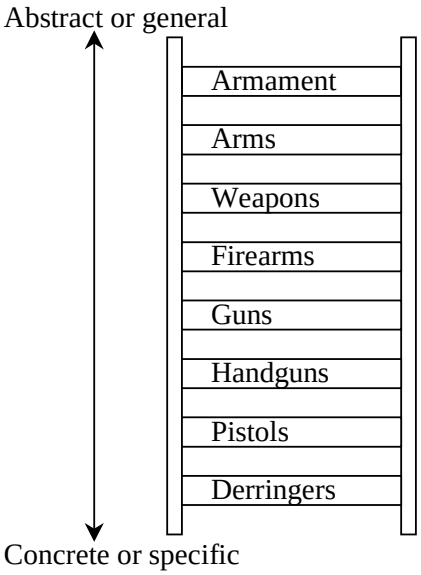
Whether or not we write extensively, we are faced constantly with the problem of choosing between two or more words. Nonnative speakers of English must make our choice of words intentionally, not unconsciously. Written communication can be carried on with a small or imprecise vocabulary. Therefore, to write precisely, to communicate effectively, we must always guard against using abstract words that the readers can interpret in different ways. We must avoid an abstract word when we can use a more precise, easily pictured, and easier-to-understand concrete word. We can say that one of the most important strategies for choosing words is to pick concrete, specific words. Concrete words refer to actual, specific things in experience. Concrete, specific words make it easier for our

readers to understand precisely what we mean. More than any other words, concrete words bring us closest to immediate sensation. They appeal to the reader's sense of touch, taste, smell, sight. or hearing.

Concrete terms add vigor, reality, and precision to prose. Martha E. Passe and Margaret D. Blickle (1963) give following words as examples:

Abstract	Concrete
facility	loading platform
transfer a liquid	siphon
connect	bolt; screw; weld
more than you think	$100
relatively long time	2 hours (10)

Jefferson D. Bates (1996) explains using a ladder like this in *Writing with Precision*:



(48)

Figure 6 Ladder of Abstraction

P. Anderson (279) explains “abstract” and “concrete” in his *Technical Writing—A Reader-Centered Approach* (1995) as follows:

In Figure 7, Anderson shows such a hierarchy where the most specific terms identify concrete items we can perceive with our senses. He also shows a hierarchy where all the terms are abstract but where some are more specific than others in Figure 8.

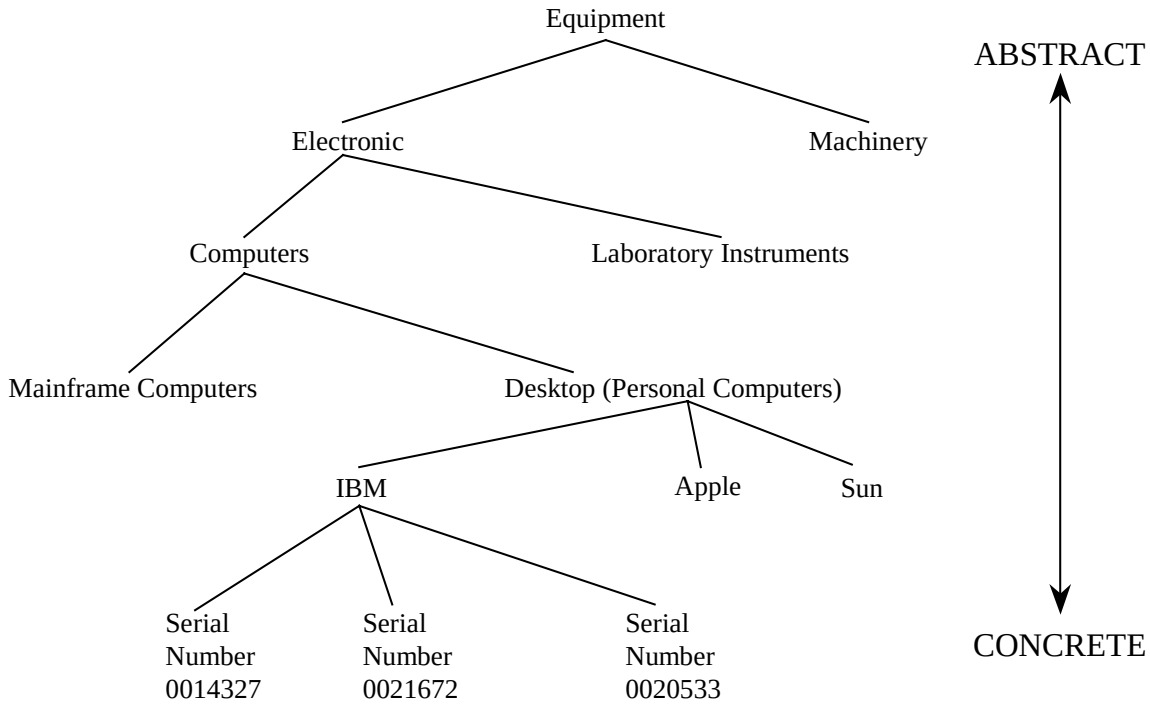


Figure 7　Hierarchy of Related Words that Move from Abstract to Concrete

Most books on TSW explain the importance of vocabularies, emphasizing only on almost all the same points: “sexist words,” “incorrect use of words,” “vague words,” “concrete word,” “jargon,” and “clichés.” These are of course a matter of importance, but for nonnative-speakers-of-English words’ choice is one of the most

important elements. Choosing the right words and phrases is as important as avoiding sexist words, incorrect use of words, vague words, and jargon. Choosing the right words and phrases to convey what you want to say is a different kind of problem; you must not only concentrate, but you must also retrieve what is in the back of your mind. Few Japanese writers seem to pay attention to word choice when writing their documents. Correct word choice varies according to the writing task and is essential to effective writing.

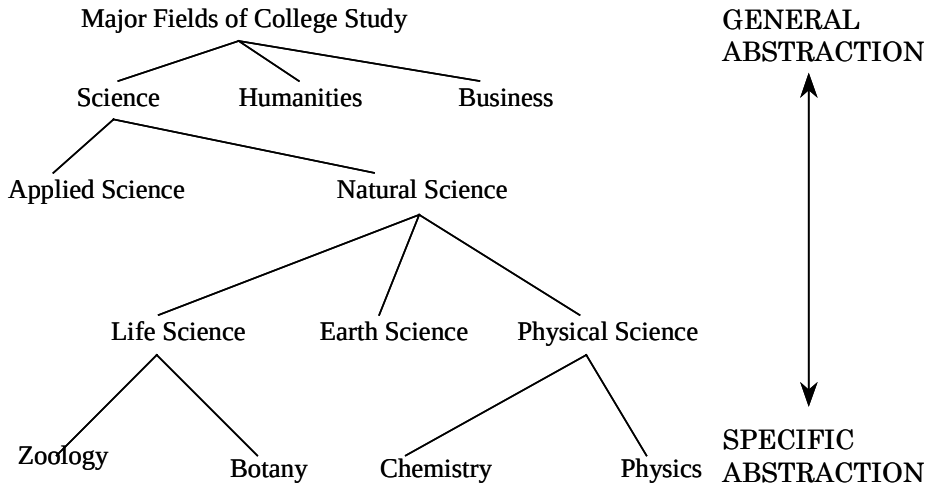


Figure 8 Hierarchy of Related Words that Moves from SPECIFIC a General to Specific ABSTRACTION

As for one meaning in one word, nonnative speakers of English must always spare no effort to use the most concrete, clear, accurate, and correct word. We must avoid using the clichéd English words that contain emotion, passion, and feeling. We must choose words to inform rather than impress. With these dictionary models, some improvement of our original can be achieved by creative imitation. Therefore it is very important for Japanese specialists and translators to use dictionaries effectively.

4.2.1.1 Choice of Noun

It is no exaggeration to say that without dictionaries, nonnative speakers of English can hardly write or edit or compose English sentences correctly. There are many words in English that express gradations of meaning of what may be only one word in Japanese. Take a simple example. If a native speaker of English asks a Japanese person:

"How many fingers do you have?"

Most of them will reply,

"I have twenty."

For Japanese, thumbs, fingers, and toes are the same one word "fingers" in basic general words.

Being specific involves using precise words, providing adequate detail, and avoiding ambiguity. Wherever possible, the most precise word must be used. "River" which belongs to a "basic general word" can convey more than one meaning or quality. The river can denote

Figure 9 One word, one meaning

a stream, a brook, a streamlet, a rivulet, a waterway, a creek, a runlet, or a watercourse.

Consider "damage." The *Longman Dictionary of Contemporary English* (1987) shows the word as shown in Figure 9 (258).

The other approach to get the "one word/one meaning" is to find the core word. For example, when Japanese specialists and translators of TSW wish to denote a "vehicle," they almost always select the word "car" or "automobile." But a "truck," a "bus," or an "airplane" is also a vehicle. The word "vehicle" covers a wide variety of devices – different in purpose, size, shape, and an enormously long list of other things. Let's say they want to refer to a "passenger vehicle." The word "automobile" or "car" can be overly vague. The reader might ask,

"What kind of automobile do you mean?"

The writer might answer,

"A passenger car."

"Passenger car" is still not clear. The reader might then ask,

"What *kind* of passenger car do you mean?"

The writer might reply,

"A Ford."

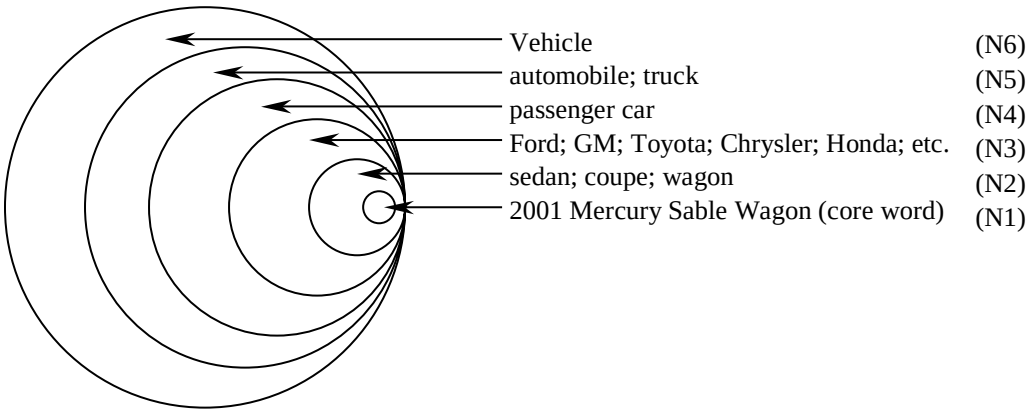


Figure 10 From the General to the Particular

Then,

"What kind of Ford?"

The writer may answer,

"A Mercury Sable Wagon."

Such questions might continue until the reader grasps the core word. The core word, in this case, -- "2001 Mercury Sable Wagon" (Figure 10).

Writers should try to find the core word when writing a technical or scientific document, the reason being that the specific word conveys the meaning quickly and precisely to the reader.

4.2.1.2 Choice of Verb

Choice of verbs is also important. A verb is the source of action in a sentence. Therefore, the verb carries more weight than any other element.

Geoffry N. Leech explains in *English in Advertising – A Linguistic Study of Advertising in Great Britain* (1966) that "the twenty most common verbs in the television sample were all very commonplace English monosyllables, and all except one (*use*) belonged to the Germanic stock which has remained up to the present day the core of colloquial English verb vocabulary" (154). And he lists the most remarkable verbs:

1. make	8. go	15. feel / like
2. get	9. know	17. choose
3. give	10. keep / look	18. take
4. have	12. need	19. start / taste
5. see	13. love	
6. buy	14. use	
7. come		

He complains that “many of the verbs in this list have a very general meaning, and contribute little to the force of an advertising message. They are the “bare pegs” on which descriptions of the product and its effect are loaded” (154). I call these monosyllable verbs “weak verbs,” or “false verbs.” In technical and scientific writing, these verbs must be avoided because these are providing only grammatical functions as linking words.

Writers should try to find the core verb just like the noun when writing a technical and scientific document, the reason being that the specific verb conveys the meaning quickly and precisely to the reader

4..2.1.3 Outstanding Nominal Group

Pre-modified nominal groups, or noun strings are extremely common in technical and scientific text.

- “In fact, in present-day English, position indicates modification, and nouns, both singular and plural, are freely placed before others as modifiers” (Fries: *American English Grammar* (1964, 259).
- “Any noun in English may be used as an adjective. In many instances the noun and the adjective are identical …” (Bernstein: *The Careful Writer* (1966, 298).

Fries says that nouns can be place “freely,” and Bernstein suggests “Any noun in English may be used as an adjective.” However, we cannot accept their suggestions completely. If we accept their ideas entirely, we have to admit following phrasal expressions written after the arrow:

- “an ornament of value” → “value ornament,”
- “a man of honor” → “honor man”
- “a work of distinction” → “distinction work.”

Some other authorities explain as follows:

- “That is, almost any English noun can be used to qualify another noun” (Evans and Evans: *A Dictionary of Contemporary American Usage* (1957, 325).
- “Although we have said that prepositional phrases ‘generally’ can yield noun pre-modifiers, this applies in fact only to the most central prepositions” (Quirk et al: *A Grammar of Contemporary English* (1972, 915).

Evans and Evans limit noun pre-modifiers explaining “almost any English noun.” Quirk et al. also have the same idea as Evans and Evans by using the adverb “generally.”

Let me quote a few examples:

- sodium dodecyl sulfate-polyacrylamide gel electrophoresis (Morris 1992, 2022)
- rated peak single pulse transient current (Frank Jay 732)
- marine inertial navigation data assimilation computer (*ibid*. 1114)
- management information system symbolic interpretive language (*ibid*. 1114)
- full-duplex communication facility-read command (*IBM Description*: 4-11)
- HP LaserJet Printer Family Paper Specification Guide (Hewlett Packard, i)

The examples as listed above are easily found in written materials in this field. Mathes and Stevenson (1991) criticize problems of clarity by noun strings. They explain that "technical people often strings nouns together to make names for new things.

Example:

Laser
Laser Printer
Laser Printer Paper
Laser Printer Paper Tray
Laser Printer Paper Tray Retainer
Laser Printer Paper Tray Retainer Spring
Laser Printer Paper Tray Retainer Spring Clip
Laser Printer Paper Tray Retainer Spring Clip Fastener
Laser Printer Paper Tray Retainer Spring Clip Fastener Screw

In each case, the last noun in the string is the things really being talked about; all of the other nouns effectively become adjectives modifying that noun" (322-323).

Such noun clusters are clear and useful when they become technical terms after standardization. For example, "the key for the mainspring" should be "the mainspring key" if this phrase is a technical term, or a standardized part name. Persons who carry on a specialized activity develop technical terms and locutions; such shortened speech and noun strings almost always make response more accurate and more economic.

4.2.1.4 Importance of the Anaphoric Noun

Japanese specialists, translators, and students are very fond of using pronouns such as “this” or “it.” Unfortunately, in technical and scientific texts, nouns and noun phrases are floating around, making the specific meaning of a pronoun unclear. For example,

> Improper procedures have resulted in more equipment failures. These are our most serious problems at present.

What does “These” mean? “Procedures” or “failures”? To which of the two nouns does the pronoun refer? The only way to be sure is to repeat the appropriate noun such as “class” I explain in **4.3.5 Purpose of the Definition**. Or “the + synonymous noun.” In the above sentence, therefore, “These” should be “These procedures” or “These failures.”

As an example of “the + synonymous noun,” the following is a suitable one.

> Growing a dwarfed, or miniature, tree is not only a challenging craft but also a decorative art form. This has been practiced for centuries in the Orient.

What has been practiced? What does “this” mean? – “tree,” “craft,” or “art form”? This kind of unclear pronoun should be replaced by the clear noun, or anaphoric noun. In this case. we can use class in the academic definition formula. Therefore in this case, “This hobby.”

4.2.2 Editing Sentences Using the One Word/One Meaning Method

Michael H. Markel explains in *Technical Writing Situations and Strategies* (1988) that “Wherever possible, use the most precise word

you can.... Remember that the reader knows less than you do. What might be perfectly clear to you might be too vague for the reader" (107).

He gives following examples:

VAGUE

An engine on the plane experienced some difficulties.

What engine? What plane? What difficulties?

CLEAR

The left engine on the Jetson 411 unaccountably lost power during flight (107).

He continues that "what should you do if you don't have the specific data? You have two options: to explain why the specific data are unavailable and indicate when they will become available" (107).
And he shows the following example:

VAGUE

The leakage in the fuel system is much greater than we had anticipated.

CLEAR

The leakage in the fuel system is much greater than we had anticipated; we estimate it to be at least five gallons per minute, rather than two (108).

Here are some examples of what Japanese specialists and translators often produce:

*A battery moves our clock accurately for a year.

I'd recommend that, to begin, the nouns be checked. In this sentence, "A battery" and "our clock" are ambiguous. We should revise them on the basis of "one word/one meaning." So these should be "A size AAA battery," "A size AA battery," "A size C battery," "A size D battery," etc. For the "our clock," we need to specify the particular model as "our CD model."

The next things we must do are to check verbs, adjectives, and adverbs. The "moves'" should be "runs," "drives," "operates," or "works." The "accurately for a year" is also ambiguous. This should be, for example, "with an accuracy of ± 3 seconds per year" or "within a tolerance of ± 3 seconds per year."

For Japanese, these step-by-step correction methods are very useful. Otherwise, they usually finish reading any poor English sentence absent-mindedly because they usually pay special effort to grasping the meaning of the sentence. As a result, they are satisfied with finishing reading English without grasping the meaning of the sentences.

As a result, by following the directions, we can write an accurate, clear, concrete English sentence which is appropriate for TSW.

> The size AA battery drives the CD clock with an accuracy ±3 seconds per year.

or

> The size AA battery runs the CD clock within a tolerance of ±3 seconds per year.

4.2.3 Avoiding Mismatched Words

One of the most difficult problems that confronts foreign specialists and students is noun-verb matching and adjective-noun

matching – collocation.

On English collocation, H. E. Palmer classifies in *Second Interim Report on English Collocations* (1966, 21-186) the subject as follows: Verb Collocations, Noun Collocations, Determinative Collocations, Adjective Collocations, Adverb Collocations, Preposition Collocations, and Connective Collocations.

Verb Collocation usually includes phrasal verbs, two- or three-word verbs, etc. such as "get up," "look up," "take off," "get rid of."' Some grammarians call such particles as "away," "down", "in," "off," "over," "through," etc. adverbial particles. For many linguists, though, collocations are related to a range of commonly recognized multi-word phrases in language, including catchphrases, clichés, fixed expressions, formulae, free and bound collocations, idioms, lexical phrases, turns-of-phrases and so on (Gledhill: *Collocations in Science Writing* 2000, 7).

This paper is devoid of such idiomatic expressions because they always appear not only in technical and scientific articles but in other everyday use of the term in English to denote skilful mastery of linguistic formulations. In technical and scientific articles, "noun＋verb" matching (or agreement) and "verb＋noun" agreement are extremely tighter than in other fields. This is because a slight change of verbs and adjectives results in larger differences of meanings. For example:

- The metal will *rust*.
- The brass will *tarnish*.
- *auburn* hair
- *reddish-brown* hair
- *rancid* butter
- *rotten* butter

The "noun + verb" matching and "adjective + noun" matching problems appear in almost all compositions written by Japanese learners. The reason, of course, is that they have the expression of their mother tongue in their minds. Several examples are as follows.

- *Dry* the futon (instead of "*Air* the futon").
- *Beware of* our brand (instead of "*Buy* our brand").
- *Make* a house (instead of "*Build* the house").
- Milk goes *rotten* (instead of "Milk goes *sour*").
- *Stop* your breath (instead of "*Hold* your breath")

Concerning adjective-noun matching:

- Thank you very much for your *laborious* lectures (instead of "Thank you very much for your *informative* lecture").
- *powerful* caffeine (instead of "*strong* caffeine")
- *quick* speed (instead of "*high* speed")

4.3 The Rhetorical Approach

In traditional grammar, rhetoric was the study of style through grammatical and logical analysis. But according to the *Longman Dictionary of Language Teaching & Applied Linguistics* (1997), "rhetoric is the study of how effective writing achieves its goals. The term "rhetoric" in this sense is common in North American college and university courses in rhetoric or "rhetorical communication," which typically focus on how to express oneself correctly and effectively in relation to the topic of writing or speech, the audience, and the purpose of communication" (316). In *Rhetoric and Reality: Writing Instruction in American Colleges, 1900-1985* (1987), a

rhetorician James Berlin categorizes “rhetoric” for teaching writing as three major approaches: objective rhetoric, subjective rhetoric, and transactional rhetoric. How sophisticatedly the rhetorical approaches are divided, with the expanded definitions of rhetorical studies of writing, rhetoric has become an integral part of TSW research.

Cleanth Brooks and Robert Penn Warren explains in *Modern Rhetoric* (1979) that “Rhetoric, more specifically, is the art of using language effectively” (5).

From this reason, in this paper, as for the second area, rhetoric is one of the necessary issues. Rhetoric is a challenging field for almost all Japanese specialists and students; hardly any Japanese school teaches it. Rhetoric deals with the choice of words and with the arrangement of words and sentences. One could not imagine that EST exists without rhetoric. By my definition, rhetoric is significantly needed for the proper style and honorifics (or tone) as well as for the effective organization of sentences, paragraphs, and content in TSW.

4.3.1 Editing Sentences by the Most Appropriate Style

After finishing the collocational and one word/one meaning operation, we must revise the sentence I quoted in **4.2.2 Editing Sentences Using the One Word/One Meaning Method** as a clock manufacturer’s or a battery maker’s. We have a rule to put the most important words in the initial position. Therefore if the sentence is a clock manufacturer’s it will be:

- Our CD clock operates within a tolerance of ±3 seconds per year on a size AA battery.

In this sentence, “Our” means “was manufactured by,” which may be appropriate for a catalogue, but not for a manual. We should

change this “Our” to “Your” if this sentence is for manual. Here “Your” means “belongs to you” or “bought by you.”

What is the formal research paper style? In a research paper, we can think of two cases: One is:

> ・The CD clock (used in this experiment) operates within a tolerance of ±3 seconds per year on a size AA battery.

The other is:

> ・The CD clock (used in this experiment) *must* operate within a tolerance of ±3 seconds per year on a size AA battery.

Here “must” can be changed to “requires” in a formal expression like a research paper. Otherwise some readers would take the “must” to mean “to be likely or certainly to” or “what one is forced to do.” TSW makes it a rule to express clearly and does not produce misunderstanding for the readers. Then a research paper reads:

> ・The CD clock (used in this experiment) *requires* operating within a tolerance of ±3 seconds per year on a size AA battery.

For a “contract” style, a contract must show a promise, command, or legality. Therefore, the revision reads:

> ・The CD clock *shall* operate within a tolerance of ±3 seconds per year on a size AA battery.

If we use “must” instead of “shall” here, the obligation becomes less.

In a proposal or a style indicating suggestion, the “should” means

certain expressions of feeling or opinion. The result reads as

・*I suggest* that the CD clock (should) operate within a tolerance of ±3 seconds per year on a size AA battery.

A direction requires revision to an instruction style. An instruction style is used to command someone to do something; therefore we use the imperative mood. Thus,

・*Operate* the CD clock within a tolerance of ±3 seconds per year on a size AA battery.

As a result, the directions would read as follows:

Research paper style:

・The CD clock (used in this experiment) *operates* within a tolerance of ±3 seconds per year on a size AA battery.

or

・The CD clock (used in this experiment) *requires* operating within a tolerance of ±3 seconds per year on a size AA battery.

Contract style:

・The CD clock *shall* operate within a tolerance of ±3 seconds per year on a size AA battery.

Proposal style:

・I suggest that the CD clock (*should*) operate within a tolerance of ±3 seconds per year on a size AA battery.

or

・The CD clock *should* operate within a tolerance of ±3 seconds per year on a size AA battery.

Catalogue style:

・*Our* CD clock operates within a tolerance of ±3 seconds per year on a size AA battery.

Manual style:

・*Your* CD clock operates within a tolerance of ±3 seconds per year on a size AA battery.

Instruction style:

・*Operate* the CD clock within a tolerance of ±3 seconds per year on a size AA battery.

In catalogue and manual styles, however, the subsequent sentences revert to the definite article: “The CD clock,” “The CD,” or “The clock” not “Our clock” or “Your clock.”

We must remember that these sentences are written from a clock manufacturer’s stand point. Therefore from a battery manufacturer’s point of view, these sentences should be by imitating the methods shown for a CD clock manufacturer.

4.3.2 Using the Verb instead of the Noun

Lois Johnson Rew argues in *Editing for Writers* (1999) that

1. Search through the sentence, asking “Where is the action?” Be especially suspicious if the sentence includes nominals that end in

–ment, -sion, -tion, ance, or –ence.

2. Turn the word that contains the action verb into a verb, or find a verb to express that action (229).

Rew's suggestion seems that we avoid using "make a reservation of," "make an estimate," "give approval." etc. When these phrases have no objects, however, we have to use these phrases. Therefore I would like to argue that to avoid over-dependence on weak verbs following three sentence constructions must always be kept in mind:

1. Noun ＋ Weak verb construction
2. Intransitive verb ＋ adjective construction
3. Verb ＋ nouns construction

I always insist that (1) the noun which has a verb form should be used in that form if the verb has (an) object(s) and (2) replacing weak verbs with strong verbs is another way to tighten and energize English.

Japanese specialists and university students almost always ignore wordiness and awkward combination of words. One type of wordiness we should avoid in our writing is the use of empty words that function as grammatically correctness. Vigorous verbs lend energy to narratives. Consider the following examples.

・The *adjustment* of the machine has been *done*.

The expression of this sentence can be easily economized by replacing the noun "adjustment" with the verb form and by transposing this verb's form with the important words, here, "machine." Note, too, that weak verb "done" does not really add to the meaning of the sentence. Thus, the rather cumbersome

・The *adjustment* of the machine has been *done.*

can be simplified to

・The machine has been *adjusted*.

Putting the important word in the initial position is also applied in this example.

This wordy kind of expression makes our style flat, clumsy, and bureaucratic, and often make our sentence unnecessarily longer. Writers who use this construction frequently fill the resulting verb slot with a "weak verb": *be, do, get, give, have, make, take, use*, etc. (See **4.2.1.2 Choice of Verb** and **4.3.3 Avoiding Weak Verbs and Phrasal Verbs**.) In government, business, and industry this bureaucratic style is abundant.

Let's look at another example:

・The normal *employment* of this drug is in the diluted condition.

Here again, "employment" has a verb form. Therefore this sentence could be revised, putting the most important words "this drug" in the initial position: "This drug is normally employed in the diluted condition." This revision is quite acceptable. But, "diluted" has a verb form, too, and therefore, could be further revised again as follows.

・This drug is normally *diluted*.

This sentence conveys the meaning more concisely and thus with

greater clarity, avoiding a stuffy and indirect way of expression. I always recommend that we use the "verb form" instead of the "noun" if a technical term has "verb." For example,

・It is the *conclusion* of the report that the method of determining the *weight* of the finished product should be changed.

Turn the nouns into verbs, and we can erase the ineffective expletive as well.

・The report *concludes* that the method of *weighing* the finished product should be changed.

R. H. Fiske explains in *Dictionary of Concise Writing* (1996) these phenomena by the following examples.

To give phrase

・The reset of the equation is to give people from diverse backgrounds a chance *to give expression to* their different views of the world (11) .

Turn "to give expression to" into verb, and we can erase the ineffective expletive as well.

・The reset of the equation is to give people from diverse backgrounds a chance *to express* their different views of the world.

He further continues "*to have* phrase," "*to make* phrase," "*to*

place and *to put* phrases," "*to present*, *to provide*, and *to show* phrases" and "*to take* phrases." For examples,

has the appearance of → appear
make use of → use
make a distinction → distinguish
put heavy emphasis on → heavily emphasize
place pressure on → pressure
provide an explanation of → explain
show a listing of → list
take ～into consideration → consider (11-13)

4.3.3 Avoiding Weak Verbs and Phrasal Verbs

Japanese specialists and university students tend to use "weak verbs" like *be, do, have, get, make, take*, etc. in technical and scientific discourses as a result of being overly influenced by English conversation texts, which insist upon the use of these weak verbs. If we use these weak verbs instead of true verbs in a sentence, the sentence usually becomes not only longer but full of empty words. Therefore it always loses energy. For example, Japanese usually write:

- Toyota *is* a *maker* of automobiles (instead of "Toyota *manufactures* automobiles").
- The overhead projector *has* an arm (instead of "The overhead projector *is equipped with* an arm").
- The method of *taking away of* all these parts of the automobile (instead of "The method of *removing* all these parts of the automobile").
- The new technique has *got rid of* the need of checking the

products (instead of “The new technique has *eliminated* the need of checking the products”).

From these points, the following sentences convey the same information. Therefore, Japanese specialists of English and university students find it almost impossible to judge which sentences are the most appropriate to formal technical and scientific writing.

1. The power of the steam puts the lever into action.
2. The lever is put into motion by the power of the steam.
3. The power of the steam moves the lever.
4. The lever is moved by the power of the steam.
5. There is a lever moved by the power of the steam.
6. The power of the steam activates the lever.
7. The steam activates the lever.
8. By use of the power of the steam, the lever is activated.
9. The lever is activated by the power of the steam.
10. The lever is activated by steam power.
11. The lever is activated by the steam.
12. The lever is activated steam.

These sentences can be hardly distinguished by Japanese specialists and university students. For them, they are all virtually identical.

Sentences 1 and 2 are ruled out because the phrases “puts ～into action” and “put into motion” can be expressed by one word.

Sentences 3 and 4 are not acceptable because “moves” and “moved” are ambiguous.

Sentence 5 is not acceptable because the “There is ～.” construction is inappropriate. Japanese specialists and students like

to use the “There is ～.” construction. They often write

*“There is our company in Tokyo.”

or

*“There is the book on the table.”

Sentence 6 is also unacceptable because any small amount of steam produces a certain strength of power. Therefore “The power of” is redundant.

Sentence 7 is clear, without any needless words; therefore, acceptable.

Sentence 8 is not acceptable because the “By use of” is redundant. This should be replaced with “By (steam),” or “By using (the steam).”

Sentence 9 is unacceptable for the same reason as sentence 6.

Sentence 10 is unacceptable because “power” is redundant. Any “steam,” of course, produces a certain amount of power.

Sentence 11 is also unacceptable because the definite article should be omitted when “by” is used in the meaning of “through the use of” or “by means of.” For example, “‘by car [bus, plane, train, etc].”

Sentence 12 is acceptable.

The difference between sentences 7 and 12 is that sentence 7 wants to emphasize “The steam” to the reader(s), while sentence 12 wants to emphasize “The lever.”

When we put the keyword in the initial position, active or passive voice is constructed naturally and automatically. Therefore we cannot say unequivocally that the active voice is better in technical and scientific papers but the passive voice should be avoided if we can produce sentences in the active voice.

4.3.4 The Tones Creating Favorable or Adverse Reaction

In the previous sections, I have directed my attention toward the clarity and readability of sentences. Here, however, I would like to focus on the tone of what we write. Tone has been defined as "height of pitch and change of pitch which is associated with the pronunciation of syllables or words and which affects the meaning of the word"(Richards, Platt, and Platt 1992, 382). "However, just as our voice may project a range of feelings, our writing can convey one or more tones, or emotional states: enthusiasm, anger, resignation, and so on. In writing it reflects our attitude toward ourselves, our purpose, our subject, and our readers" (Nadell, McMeniman and Langan 1997, 22).

When we are asking someone to do something for someone or trying to affect someone's actions, we often want to be polite by saying things in an indirect way. Generally, the more indirect the expression we use, the more polite we will seem. If we are too direct the audience may consider us rude. However, the more indirect expressions can sound "too polite" or in some cases "pompous," or "sarcastic." Japanese specialists and students are weak in English tone and style because Japanese usually use honorific, or polite expressions to superiors and those they respect; while English speakers use tone instead of honorific expressions. Therefore many Japanese have great difficulty distinguishing between polite and impolite English expressions. Few Japanese can distinguish the delicate differences among the following sentences:

1. Please send us our Order No. 100 before July 1.
2. Kindly send us ….
3. We want you to send us ….
4. We would like to ask you to send us ….

5. You are kind enough to send us ….
6. We expect you to send us ….
7. We would be obliged to you if you would send us ….
8. Will you send us ...?
9. Will you be so kind as to send us ...?
10. Would you please send us ...?
11. Could you please send us ...?
12. Could you possibly send us ... ?
13. We'd appreciate it if you could send us ….
14. We'd appreciate your sending us ….
15. May we ask you to send us ... ?
16. Would you mind sending us ... ?
17. We wonder if you could send us ... ?
18. We are just wondering if you could send us ….
19. We were wondering if you could send us ….
20. We are much interested in your sending us ….

To a Japanese reader, these twenty sentences would convey almost same meaning. Teachers should explain the differences in tones to their students.

4.3.5 Purpose of the Definition

Now I want to turn to "definition." "Definition has a number of purposes in our writing: to explain things to our reader(s), to clarify the key points in an argument, to make ourselves understood in everyday affairs, to specify, particularize, itemize, individualize, and characterize. Therefore definition is a way to clear up those hidden or unwanted assumptions and implications" (Baker 1980,111). Almost all expository or persuasive writing contains definitions. Definition becomes critical just when the proposition becomes really arguable

(Fahnestock and Secor 1990, 74). In *Handbook of Technical Writing* (2000), C. T. Brusaw, G. J. Alred and W. E. Oliu explain clearly that "The first rule of good writing is to help the reader. To do this, keep your reader's level of technical knowledge in mind and define any term that might not be understood"(542-543). In *The Oxford Guide to Writing* (1983), T. S. Kane acknowledges the definition "to be at the heart of exposition" (155).

The Complete Stylist and Handbook (Baker 1980) lists six classic kinds of definition: "definition by synonym, definition by function, definition by synthesis, definition by example, definition by comparison, and definition by analysis" (111-112). However, T. S. Kane classifies in further detail in *The Oxford Guide to Writing* (1983, 155-164): *nominal* and *real* definitions; *consensual*, *stipulative*, and *legislative* definitions; *incidental* and *primary* definitions; *ostensive* definition; *genus-species* definition; synonymous definition using illustrations in definition; metaphor and simile in defining; negative definition; paired and field definitions; etymology and semantic history. And he explains that "the most common mode of defining is that of *genus-species*"(157). This *genus-species* kind of definition is sometimes called a *formal, academic, Aristotelian, logical, technical,* or *sentence definition*.

Ambiguous definition will lead to a legal case. Therefore, defining a term clearly and precisely is essential to almost all real-world documents such as contract, specification, proposal, catalogue, manual, research paper, etc. But few Japanese specialists or university students are familiar with this notion of definition. As I have explained the importance of definition, the following will explain a formal definition. As an example of formal definition, we must recognize that all but two of following sentences are not acceptable.

*A camera is a machine for taking pictures.

A camera is an apparatus for taking pictures.

A camera is a piece of equipment for taking pictures.

*A camera is an appliance for taking pictures.

*A camera is an instrument for taking pictures.

*A camera is a tool for taking pictures.

*A camera is a utensil for taking pictures.

A camera is a black box for taking pictures.

*A camera is a device for taking pictures.

*A camera is what we take pictures with.

*A camera is the thing that we take pictures with.

All these sentences consist of a kind of formula:

Term = *Genus* + *Differentiation* (T= G + D)

Now, by definition, “a camera is an apparatus” or “a camera is a piece of equipment” according to English/English Dictionaries, not “machine,” nor “appliance,” nor “instrument,” nor “tool,” nor “utensil,” nor “black box,” nor “what,” nor “the thing.” We should avoid “is when,” “is how,” “is where,” “is what,” “is that,” etc. for genus because the genus is used as the subject or the object in the following sentence. If the genus is expressed vaguely, the subject will be ambiguous. And “is” is a weak verb. Therefore, in formal documents ‘is’ should be replaced to “refers to,” “is defined as,” or “means.”

No one has argued about a G ＋D = T construction which I have found.

An apparatus for taking pictures is a camera.

In TSW, this kind of inverted construction of definition often appears especially when a new idea, system, product, etc. is defined

Then we must evaluate the following example:

*Two processes to cool an engine are air and water.

In this sentence, “air and water” is not “process.” Therefore we will revise this like

Two *substances* to cool an engine are air and water.

Here “substances” is not only very ambiguous. When we use “substance” or “material” as a genus (or class), the word used as genus is often replaced with a technical term. Therefore “substance to cool” can be expressed more precisely with a technical term “coolant.” As a result, a better sentence results:

Two *coolants* for an engine are air and water.

Note that here the logical structure of this definition is not T = G + D, but G + D = T. And then I explain the difference between the two.

4.3.6 Combining Two Sentences into One Sentence

Most Japanese specialists and university students can write grammatically correct short sentences like:

- The ABC Company now employs 1000 people. It was founded ten years ago.

We can combine these two sentences, thus:

- The ABC Company, founded ten years ago, now employs 1000 people. .

or

- The ABC Company, now employing 1000 people was founded ten years ago.

The former sentence emphasizes “The ABC Company now employs 1000 people,” while the latter emphasizes “The ABC Company was founded ten years ago.”

Now let us evaluate one more example:

- The file is obsolete. It is using valuable storage space.

These sentences can be combined to:

- The file, using valuable storage space, is obsolete.
- *The file, which is obsolete, is using valuable storage space.

→ The obsolete file is using valuable storage space.

The former sentence emphasizes “The file is obsolete,” while the latter emphasizes “The file is using valuable storage space.”

4.3.7 Editing Sentences Using the One Sentence/One Idea Method

Thus far we have seen that the basic sentence types are the foundation of an effective style. But to achieve a mature style, we need to draw upon other stylistic principles, such as modification, substitution, and avoidance of the conjunction “and” to connect two

sentences. When two sentences are combined with “and,” we are inclined to think that two sentences are equally important. But either the sentence before “and” or the sentence after “and” should be more important. For example:

・*The machine is sophisticated, easy to operate, and we will use it to assemble the appliance easily.

This sentence should be arranged as follows:

The machine
1. sophisticated
2. easy to operate
3. we will use it to assemble the appliance easily.

In this sentence, 1. and 2. are adjectives, but 3. is a full independent sentence beginning with “we.” Therefore they hinder parallelism. The example should be revised as follows:

・The machine is sophisticated, easy to operate,
and will enable us to assemble the appliance easily.

or

・Because the machine is sophisticated and easy to operate, we will use it to assemble the appliance easily.

In these examples, the important word in the former sentence is “the machine,” and in the latter example, the emphasis is on the idea, “we will use it to assemble the appliance easily.”

Here is the other example:

- *The engineer has an M.S. from MIT, and 15 years experience and lives in Santa Barbara.

In this sentence, “an M.S. from MIT, 15 years experience” and lives in Santa Barbara should not be used in the same sentence because the content differs. Therefore if we want to emphasize “The engineer lives in Santa Barbara,” the sentence should be:

- The engineer, who has an M.S. from MIT and 15 years experience, lives in Santa Barbara.

This sentence should be shortened like:

- The engineer, with an M.S. from MIT and 15 years experience, lives in Santa Barbara.

If however we want to emphasize “The engineer has an M.S. from MIT and 15 years experience,” the sentence should be:

- The engineer, who lives in Santa Barbara, has an M.S. from MIT and 15 years experience.

4.3.8 Planning for a Paragraph: One Paragraph/One Topic

Whatever kind of article we are writing, the paragraph is the major building block for what we want to express to our audience. I have learned from teaching Japanese students and Japanese company specialists that few give sufficient thought to paragraphs when they write or present their ideas. They are not anxious much about

focusing on one major idea, about developing the topic, about achieving a natural flow, or providing adequate details. Therefore Japanese engineers and scientists must be taught the importance of logical construction in the paragraph. If their written or spoken materials ignore logical construction, their valued investigation or jobs will be refused. Their teachers must never cease teaching them logical constructions in the paragraph,

The evidence appears when I have asked the following questions to company people,

> "What are the two main products of your company? Please explain them as much as you can."

Most reply,

> "Our two main products are A and B."

That is all that they can think of. A more loquacious respondent might say,

> "Our two main products are A and B. And our company was established in 1880. And the number of employees is about 30,000." And so on.

In either case, the nature of products A and B or any information concerning them is generally omitted altogether. Almost all graduate students have kept silence for similar questions like: "What are your two interests?"

My point is this: Most Japanese specialists and university students can construct short English sentences almost perfectly, but

they do not know “logical” development of a paragraph because few of them have been well trained at the school. Therefore they do not pay attention to the proper arrangement of sentences, let alone paragraph. Most of them strongly believe that if they construct grammatically correct English sentences native speakers of English can understand them.

4.3.8.1 The Process of Composing a Paragraph

In TSW, we must focus on the strategies necessary for achieving effective paragraphs if we want to convey our idea to our audience effectively. A paragraph is a distinct unit of thought – but so is a word and so is a sentence. A paragraph is a group of related statements that a writer presents as a unit in the development of the subject. A paragraph is complete and self-sufficient but also contributes to the larger discussion. “Paragraphs are the most convenient unit for studying plots and particularly the editing problems that result from a failure to present plots clearly and completely” (Young, Becker and Pike 325). Therefore a paragraph is extremely important in teaching English writing in schools. However, in college writing and in company seminars, the paragraph training has been neglected in Japan. Few Japanese specialists or translators pay attention to the paragraph. That is to say, they seem to write paragraphs not for the reader, but for the writer only.

An effective paragraph strikes the mind as a unit if the statements in it are closely related, representing a stage in the flow of the writer’s thought. In TSW, the whole paragraph follows logically from the material that precedes it.

Effective TSW proceeds from defining a problem, or project. After a problem is decided, the research starts. In this step, data must be collected. After data are collected, unnecessary data must be deleted.

And then, select the data the readers want to read, and arrange the similar content into one paragraph/one topic like:

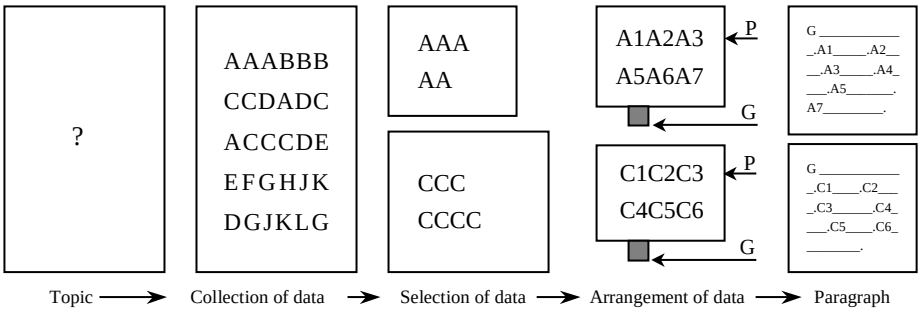


Figure 11　Process for Composing a Paragraph

Only the data AAAAA and CCCCCC are selected, and the other data should usually be disregarded because for the information they are insufficient or unimportant.　In this stage, however, the most important thing we have to do is arrange each piece of data (sentence) logically to give explicit instructions to the readers. (The right side in Figure 11.)　At the last moment, a general (or topic sentence) should be produced and inserted. The black small blocks pointed to by arrows illustrate generals.

Here is an example how to arrange details and construct a general:

1. 消火栓の側に乗用車が数週間止めてある。
   Shokasen-no soba-ni johyohsya-ga suhsyhukan tomete-aru
2. フロントガラスに駐車違反の切符が数枚挟まれている。
   Furontogarasu-ni cyuhsyaihan-no kippu-ga suhmai hasamarete-iru
3. 車は埃だらけである。
   Kuruma-wa hokoridarake-de aru
4. パンクしている。
   Panku-shiteiru

These Japanese sentences are translated in English as follows:

1. A car has been parked for several days by the fire hydrant.
2. It has several parking tickets.
3. It is covered with a thick layer of dust.
4. It has a flat tire.

These English sentences, even if they are correct in grammar and construction, do not communicate an idea but only facts, or details. From these details, a sentence which supports these details, that is, a general or topic sentence must be constructed like

5. 消火栓の側に止められている車は捨てられたものである。
   (*Shohkasen-no sobani tomerarete-iru kuruma-wa suterareta-monode-aru.*)
   The car parked by the fire hydrant is abandoned.

4.3.8.2 The Importance of the Sequential Arrangements of Details

In a paragraph, details (or data), excluding the general (or topic sentence) should be arranged in a hierarchical structure because a hierarchical text structure allows the reader to move quickly through a text, seeing how the details are linked together and what kind of detailed support they have. Especially for many American and British busy readers, we should try to arrange and present our details in a highly hierarchical pattern; otherwise they would not catch the meaning even though they understood the words. If we adhere to a logical arrangement in all our paragraphs, we will greatly enhance the overall readability of our TSW. The details should be logically subordinated. As in a hierarchical structure, the details in a list are all on the same level and thus share equal prominence (Huckin and

Olsen 1991, 404). The details should be arranged in a parallel structure, but they are not always on the same level or in an equal prominence.

What is the logical arrangement of details in a paragraph? Almost all literature I have investigated lists

- "Chronological," "Spatial," "Increasing detail," "Major divisions," "Inductive/Deductive," "Known to unknown (analogy)," "Increasing or decreasing importance," "Cause /Effect," "Comparison/Contrast (Advantage/Disadvantage)," "Literary or suspense" (Bjelland 65).
- "Chronological or time order," "Space order," "Order of logic," "Order of easy understanding," "Order of climax," "Order of choice or psychological interest" (Mykoff and Shaw 31).
- "space order," "time order (chronological order)" (Moody 79)
- "chronological organization," "spatial organization" (Rew 254)
- "Order of time," "Order of place," "Order of Increasing Importance," "Order of Decreasing Importance," "Order of Emphasis by Position" (Tichy 37-50).
- "general-to-specific order," "specific-to-general order," "emphatic order," "spatial order," "chronological order" (Lannon 208-212).

Jefferson D. Bates asks in *Writing with Precision* (1996):

> ...if you are discussing four animals—a cat, a dog, a horse, and an elephant—what would be a logical arrangement? Well, according to my logic, at least, the order I just use would be the best one, although you might argue for other ways. My logic here is that people usually think in terms of going from the

> small to the large, and might be confused if you started at the other end of the size scale. (The converse would be true if you were discussing items in the microscopic or submicroscopic range.) Also the first animals listed would be more familiar to most readers. Another way might be to organize the individual items into related groups: *cats, lions,* and *tigers*; *coyotes, dogs*, and *wolves; burros, horses*, and *mules*, and so on. Don't underestimate the power and usefulness of a-b-c's and 1-2-3's (61-64).

However, Janet Van Wicklen writes in *The Tech Writer's Survival Guide* (2001):

> Try to give your lists a logical order. If you cannot arrange items by importance, chronology, or some other logical order, arrange them alphabetically. Chronological order is particularly important in step-by-step procedures (155).

Wicklen's way of thinking is close to mine. My explanation is as follows.

Almost all works I have investigated select items at random. Many books on communications do not touch any arrangements of data (or particulars). From the above quotations, we must choose first of all *descending order of importance* because the order arranged from more importance to less importance relieves busy readers of the necessity of reading to the end. They can stop reading at any point, and when they stop reading, they have covered all the main thoughts that they can grasp in the time expended.

Second, how should we arrange the items when all of them are equally important? After descending order of importance, we must

select *chronological order*. The chronological order is often desirable and sometimes necessary in writing for industry. Manuals, for example, usually must arrange the items sequentially to be followed.

Third, how should we arrange the items which have no connection with *descending order of importance* or *chronological order*? The *spatial order* must be selected. Spatial order, sometimes called space order, geographical order, or organization by place, appears frequently in TSW as well as in business writing. When we explain a table or a figure, details of a description may be explained from top to bottom, near to distant, left to right, or clockwise.

Fourth, alphabetical order must be considered after the above orders. When we enumerate the names of people, we usually list them alphabetically.

Now let me put them in order:

1. Descending order of importance
2. Chronological order
3. Spatial order
4. Alphabetical order

4.3.8.3 Example of the Basic Rules of Logical Development

In order to explain one of the basic rules of logical development, let us review a Japanese fairy tale that any Japanese would be familiar with.

> "Once upon a time, there live an old man and an old woman
> in a small village."

Here I often ask, "What is the next sentence subject of this tale?" All of them reply, "The man" is. I then ask, "What is the subject of the sentence after that?" All of them reply "The old woman" is. What this illustrates to me is the fact that they all have the latent talents of logical ordering, but they often do not make use of it.

The tale, in my translation, is:

Peach-Taro

Once upon a time, there live an old man and an old woman in a small village.

The man goes to the hill to collect twigs, while the woman goes to the brook to wash their clothes.

She finds a peach floating down the brook.

↓

She brings it home.

↓

She cuts the peach open.

↓

She finds a baby boy in the peach.

↓

She names him "Peach-Taro."

Taro grows quickly .

↓

He becomes the strongest person in the neighborhood.

↓

He decides to get rid of all of the ogres.

↓

He walks on and on until he comes upon two animals and one bird.

They are A, B, and C.

This paragraph illustrates a paragraph moving from generalization to specification and each of the developmental

sentences adds to the sentence it follows. These examples represent three basic paragraph patterns: the sentences added directly to the topic sentence comprise an *analysis*; added to each other, a *coordinate* pattern, which constitutes the same subject "the woman, She" and "He" only. The sentences "She names him Peach-Taro" and "Taro grows quickly" has a relationship of a *subordinate* pattern because each explains only the sentence immediately preceding it. The sentences from "She finds a peach floating down the brook" to "She names him 'Peach-Taro" shows a process pattern which is the same as from "Taro grows quickly" to "He walks on and on until he comes upon two animals and one bird." The sentence "The man goes to the hill to collect twigs, while the woman goes to the brook to wash their clothes" illustrates a *contrast*.

In the sentence "He walks on and on until he comes upon two animals and one bird," and in the following sentence "They are A, B, and C." The order of A, B, and C (the three followers) must be observed. Namely all persons must answer the same order. When I asked my trainees if they remembered the names, they could easily give them, but not in order. The characters in the story happen to be a dog, a monkey, and a pheasant, in that order. This particular tale is a good example of contrast and the concept of one sentence/one idea, as well as ordering the most important elements or words, what I might call "keyword" in a logical hierarchy, with the most important term coming in the initial position.

The story illustrates what is meant by "unity" and "coherence" in a paragraph. Because the sentences are held together in one or the other pattern of relationship, the paragraph becomes a unit; because the sentences are related to each other, the reader is able to follow a coherent flow of information from one sentence to the next. Thus, any sentence that breaks the pattern or does not seem to be clearly

related to either a sentence above or the topic sentence breaks the unity of the paragraph and may cause the reader to lose the thread of meaning. The importance of the order of details and the effective development of patterns are explained in **4.3.8.2 The Importance of Sequential Arrangement of Details** and **4.3.8.6 The Proper Arrangement of Details in Paragraphs**.

4.3.8.4 Traditional Logical Organization in Japanese Writing

In Japan, one of the old traditional formulas for logical organization is *ki*, *shoh*, *ten*, *ketsu*, which mean "Introduction," "Development," "Turn," and "Conclusion." Even today, some —not many— older managers in Japan as well as Japanese teachers and professors still hold it in high esteem. This technique is very interesting and merits my giving you an example: *Itoya-no musume* (*The Thread Shop Daughters*). Almost all Japanese know this story. In this story, in my translation, the key paradigm of a *ki-shoh-ten-ketsu* framework might unfold as follows:

In a thread shop on the main street in Osaka,
live two pretty daughters. – Introduction

The older one is eighteen and the younger is sixteen.

—Development

? ?

Japanese feudal lords in various regions are killing people

? ?

with bows and arrows. —Turn

Each daughter is killing men with an obscene wink.

—Conclusion

This is the *ki* or start (or Introduction) of the paradigm. What might one expect the next subject, *shoh* of "Introduction" to be? That is, What is the next theme of the paradigm? According to this logical paradigm, the subject should be the human agent(s) because the keyword in the preceding sentence is "daughters." The subjects corresponds to what we have expected. What do we expect the next subject to be? According to the logical development, the next subject should be the "older daughter" or "both." However, as *ten* or "Turn" means, no one can tell the subject or the content of the next sentence. Therefore we do not know it. The next follows: "Japanese feudal lords in various regions are killing people …." This is "the intrusion of the unexpected element into an otherwise normal progression of ideas" (Hinds 1983, 188). This is one of the wonderful traditional paradigms in Japan. "Killing" here means "gaining." The last sentence is most important. This is the general or topic sentence in this example.

This paradigm demonstrates "contrastive rhetoric." The discourse organization in Japanese texts is in contrast with English texts. A certain vice-president in a Japanese leading corporation told me when I was in the United States that he is always writing his articles in the *ki-shoh-ten-ketsu* framework. This paradigm, which originated in classical Chinese poetry, is not appropriate to TSW because of the sudden unexpected content of the third element.

The major contrast with English writing expectations is the third element of the development, *ten,* which develops a minor message in a manner that would be considered off-message in English. (See Appendix F.)

4.3.8.5 Negative Examples of One Paragraph/One Topic

The following examples are deficient in one topic in one paragraph.

Example 1

> There are five different types of inputs that may be used with the digital computer: (1) keyboard, (2) electric typewriter, (3) Hollerith card, (4) perforated tape, and (5) magnetic tape. The Hollerith card is well known and will be recognized if the IBM punched card is cited as the most popular example of the Hollerith card. The perforated tape has holes mechanically punched in a roll of paper according to a fixed code. The machine reads the input through a photoelectric cell and light arrangement. The magnetic tape is the fastest to date. Numbers are introduced as a positive tape saturation. This is done by incorporating a binary system of numbers. (*Guidebook for Summer Seminar at the University of Michigan*)

In this analysis example, we can arrange five inputs into each item analyzing the data to pick up each keyword like this :

Five Inputs for Digital Computer

(1) Keyboard: (No information)
(2) Electric typewriter: (No information)
(3) Hollerith card: well known → IBM punched card
(4) Perforated tape: mechanically punched holes, roll paper, fixed code; the input read through a photoelectric cell and light arrangement
(5) Magnetic tape: fastest; numbers introduced as a positive tape

saturation; binary system

W can easily find deficiencies in this paragraph. As we can see, (1) and (2) need data, and the data “fastest” in (5) goes against the principle of one topic in one paragraph. To take notes on analysis-listing, we can use the same method that we use for simple listing. On the contrary, to edit lots of information into paragraphs, we can develop these data into them. This example lacks data for “the fastest.” Therefore no data means no correction.

Example 2

Let's read the following example:

The molecules of a solid are fixed in relation to each other. They vibrate in a back-and-forth motion. They are so close that a solid can be compressed only slightly. Solids are usually crystalline substances, meaning their molecules are arranged in a definite pattern. This is why a solid tends to hold its shape and has a definite volume.

The molecules of a liquid are not fixed in relation to each other. They normally move in a flowing type of motion but yet are so close together that they are practically incompressible, thus having a definite volume. Because the molecules move in a smooth flowing motion and not in any fixed manner, a liquid takes the shape of its container.

The molecules of a gas are not fixed in relation to each other and moves rapidly in all directions, colliding with each other. They are much farther apart than molecules in a liquid, and they are

extremely far apart when compared to the distance between molecules in solids. The movement of the molecules is limited only by its container. Because the molecules are far apart, a gas can easily be compared and it has the same volume as its container. (*Physics for Career Education* 184)

We can arrange the above from the most important predicate into three genres because each keyword indicates important data.

Molecules

Keywords from each predicate

Solid
1. fixed
2. vibrate
3. compressed
4. hold its shape and has a definite volume

Liquid
1. not fixed
2. flow
3. incompressible
4. take the shape of its container

Gas
1. not fixed
2. collide
3. compressed
4. have the same volume as its container

In this contrast example, we can use the same method that we use for simple listing. However, when contrasting several objects, we usually explain their differences.

When we read these paragraphs, we cannot grasp the main idea

because the topic sentence does not appear in this expository essay. Here I must explain the importance of the title of "a table and the topic sentence." From this contrast-listing we can easily find the keywords which should be in the title. The first keyword is "molecules." And the other keywords are "solid," "liquid," and "gas." These words should appear in the title. Therefore, the title should begin with "The molecules of a solid, a liquid, and a gas ... "

When looking up a "contrast" in an English-English dictionary, we can easily find the following explanation.

> **contrast**: the comparison of objects or situations that are dissimilar, *esp*. to show differences. [C;U] (between) (a) difference between people or things that are compared. (*Longman Dictionary of Contemporary English* 1987)

On the basis of this definition, we can then make the main idea such as

> The molecules of a solid, a liquid, and a gas show differences.

But this is a little bit ambiguous. From a close look at the definition, we could compose a sentence such as

> The molecules *among* a solid, a liquid, and a gas show *differences* in their *situations*.

The italicized words are shown in the dictionary. But, "What are their situations, here?" From the principle of "one word/one meaning," we can easily revise "situations" to "properties" or "relationships." Finally, from the principle that the important words or keywords should be

put into the initial position:

> The molecules show differences among a solid, a liquid, and a gas in their properties.

This should be a general, or topic sentence. The heading of the table usually takes a phrasal construction, not a subject-predicate one. Therefore, the heading of this table reads:

> Differences of molecules among a solid, a liquid, and a gas in their properties

Example 3

Japanese specialists and university students are extremely weak in cause-effect relationships because they usually do not pay attention to these relationships at all. The main reason is that Japanese people have a tendency of thinking that a man or woman who is in a higher position must grasp the main point of the sophisticated document produced by someone of lower position either within a company or in the world at large. Otherwise the writer of a document, someone who may be of lower position could look down on his supervisor as a less cultured person. Therefore the boss sticks to the desk all day to understand the document at any cost. This is one of the main reasons that sophisticated, ambiguous sentences and/or paragraphs are produced intentionally. This can surely be applied to any document written in English. If we cannot understand the content of an English document, we tend to think the reason is that our ability to understand English is poor. I have a lot of examples which ignore a cause-effect relationship.

One student came over to me soon after the class finished and

said, “Professor, the school bus I took was late.”

Because this is only an cause, I could not understand what he wanted to say. I was compelled to ask him,

“And so what?”

Here he replied,

“So, I was late for the class.”

I continued to ask him,

“And so what?”

He replied,

“So, please permit me to get credit for the class.”

Now I understood what he wanted to say. He should have asked me using a cause-effect logical relationship,

“Professor, because the bus I took was late this morning, I was late for the class. So, please permit me to be marked present.” (See “an cause-effect example” pp. 132-133.)

4.3.8.6 The Proper Arrangement of Details in Paragraphs

After the details (data) are selected properly, the next thing we have to do is to produce a proper “general” (or “topic sentence”). The general is not a detail, but the writer’s opinion or a sentence close to it. The place of the “general” is at one of three positions.

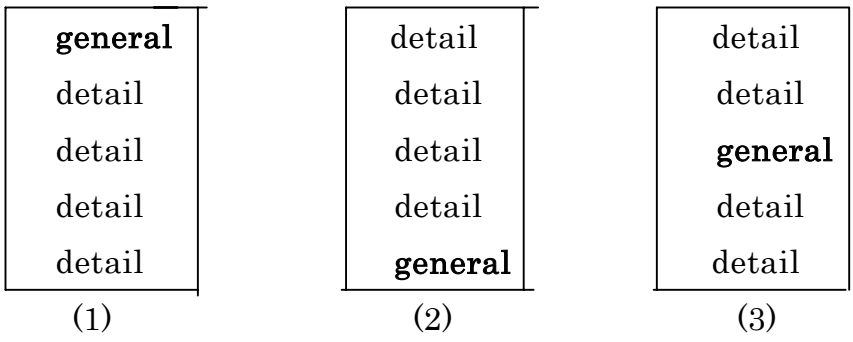


Figure 12 Three Different Places of the General

In TSW, the (1) structure is beneficial because busy readers can grasp the meaning of the paragraph without reading all of the sentences.

After the place of the general is decided, the details should be arranged effectively for busy readers.

Suppose that the "general" is 1, and that details are 2, 3, 4, 5, ..., the first type of paragraph development is:

1. general (topic sentence)
    2. detail (datum)
    2. detail (datum)
    2. detail (datum)
    2. detail (datum)

In this development, all the subjects are the same in meaning or are in the synonymous words. Therefore this development can be called a "parallel construction pattern." This pattern is applied when describing a process, a meeting's progress, reporting laboratory experiments, etc.

The second type is:

1. general (topic sentence)
    2. detail (datum)
        3. detail (datum)
            4. detail (datum)
                5. detail (datum)

In this development, the subject in the following sentence is taken from the preceding predicate. Therefore this development can be called a "series construction pattern." This sequential pattern,

which is applied when explaining something step by step, is suited to instructions, user manuals, etc.

We have two other types which are combinations of each other: The first one is:

1. general (topic sentence)
    2. detail (datum)
    2. detail (datum)
        2'. sub-detail (sub-sentence)
        2'. sub-detail (sub-sentence)
    2. detail (datum)
    2. detail (datum)

The second type is:

1. general (topic sentence)
    2. detail (datum)
        3. detail (datum)
            3'. sub-detail (sub-sentence)
            3'. sub-detail (sub-sentence)
                4. detail (datum)
                    5. detail (datum)

The former can be called a "parallel-series construction pattern," while the latter can be called a "series-parallel construction pattern." Other variations of patterns could be considered; however, the pattern which contains the detail like the *ten* in the *ki, sho, ten, ketsu* pattern should be avoided.

Now, let me explain an example of the first type of development:

1. The silver car parked by the fire hydrant is abandoned.
– general

2. It has been parked for several days. – detail

2. It has several parking tickets. – detail

2. It is covered with a thick layer of dust. – detail

– detail

– detail

This is an ineffective paragraph. Therefore in order to make the connection of these sentences clear and effective, the following arrangement must be followed.

The silver **car** parked by the fire hydrant is abandoned..

↙

It has been parked for several days.

↓

It has several parking tickets between the windshield and the wiper.

↘

What's more, **it** is covered with a thick layer of dust.

↙

The **car** has a flat tire.

↓

The **vehicle** has no steering wheel.

In this example, the grammatical subjects are same.

The following is a "cause-effect" example of the second type of development:

１．　ピストンが上昇する。
Pisuton-ga johsyoh-suru
２．　空気とガソリンの混合気が圧縮される。
Kuhki-to gasorin-no kongohki-ga asshuku-sareru
３．　温度が上がる。
Ondo-ga agaru
４．　爆発が起こる。
Bakuhatsu-ga okoru
５．　ピストンが押し下げられる。
Pisuton-ga oshisage-rareru
６．　動力はシリンダー内のピストンの往復運動で作られる。
Dohryoku-wa sirindah-nai-no pisuton-no ohfukuundoh-de tsukura-reru

1. The piston moves up. – detail
2. The mixture of air and gasoline vapor is compressed. – detail
3. The temperature rises. – detail
4. An explosion occurs. – detail
5. The piston is pressed down. – detail
6. Power is produced by the reciprocating movement of the piston in the cylinder. – general

This is the original and ineffective organization. Therefore in TSW, these have a following flow.

The piston moves up. **When** the piston moves up, the mixture of air and gasoline vapor is compressed. **When** the mixture is compressed, the temperature rises. **When** the temperature rises, an explosion occurs. **When** the explosion occurs,

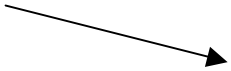
the piston is pressed down. Power is produced by the reciprocating movement of the piston in the cylinder.

When we combine each subordinate clause with each main clause, the result is like this:

The power of an engine is produced by the reciprocating movement of the piston in the cylinder. The upward movement of the piston compresses the mixture of air and gasoline vapor. The compressed mixture raises the temperature. A rise in the temperature causes an explosion. The explosion presses the piston down.

Careful examination of the above construction leads to as follows:

The power of an engine is produced by the reciprocating movement of the **piston** in the cylinder.



The upward movement of the **piston** compresses the **mixture** of air and gasoline vapor.

The compressed **mixture** raises the **temperature**.

A rise in the **temperature** causes an **explosion** to occur.

The **explosion** presses the piston down.

4.3.8.7 Frequently Used Patterns of Organization

Nobody denies that writers who want to convey ideas effectively and precisely make choices about what to say and where and how to say it. Typically, we strive to coordinate that sense with an estimate

of the needs and expectations of the intended reader in order to convey effective assertions in a coherent sequence.

We must choose the order that is the most logical in the circumstances. In addition to coherence and unity in the paragraph, sequential organization methods of the sentences have items that follow one another in order.

Sidney and Carolyn Moss list in *The New Composition by Logic* (1978): "(1) random arrangement, (2) partially random arrangement, (3) non-random arrangement, (4) climactic arrangement, (5) chronological arrangement, (6) partially chronological arrangement"(25). But in these patterns only (5) chronological arrangement is suited for TSW because other arrangements are often used for expressing the writer's feeling and emotion.

J. Nadell, L. McMeniman and J. Langan suggest in *The Macmillan Writer, Rhetoric, Reader, Handbook* (1997) that "you need to know four general approaches for organizing the supporting evidence in an essay: chronological, spatial, emphatic, and simple-to-complex" (54-56). Of these patterns, only chronological and spatial are suitable for TSW; the others are for essay and newspaper.

L. J. Rew explains in *Editing for Writers* (1999) about "Organization of Sequence, Organization by Hierarchy, and Organizational Combination." In "Organizational Combination," he writes "General to specific, Most-to-least important, Most-used to least-used, Questions and answers, Causes and effect, Problem and solution"(255-56). He describes all these methods of organization, indicates their most common applications, and assists us in choosing the most effective method of organization for each particular document. In these patterns, "Organization of Sequence," "Organization by Hierarchy," "General to specific," "Most-to-least important," "Most-used to least-used," "Causes and effect," "Problem

and solution" are frequently used in TSW. Some of them have different names, but the meaning is the same.

Richard M. Weaver explains in *A Rhetoric and Composition Handbook* (1967) "spatial pattern," "temporal pattern, example and illustration pattern," "comparison and contrast pattern," "cause and effect pattern," "definition and analysis pattern," and "combined patterns" (207-220). All the patterns listed here except "temporal pattern" are used in TSW.

For ESP, John McCall suggests eight developments in the paragraph in *How to Write Themes and Essays* (1989): "Analogy," "Argument," "Balanced," "Cause and effect," "Classification," "Compare and Contrast," "Definition," "Analysis," "Summary" (8-9). Here, "Balanced" and "Summary" should not be included in the paragraph organization because every organization of paragraph needs "Balanced" and the organization of "Summary" differs in the persuasive article and the informative pattern.

Thomas N Huckin and Lesllie A. Olsen list in *Technical Writing and Professional Communication for Nonnative Speakers of English* (l991) some of the most commonly used patterns of organization in technical and scientific writing: "chronological description," "cause-and-effect analysis," "comparison and contrast," "listing," and "general-to-particular ordering of details." In the subheading of "Other Patterns" they add "classification-division," "exemplification," "extended definition," and "analogy" (419). But "general-to-particular ordering of details" is used in almost all paragraphs in TSW. Therefore it should be excluded in their explanation.

Michael H. Markel classifies in *Technical Writing—Situations and Strategies* (1988) "chronological (time)," "spatial," "general to specific," "more important to less important," "problems-method-solution" (46-51). His five patterns, however, are

extremely broad. We usually use his way for classifying patterns not only in the whole set of document, but in one section of the documents in one paragraph. “Chronological (time),” “spatial,” “more important to less important” should be used for not organizing the complete one paragraph, but for explaining details (or data) step by step. Therefore, if we cannot arrange details (or data) by descending order of importance, chronology, or spatial order, we should arrange them alphabetically. (See **4.3.8.2 The Importance of the Sequential Arrangements of Details**.)

C. T. Brusaw, G. J. Alred, and W. E. Oliu explain in *Handbook of Technical Writing* (2000) that “many different methods of development are available to the writer. To business and technical people, the following methods are useful: “sequential, chronological, order of importance,” “comparison,” “general-to-specific,” “specific-to-general,” “cause-and-effect,” “spatial,” and “analysis” (383-385). Here again, “sequential, chronological, order of importance,” “general-to-specific,” “specific-to-general,” and “spatial” do not belong to the same category as the others. “Problems-method-solution,” “comparison,” “cause-and-effect,” and “analysis” are suitable for the methods of development for paragraphs in TSW, while the “descending order of importance,” “chronological order,” and “spatial order” are appropriate to the explanations of particular items step by step. These are very important in arranging data (or particular items) in the paragraph that has no general (or topic sentence).

Dina C. Reep gives eight patterns in her *Technical Writing – Principles, Strategies and Reading* (2000): “Ascending or Descending Order of Importance,” “Cause-and-Effect Pattern,” “Chronological Pattern,” “Classification,” “Partition Pattern,” “Comparison and Contrast Pattern,” “Definition Pattern,” and “Spatial Pattern” (78-84). Here again “Ascending or Descending Order of Importance,”

"Chronological Pattern," and "Spatial Pattern" should be excluded because they are used to arrange in logical sequence the details (data) supporting the topic sentence.

Bill Wesley Brown explains in his *Successful Technical Writing* (2000) that "there are six useful writing 'tools' you can employ to make your writing more descriptive and understandable. These techniques are *comparison*, *contrast*, *analysis*, *analogy*, *synthesis*, and the use of *synonyms*" (83-93).

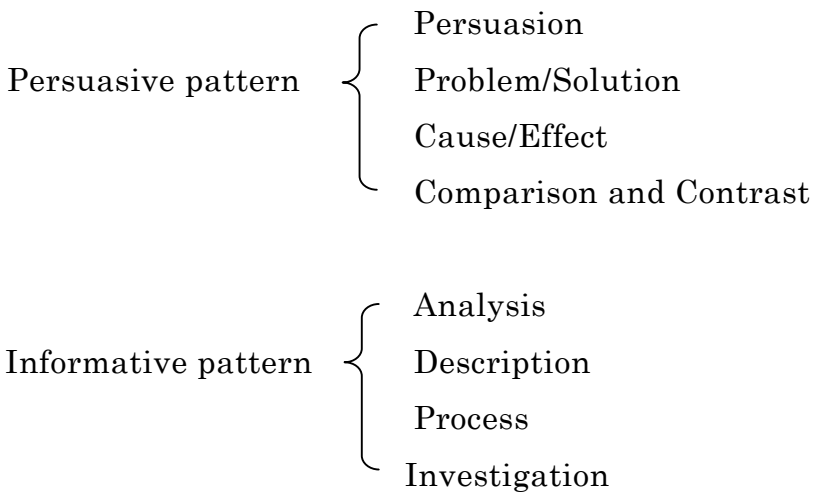
As *analogy* is the process of identifying similarities between items and concepts, this pattern should belong to the comparison pattern. A *synonym* is a term that essentially has the same meaning as another word; therefore this does not constitute one complete paragraph pattern. This should be excluded from this pattern. He does not include "Cause-effect pattern," "Description pattern," etc.

John M. Lannon lists in his *Technical Writing* (1997) "Spatial Sequence," "Chronological Sequence," "Effect-to-Cause Sequence," "Cause-to-Effect Sequence," "Emphatic Sequence," "Problem-Causes-Solution Sequence," "Comparison-Contrast Sequence" (254-257). As I have many times argued above, the "Spatial Sequence" and "Chronological Sequence" should be excluded in the development of the one complete paragraph in TSW.

A single paragraph usually follows one particular sequence in TSW. A longer document may use one particular sequence or a combination of sequences. Therefore we must establish concise and precise patterns in TSW because documents in this field do not allow any mistakes or ambiguity.

There are numerous methods of development of paragraphs; however, none of the methods in the paragraph development for TSW can systematically match the methods of J. C. Mathes and D. Stevenson (1991). They clearly divide paragraphs in technical and

scientific writing into two broad categories including all the patterns mentioned above: persuasive patterns and informative patterns. The former, which is applied for convincing somebody of something, consists of "Persuasion," "Problem/Solution," "Cause/Effect," "Comparison and Contrast," and the latter, which is applied for presenting data to the readers and for providing a written record of observation, consists of "Analysis," 'Description," "Process or Instruction," 'Investigation" (201-202). They divide these eight patterns to two main categories: Persuasive and Informative.



From my investigation shown in Figure 3 "Suggested Items to be Studied" (pp. 52-54), I should add "Definition" to the informative patterns of Mathes and Stevenson's eight patterns and amend some words and concepts as explained in the following table.

I should say that the following ten patterns are boilerplate (standard) paragraph patterns for situations in which information changes rapidly or remains similar in many contexts: Plausibility, Problem-Solution, Cause-Effect, Comparison, Contrast, Analysis, Description, Process, Survey, and Definition.

Persuasive pattern
- Plausibility
- Problem/Solution
- Cause/Effect
- Comparison
- Contrast

Informative pattern
- Analysis
- Description
- Process
- Survey
- Definition

Now let me show a variety of paragraph patterns in Table 2 for TSW.

Table 2　Purpose and Outline of Specific Paragraph Patterns

Pattern	Purpose	Outline
Plausibility	To justify a conclusion or recommendation	1. State conclusion 2. Support the conclusion in descending order of importance 3. Alternatives 4.Restatement and explanation of conclusion
Problem-Solution	To present a solution to a problem; to explain a problem; how to implement that solution	1. State the need. 2. State the problem 3. Explain a point-by-point problem in a descending order of importance.

		4. Explain the solution.
Cause-Effect	To stress the connection between a result and a preceding event	1. State the issue (conclusion). 2. Support the issue — analysis of the causes or effects in descending order of probability. 3. Anticipate and refute alternative causes or effects. 4. Restate the conclusion and summarize support.
Comparison	To point out similarities that exist between two items	1. State the main conclusion 2. Present point-by-point similarities in descending order of importance. 3. If necessary, restate the conclusion.
Contrast	To point out differences that exist between two or more items in the same category	1. State the main conclusion 2. Present point-by-point differences in descending order of importance. 3. If necessary, restate the conclusion.
Analysis	To divide complex topics into smaller lumps of information	1. Summarize the concept to be classified 2. Break it down into basic components in descending order of importance. 3. If necessary, restate and summarize the parts.

Description	To provide sufficient details to give clear picture of the thing described	1. Explain the function of the object. 2. Describe the object in a spatial order. 3. Explain the components of the object by part-by-part
Process	To explain something step by step	1. Explain the object of the process, introducing its steps in a time order. 2. Describe the steps to understand the process. 3. If necessary, explain an overview and warnings.
Survey	To explain how a survey was conducted	1. If necessary, state the background 2. State the purpose 3. Explain the methods with the equipment, materials, and criteria used in the survey. 4. Introduce the results, or noticeable findings. 5. Analyze the results in an appropriate order. 6. State conclusions and proper future actions.
Definition	To explain new term(s), new concept(s), or new system(s)	1. Explain the new term, concept, or system by using T=G+D formula. 2. Provide a concrete

example of the thing
being defined to clarify
by using analysis, cause/effect,
comparison and contrast as a
method of development, etc.

4. 4 Ten Models of Frequently Used Patterns

1. Example of Plausibility

Today, I am informing you that Bridgestone/Firestone, ---- **Conclusion**
Inc. is ending its tire supply relationship with the Ford
Motor Company. While we will honor our existing
contractual obligations to you, we will not enter into
any new tire sales agreements in the Americas with
Ford beginning today

Business relationships, like personal ones, are built --- **Supporting data**
upon trust and mutual respect. We have come to the conclusion
that we can no longer supply tires to Ford since the basic
foundation of our relationship has been seriously eroded.
This is not a decision we make lightly after almost 100
years of history. But we must look to the future and the
best interests of our company, our employees and our
other customers. (Letter from Bridgestone/Firestone, Inc.
to Ford Motor Company, May 21, 2001)

2. Problem/Solution

Because mercury spills pose the most serious safety --------- **Need**
hazard, provisions must be made for cleaning up
mercury spills in the laboratory.

Mercury often splashes and spills while being poured,----- **Problems**
because of its great density, surface tension, and low

viscosity. Droplets of mercury form and scatter in all directions and roll into cracks and corners.
Therefore, each lab bench where mercury is used ---------- **Solutions**
should be enclosed to contain the spills and simplify the cleaning operations. A sheet-linoleum floor covering with sealed joints and coved edges should be used to eliminate cracks, which trap mercury droplets. A suction apparatus can then recover the spilled mercury.
(*Modern Rhetoric for English Technical Documents* 163-164)

3. Cause/Effect
Regulation of stream flow will cause wide spread and ------ **Issue**
permanent environmental changes along the banks of the Gambia River. Periods of high erosion during the wet season and low erosion during the dry season will ------- **Support**
be replaced by a constant low level of erosion throughout **the issue**
the year. The annual flood will no longer inundate much of the upstream river bank while the banks in the lower reaches of the river between Kuntaur and Gouloumbou will no longer be kept moist by tidal flooding. In turn, these changes will both affect the environmental habitats along the river banks and significantly alter their function as a mechanism for the exchange of nutrients and material
between the land and water environments. Forest along ------ **Effects**
the river will be jeopardized by erosion. Wildlife and waterfowl will lose preferred habitat. Floodplain vegetation will be lost. And considerable biological nutrients will be lost to the river and lakes.
In short, the theoretically desirable objectives of regulating-- **Restatement**
the stream flow of the Gambia River will have long term, **of**

potentially negative environmental consequences along **conclusion**
the banks of the river. (*Guidebook for Summer*
Seminar at the University of Michigan)

4. Comparison

At your request, I investigated Mini Wear Types I and II carbon paper for quality and efficiency. I tested for durability, multi-copy legibility, curring tendency, and erasability and found Type I carbon paper to be superior to Type II. ------- **Conclusion**

The results show the performance of both carbon types in our investigation.

1. Type I carbon paper was more durable. To test ---- **Point-by-point**
durability, we counted the number of times each sheet **similarities**
of carbon paper was used before a replacement was necessary. Type I was used 20 times before it was replaced, while Type II could be used only 15 times.
2. Type I carbon paper produced a greater number of legible copies than Type II produced.
3. Type I carbon paper had no tendency to curl after use, whereas Type II curled slightly. Copies from Type I carbon paper was difficult to erase, while copies from Type II had average erasability. Copies from Type II erased more easily because of its softness.

I recommend that Mini Wear Type I carbon paper -------- **Conclusion**
be used in Central Typing.

(*Modern Rhetoric for English Technical Documents* 114-115)

5. Contrast

The molecules show differences in their properties among a solid, a liquid, and a gas. The molecules ----- **Conclusion**

of a solid are fixed in relation to each other. They vibrate in a back-and-forth motion. They are so close that a solid can be compressed only slightly. The molecules of a liquid are not fixed in relation to each other. They normally move in a flowing type of motion but yet are so close together that they are practically incompressible. The molecules of a gas are not fixed in relation to each other and move rapidly in all directions, colliding with each other. Because the molecules are far apart, a gas can easily be compressed. (*Physics for Career Education* 184)

----- **Point-by-point differences**

6. Analysis

In most cases dirt remains adhering to the fibers of textile fabrics by two kinds of forces: first, by sticking to a coating of grease or a dried coating of substances which swell up in water or other solvents; second, by direct adhesion because of the physico-chemical character of the fibres and the dirt. (*The Way Things Work*, Vol. 1, 406)

----- **Summary**

---- **Breakdown**

7. Description

A different temperature control device for hot-water storage heaters is illustrated in Fig. 8. It is installed in a protective tube beside the heating element and in close thermal communication with the hot water. Its principal component is an Invar rod which is fixed to an expansion tube. When it is heated, this tube expands, so that its end moves in relation to the end of the rod. This movement is transmitted through a lever mechanism to a mercury tube switch which tilts at a preset-temperature and thus switches off the heating element.

---- **Function of object**

--- **Component**

(*The Way Things Work*, Vol. 1, 274)

8. Process

How often to change blades? You are the best judge. ----- **Explain**
When you feel you are not getting the shave you want, **the object of**
or if your shaver feels "dull," follow the simple **the process**
instructions below to change blades.
To remove the head, turn dial to clean position, ... **Describe the**
grasp the head at both ends with thumb **steps chrono-**
and forefinger and lift it straight up from **logically**
the shaver.
To remove the old cutters, depress the springs on the
underside of the head assembly and slide the cutters out of
their shells.
To insert new cutters, pinch spring and slide carefully into
head shell. Be sure that the springs snap into the head
assembly slots on the underside.
To replace the head, dial position 1, and place the shaver
head directly over the shaver. When the head is properly
aligned, press into position.

(*Manual of Remington Electric Shaver*)

9. Survey

Compensatory vertical eye movement gain (CVEMG) was **Purpose**
recorded during pitch oscillation in darkness before, during, and
immediately after exposures to the stimulus rearrangement
produced by the Preflight Adaptation Trainer (PAT) Tilt- Translation
Device (TTD). The TTD is designed to elicit adaptive --**Methods**
responses that are similar to those observed in microgravity-
adapted astronauts. The data from Experiment 1 yielded a **Results**

statistically significant CVEMG decrease following 15 min of exposure to a stimulus rearrangement condition where the phase angle between subject pitch tilt and visual scene translation was 270 deg; statistically significant gain decreases were not observed following exposures either to a condition where the phase angle between subject pitch and scene translation was 90 deg or to a no-stimulus-rearrangement condition. Experiment 2 replicated the 270-deg-phase condition from Experiment 1 and extended the exposure duration from 30 to 45 min. Statistically significant additional changes in CVEMG associated with the increased exposure duration were not observed. The adaptation time constant estimated from the combined data from Experiments 1 and 2 was 29 min.

---**Conclusion**

(*Guidelines for Abstracts* 6)

10. Definition

A coupling is a device that connects two shafts end to end, while a clutch is a coupling provided with some form of sliding or other arrangement whereby the shafts can be connected and disconnected at will. Broadly speaking, couplings may be divided into rigid couplings and flexible couplings. The rigid type is used where accurate lineal alignment of the shafts is ensured. Where accurate alignment is not possible, a flexible coupling is used; it allows for a certain amount of misalignment, besides acting as a shock absorber for vibrations and jerks in torque transmission.

--- **T = G+D formula**

---**Classification**

—*The Way Things Work*, Vol. 2 (188)

4.5 Grammar

The third area is English grammar. From my own experience, if we devote our whole lives to studying or learning only English grammar, I believe that we will be wasting our time. Grammatically correct sentences do not always convey clear and concise content. Furthermore, studying or learning grammar is an endless task. However, having taught EST in Japan for about forty years, I can say that the fundamental problems that most Japanese scientists and engineers, as well as university students in such fields, are facing in EST are in:

Modal auxiliary;
Tenses;
Subjunctive mood;
Prepositions; and
Articles.

In addition, we should not forget that Japanese specialists as well as university students like to use Relative Pronouns and Prepositions, especially the Relative Pronouns "which" and the Preposition "of."

Let's look at some examples:

- This car was manufactured by the ABC Company *which is famous* (instead of "the famous ABC Company").
- Scientists who study the sun are trying to discover the best way to use this same method in many experiments concerned with making seawater pure (instead of "Solar scientists are trying...").

Here, "best" should be "most effective," and "with making seawater

pure" should be "with purifying water."

Concerning prepositions, Japanese specialists as well as students are very fond of using the prepositions "of." Here are several examples:

- an arm of the overhead projector (instead of "the arm on the overhead projector," or "the overhead projector arm")
- an outlet of the wall (instead of "an outlet in the wall" or "wall outlet")

The differences of the meaning of these examples and specific styles are detailed in my books: *Style and Usage in English Technical Writing* (1977), *Technical English: How to Write Logically and Effectively* (1981), and *How to Master Practical English* (1994). Therefore they are omitted from the explanation in this paper.

4.6 Format

Concerning "Format," official documents are usually written to a set format. A format gives the first impression to the reader(s). If the format of a document does not follow certain conventions, the reader will simply not read it. I will have to skip explaining format in this paper because each company has a different set format although they have many things in common.

Chapter 5

Case Studies of Actual Documents

5.1 Overview

During my second stay (1993) as a visiting professor at the University of Michigan, Professor J. C. Mathes and Professor Dwight W. Stevenson suggested that I classify and analyze the difficulties or problems that American engineers and managers in Japanese leading manufacturing companies located in Michigan have with the English documents written in Japan.

My research showed that poor word-choices, ineffective organization, and a complete indifference to correct formatting appeared most frequently in the documents. This is because the writers or translators in Japan – regardless of whether they are native-speakers of English or Japanese – are not trained at all. One of the most astonishing discoveries was that a certain leading company still advocates that employees use the Japanese traditional principle of *ki*, *shoh*, *ten*, *ketsu* for structuring effective, contemporary real world English documents. (See **4.3.8.4 Traditional Logical Organization in Japanese Writing**.) The use of this principle by certain technical writers has resulted in English documents which are unclear for readers. Unfortunately, many writers are blissfully unaware of this problem. The consequences, however, can be quite serious at times. For example, faulty documents may expose a company to product liability litigation.

The purpose of this chapter, then, is to indicate the most frequent shortcomings appearing in documents, to recommend some ways to avoid these shortcomings, and to suggest suitable business and

technical communication teaching materials for use in Japan.

5.2 Method

The methods of my investigation were as follows:

In-depth interviews were conducted with engineers and related professional staff within American subsidiaries of Japanese companies which have to use the engineering documents written in English in Japan. Interviews were also conducted with selected supervisors of those engineers and professionals.

1. Through initial contacts, a meeting was arranged with the chief engineer or a relevant senior manager of the subsidiary companies to explain the purpose of the project and to identify the specific interviewees. Generally, with appropriate advance contact, this meeting included, either at the beginning or in the second half hour, the two or three supervisors needed to select the interviewees. These managers were asked to identify the line professional who must use important engineering English documents transmitted from Japan to further research and development/testing or manufacturing activities. These line professionals were the subjects of the in-depth interviews.
2. Interviews with line professionals lasted 45 minutes to an hour; those with supervisors, 30 minutes.
3. Interview materials were submitted to interviewees in advance so that they could have specimen documents available and be prepared to answer questions.

5.3 Materials

The materials, which both professors prepared for me, are as follows:

1. Letter memo to the interviewee explaining the purpose of the

project, confirming or arranging a time for the interview, and identifying what the interviewee should bring to the interview and do for the interview.

2. Materials for the Interview (1). Important engineering documents necessary for the performance of professional activities. These should be documents written in English in Japan and transmitted to the interviewee in Michigan.

   Criteria for selection:

   Documents that the interviewee was a primary audience or important secondary audience.

   Documents that the interviewee used efficiently to perform engineering activities.

   Documents that the interviewee could not use efficiently to perform engineering activities.

3. Materials for the Interview (2) Questionnaire forms for the interviewee to fill out with notations, at least, in advance of the interview.

Questionnaire Form for Each Document

Interview:

Role and Department:

Title of Document:

Type and Purpose of Document:

Writers of Document, Role and Department in Japan:

Use of Document (Interviewee should identify his/her role):

Primary User of Document in U. S.

Specific Use of Document by Primary User

Important Secondary User of Document in U. S.

Specific Use of Document by Secondary User

Features of Document that Increase Efficiency of Use

1. Clarity of Purpose
2. Effective Audience Awareness and Address
3. Effective Heading Information
4. Clear and Substantive Summary
5. Summary before Discussion
6. Clear and Effective Arrangement of Information
7. Effective Selection and Use of Detail, Including Explanation and Analysis
8. Clear Subdivisions of Information
9. Effective Formatting and Use of Headings, Numbering, Etc.
10. Appropriate Information under Heading and in Subdivisions
11. Clear Paragraphing
12. Good Use of Visuals, Tables, and Figures
13. Clear Sentence Style
14. Good Grammar and Mechanics
15. Effective Use of Attachments

5.4 Problem Areas

These questionnaires do not fit most documents. The representative of the company providing one research paper I received could not answer the questions that both professors gave because the company in question follows the outmoded principle of *ki*, *shoh*, *ten*, *ketsu*. Oddly enough, few grammatical errors were found in the research paper. However, the traditional rhetorical principles employed rendered it disastrous and it accordingly conveyed no meaning at all. While there are numerous problems in the documents I received, the most common errors are found not in sections connected to questions presented by both professors, but in the word choices of the writers. This is not to say that the professors' questions are answered correctly, but rather that, before

answering these questions, all documents lack the most important basic element: word choice. Japanese specialists may not consider that, when we require effective communication, finding the exact word to express a specific meaning is most important. Even one of their original sentences revealed a critical inaccuracy in word-choices.

The following are the results corrected by the questionnaires suggested by Professors Mathes and Stevenson.

5.5 Case Studies

5.5.1 Business-Engineering Area

Example 1

[Original]

The work shall be completed up to Motor and Terminal Box.

In this sentence, what "work" should be done? The "work" here is very unclear. Mr. Keith Corlin, a supervisor of this company, was unable to revise this sentence because of its lack of clarity.

Example 2

[Original]

In order to transfer the acid, the piping shall have a strength enough to resist the force form …

This sentence does not explain how long the piping is. Therefore Mr. Corlin was unable to suggest a revision.

Example 3

[Original]

Converter speed shall be variable to the above two speeds by selecting the selector switch with the inverter controller.

This sentence does not convey clear directions. Is the speed in a position to be changed to the above two speeds? or can the speed be adjusted to the above two speeds? Mr. Corlin was unable to explain the context to me.

Example 4

[Original]

> A selector switch of Auto/Manual operation shall be provided on the control panel, and each unit shall be operated independently from the control panel.

According to Mr. Corlin, this sentence reads: Unit operation is independent of control panel. However the desired meaning should be:

> Each unit can be operated independently, using the push buttons on the control panel.

In addition to Mr. Corlin's explanation, "provided" is the preferred word for this Japanese specialist who runs against my principle of "one word/one meaning." This sentence is also very ambiguous. "… operation shall be provided …" does not convey any meaning to me.

Example 5

[Original]

> Audible buzzers shall be provided for indicating above (5) and (6) cases.

In this sentence, before listening to Mr. Corlin, I doubted how loud "audible" meant. "Audible" is too general. Here again, "provided" is used. The word "provide" means: attach, connect, insert, install,

mount, etc. Therefore, care must be taken in using this word.

Example 6

[Original]

A push button switch for exchanging the box shall be provided on the independent panel as shown below so that different work – pieces could not be mixed in the box when changing the work-pieces.

Mr. Corlin complained that this sentence is too difficult to understand. In my opinion, as this sentence is part of a contract, the sender could be sued as a result of this ambiguity.

Example 7

[Original]

Safety covers shall be provided with rotating or sliding parts.

Mr. Corlin complained again that this sentence is too difficult to understand. The reason might be that the writer uses "provided." This should be "installed" or "mounted."

Example 8 Specifications

[Original]

CHECK ITEM

1. The name of person authorized is properly indicated on the equipment.
2. Equipment is periodically inspected at least once a year.
3. Safety sign for inspection is properly indicated.
4. Exhaling substances are too be sucked surely.
5. Hood, duct and duct hose is not corrosion and not damaged.
6. Filter is not stopped much dust and not damaged.
7. Visible dust and contaminants are not being exhausted from the exhaust

stack.

8. Dust collector is periodically shaked dust.
9. Dust is periodically collected.
10. Filter is periodically inspected.
11. Dust shaking interval sign is properly indicated.
12. Manometer is installed.
13. The appropriate static pressure for manometer is indicated.
14. Fan is not abnormal noise, vibration and overheating.
15. Fan is installed in lower stream of dust collecting zone.
16. Independent dust collector is not connected in series of two units or more.
17. Electric machinery and tools are not installed on the dust passage.
18. Electric machinery and tools are not accumulating dust.
19. In cases of using a dust collector for spark generating equipment, such as grinder etc., spark quenching apparatus are equipped before dust collector and metallic dust are used.
20. Explosion vent is installed to exhaust blast upword providing against explosion.
21. Explosion vent moves correctly and is not accumulated dust.
22. Earthing is prepared at every position to prevent electrostatic charging.
23. Check valve is equipped at suction inlet of dust collector (excluding case of suction inlet bore of less than /40mm).
24. Check valve moves correctly and is not accumulated dust.

In effective communication, the precise words are requested. Therefore I always keep in mind my principle of “one word/one meaning” and “collocation.”

In sentence 1, “properly” and “equipment” are ambiguous. How “properly”? The name of a person should be indicated. What does the word “equipment” signify? No one can tell.

In sentence 2, “periodically” is vague. And how often is

equipment inspected"? It is not clear. What time intervals are indicated by the term "periodically"?

In sentence 3, "properly" again is ambiguous. And "sign" does not collocate with "is indicated."

My interviewee, an American engineer, did not point out any deficiency in sentences 1, 2, and 3.

In sentence 4, what is "exhaling substances"? And what is "sucked surely"? "Surely" does not collocate with "be sucked." Mr. Corlin told me that this sentence should be:

> Materials being collected are exhausted completely.

After I had his explanation, I found that the original and the revision are quite different in meaning. I am certain that the sender of the original sentence could well be sued by the recipient.

In sentence 5, there are some grammatical errors. This sentence should read:

> The hood, duct, and duct hose are not corroded or damaged.

In sentence 6, there are grammatical errors. What is more, some words are ambiguous. How, for example, is the "filter stopped"? Does this sentence mean "The filter is not stopped or damaged with much dust"? Mr. Corlin suggested to me that this sentence should read as follows:

> The filter is not blocked or damaged with dust.

Even after revision, the sentence remains ambiguous. What does "much" mean?

Mr. Corlin did not touch sentence 7, but how should we distinguish “dust” from “contaminants”? This sentence has yet to be revised.

In sentence 8, “periodically” is ambiguous. And what does “shaked dust” mean?

In sentences 9 and 10, again “periodically” is ambiguous.

In sentence 11, what does ‘properly’ mean?

In sentence 12, is “a manometer” or “the manometer” installed?

In sentence 13, ‘appropriate’ is ambiguous, and the information is insufficient.

In sentence 14, there is a grammatical error. This sentence should be

The fan does not make abnormal noise, vibration, or overheating.

But even if this sentence is grammatically correct, “abnormal” is ambiguous. What does “abnormal” mean?

Sentence 15 should be

The fan is installed in the lower stream of the dust collecting zone.

Sentence 16 indicates that an action should not be done. What, then, should we do? If the sentence is expressed negatively, we cannot understand what we should do. Therefore it is important to write the sentence not in the negative, but rather in affirmative terms.

Sentence 17 contains some grammatical mistakes. This sentence should be

No electric machinery or tools are installed in the dust passage.

Sentence 18 again contains some grammatical mistakes. This sentence should be

> No electric machinery or tools accumulate dust.

In sentence 19, there are some grammatical mistakes. This sentence should be

> If the dust collector is used with machines generating sparks, the spark quenching apparatus is to be installed before the dust collector or the metallic duster[?] is used.

In sentence 20, “is installed” should be “shall be installed.” The word “upword” should be changed to “upward.” And what does “providing against explosion” mean?

In sentence 21, what does “correctly” mean? The phase “is not accumulated dust” should be “does not accumulate dust” or “has not accumulated dust.”

In sentence 22, the problem is “Earthing.” This is British English. Mr. Corlin lamented that Americans are rather weak in British English, and therefore all documents should be written in American English to communicate effectively. In American English “earthing” is “grounding.”

In writing for international audiences, we have several ways of avoiding difficulty. We can convert all our vocabulary into the vocabulary that is normal for the target audience (Kirkman 1980). Therefore, the above example should be

> Each position shall be grounded to prevent electrostatic discharging.

Sentence 23 should be

The check valve is equipped at the suction inlet of the dust collector (unless the suction inlet bore is less than 40 mm).

In sentence 24, "correctly" again is ambiguous. This sentence should be

The check valve moves correctly and does not accumulate dust.

If all sentences are used in specifications, the predicates should begin with "shall."

When we want to communicate effectively in TSW we should not put different data into one paragraph. (See **4.3.8 Planning for a Paragraph: One Paragraph/One Topic**.) I recommend that we follow my principle: "one paragraph/one topic." Therefore, if I may take the liberty of clarifying the meaning of these sentences and arranging them in an unambiguous order, the above examples should be, after applying the effective numbering system (followed by American National Standards Institute—ANSI and National Information Standards Organization—NISO), arranged as follows:

[My Revision]

Safety Checklist for a Dust Collector

1. Installation
    1.1 Mechanical Installation
        1.1.1 The manometer shall be installed.
        1.1.2 The fan shall be installed in lower stream of dust collecting zone.

1.1.3 Independent dust collectors shall not be connected in series of two units or more.

1.1.4 The explosion vent shall be installed to exhaust blast upward, so as to avoid an explosion.

1.1.5 A check valve shall be equipped at the suction inlet of the dust collector (unless the inlet bore is less than 40 mm).

1.2 Electrical Installation

1.2.1 Electric machinery and tools shall not be installed in the dust passage.

1.2.2 When using a dust collector for spark generating equipment (such as grinder, etc.) spark arresters shall be installed before the collector and metallic ducting are used.

1.2.3 Each necessary connection shall be grounded to prevent electrostatic discharging.

2. Condition

2.1 The hood, duct, and duct hose shall not be corroded or damaged.

2.2 The filter shall not be blocked or damaged with dust.

2.3 Visible dust and contaminants shall not be exhausted from the exhaust stack.

2.4 The electric machinery and tools shall not accumulate dust.

3. Signs and Labels

3.1 The name of the person in charge of the equipment shall be properly indicated on the equipment.

3.2 Safety signs for inspection shall be indicated/located properly.

3.3 Dust cleaning/checking interval sign shall be properly indicated.

3.4 The appropriate static pressure for the manometer shall be indicated.

4. Inspection and Maintenance

4.1 The collector shall be periodically inspected – at least once a year.

4.2 Dust shall be periodically collected from the collector.

4.3 The filter shall be periodically inspected.

5. Operational Check

5.1 Materials being collected shall be exhausted completely.

5.2 Visible dust and contaminants shall not be exhausted from the exhaust stack.

5.3 The fan shall make no abnormal noise or vibration and shall not overheat.

5.4 Explosion vent shall move correctly and shall not accumulate dust.

5.5 The check valve shall move correctly and shall not accumulate dust.

But I would like to propose even more extensive corrections. Lack of more information in the original version prevents my correcting more precisely.

Example 9 Specifications

[Original]

9. SAFETY CONDITION

1. Fix the Common Base by Anchors.
2. Piping and Duct Flange Parts to be free from leakage.
3. Manual Valve opening and closing indicator plate to be provided.
4. Caution Plates to be provided.

DANGER

1. DO NOOT OPERATE UNLESS THOROUGHLY FAMILIAR WITH SAFETY RULES AND OPERATIONS IN OPERATION MANUAL

2. CUT POWER SUPPLY BEFORE CONDUCTING INSPECTIONS OR ADJUSTMENTS

(5) Noise

Noise shall be less than 80 dB (A) at the measurement point where is away 5 feet from noise source and 4 feet height from the floor.

This example lacks “Clarity of Purpose,” “Clear and Effective Arrangement of Information,” “Effective Formatting and Use of Numbering, Etc.,” “Clear Sentence Style,” “Good Grammar and Mechanics,” etc. What is more, the warning word, “DANGER” should be “WARNING.” “DANGER” indicates an imminent hazard that, if not avoided, will result in death or serious injury. “WARNING” indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. “CAUTION” indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. (CAUTION may also be used to indicate other unsafe practices or risks of property damage.) The term NOTICE can be used to warn of potential property damage, but it is inappropriate for any warning of potential human injury (Mathes and Stevenson 464-465). This is a matter of no small importance. There are potential legal implications for imprecise application of hazard alert signals, and legal action could ensue. Therefore if we do not use precise, correct terms for hazard alert signals, legal action could ensue. When we arrange this example with the same category and use the recommended numbering system, the example should be revised:

[My Revision]

9. SAFETY FEATURES

9.1 The common base shall be installed with anchors.

9.2 A plate shall be installed on the manual valve to indicate the opening and closing position.

9.3 Hazard alert signal plates shall be installed indicating as follows:

CUT POWER SUPPLY BEFORE CONDUCTING
INSPECTION OR ADJUSTMENTS

DO NOT OPERATE UNLESS THOROUGHLY FAMILIAR
WITH SAFETY RULES AND OPERATING PROCEDURES
IN OPERATION MANUAL

9.4 The piping and duct flange parts shall be free from leakage.

9.5 Noise level shall be less than 80 dB (A) at the measurement point of 5 feet away from noise source and height of 4 feet from the floor.

Example 10　Specifications

[Original]

ELECTRICAL SPECIFICATION

7-1 Control

(1) For electrical control, refer to the attached Electrical Motion Drawing.

(2) Control Board shall be provided to (1 + 4) Base Flux Blending Tank while Operation Panel to (1 + 2) Blending Tank. The outer control function shall be indicated the Control Box. For their location, refer to the attached Layout Drawing.

(3) Abnormality Lamp and Siren to be used to Control Box

(4) UL approved parts shall be used.

7.2 Conditions when Abnormality occurs

(1) Alarm Lamp lights up, Siren sounds and Equipment fully stops with each tank, liquid level at the highest limit.

(2) Alarm Lamp lights up, Siren sounds and Equipment fully stops by detecting the liquid level of Overflow Detector Tanks.

(3) Equipment stops all its functions when Emergency Stop Button is pushed.

(4) 2 units of Feed Pumps from (1 + 4) Blending Tank to Head Tanks shall be provided so that even if one unit fails, the other can supply the flux.

This example not only fails to group the sentences into some logical order, but lacks “Clear and Effective Arrangement of Information,” “Effective Formatting, and Numbering, Etc.” “Clear Sentence Style” “Good Grammar and Mechanic,” etc. What is more, (4) is not included in any item. This example should be revised as follows:

[My First Revision]

ELECTRICAL SPECIFICATIONS

7.1 Specifications for assembling the control system

The electrical control shall be referred to the attached electrical motion drawing.

7.1.1 The control board shall be attached to the (1 + 4) base flux blending tank.

7.1.2 The operational panel shall be attached to the (1 + 2) blending tank.

7.1.3 The control box shall be attached to the other control systems.

Notes 1. The location for each installment shall be referred to the attached layout drawing.

2. Only UL approved parts shall be used.

7.2 Specifications for installing feed pumps

Two units of feed pumps shall be mounted from the (1 + 4) blending tank to the head so that in the event that one unit fails, the other is able to supply the flux.

The original sentence "7.2 Conditions when Abnormality occurs" might be "Indicators of Abnormal Conditions." However, if we revise it like this, this sentence is not inclined in the title of "ELECTRICAL SPECIFICATIONS."

[My Second Revision]

7. INDICATORS OF ABNORAL CONDITIONS

The abnormality light and siren shall be connected to the control box.

7.1 When the liquid level in each tank reaches the maximum limit, the alarm light shall light up, the siren shall sound, and the

equipment shall automatically shut off completely.

7.2 When the liquid enters and reaches the liquid level of the overflow detector, the light shall light up, the siren shall sound, and the equipment shall automatically shut off completely.

7.3 When the emergency stop button is pushed, the equipment shall shut off all its functions.

Dwight W. Stevenson was more severe in his criticism. We corrected sentences as well as we were able to make out their intended meanings. But correcting the text has not improved it much. From our analysis we know that a good deal of critical, important information is still unclear. We also know that there is a good deal of missing information. And by now you may have perceived that although the structure of the original is chaotic, the "corrected" version remains chaotic. After we group the sentences into some logical orders shown above, ambiguity still remains. Some critical information is still missing. Therefore, without graphics it is difficult to visualize.

The above examples were chosen at random in the documents of A company. The following is also chosen arbitrarily from the documents of B company.

Example 11 Catalog

[Original]

GENERAL DESCRIPTION

About 15 years ago The ABC Co., Ltd. succeeded in developing a highly reliable silver oxide battery for use in quartz watches. Since then the company has been continuing to expand its microbattery business. With incremental advances in technology of electronics, highly advanced microbatteries are now being strongly demanded for

sophisticated electronic instruments and equipment.

The company is continuing its best efforts to develop a comprehensive variety of high performance microbatteries capable of responding to any kaleidoscopic users' needs and requirements.

This brochure introduces button-type Alkaline-Manganese batteries, Lithium coin batteries, and Lithium paper batteries, Rechargeable Polymer Lithium Battery, Electric Double-layer Capacitor, 1.5V Lithium Button Battery.

Features

1. Superior leakage-proofness

With the precision machinery, equipment, measuring instruments and apparatus including quartz watches using the microbatteries, electrolytic leakage causes damages to electric connection with their terminals.
This interferes the stable operations.

Our microbatteries have an excellent leakage proofness under any conditions, through our special sealing materials and superior processing technologies.

2. High capacity

A battery having a large capacity or a large energy per volume is required so as to extend the operating time of the machinery and equipment as much as possible within the limited battery space.

In our microbatteries, a high capacity can be obtained through our original design technologies and by use of high purity materials.

3. Stable operating voltage

The battery voltage depends on the temperature and the depth of discharge.

Since the change of the voltage influences the characteristics of the machinery and equipment, it is necessary that the operating voltage is stable.

Our microbatteries always have a stable operating voltage in a wide operating temperature range and in a depth of discharge.

4. High reliability

Batteries are always required to have high performance, that is, high reliability.

Our microbattries are manufactured through our high quality control.
Only those batteries having such the high quality are delivered.
[*The company name has been changed.]

I present two types of commentary: rhetorical analysis and editorial comments. The rhetorical analysis should be considered the more important, although my editorial comments suggest ways to make the documents easier to read and understand.

<u>Rhetorical analyses</u>

This example, which was even checked and corrected by a native speaker of English, lacks "Clarity of Purpose," "Clear and Substantive Summary," "Summary before Discussion," "Clear and Effective Arrangement of Information," "Clear Subdivision of Information," "Effective Formatting and Use of Headings, Numbering, Etc."

1. The title, GENERAL DESCRIPTION is misleading. Judging

from the content, I should say that this brochure explains the features of micro-batteries, but does not give general description of micro-batteries. Therefore this section should be completely revised. This part of the explanation seems to be a Japanese way of thinking.

2. Any catalog should always be simple and explain only what the readers want to know. From this point, the first paragraph should be deleted because this section has little relation to the features of micro-batteries.

3. The second paragraph lists five different batteries and one capacitor. A battery produces electricity, but a capacitor collects and stores electricity. Therefore the Electric Double-layer Capacitor should be excluded from the group of batteries.

4. Explanations using numbers, or numerals, mean descending order of importance. Is "1. Super leakage-proofness" the most important? To me the last "4 High reliability" seems to be the most important. Therefore this should be placed in the beginning. When items are listed, the first attention must be paid to lining them up according to the descending order of importance.

5. In each article of "Features," which part does this manufacturing company want to make an appeal to customers, "the first part," or "the second part"? I think the second part is what the customer wants to know. The first part does not explain the features of batteries; it explains the properties. The first section and the second section should be reversed.

Editorial comments

GENERAL DESCRIPTION[1]

About 15 years ago[2] The ABC Co., Ltd. succeeded in developing[3] a highly

---

[1] Delete this part.
[2] Use the exact year – for example, "In 1985."

reliable silver oxide battery for use in quartz watches. Since then the company has continued to expand its micro-battery business. With incremental[4] advances in technology of electronics[5], highly advanced micro-batteries are now being strongly demanded[6] for sophisticated electronic instruments and equipment.

The company is continuing its best efforts to develop a comprehensive variety of high performance micro-batteries capable of responding to any kaleidoscopic users' needs[7] and requirements.[8]

This brochure introduces button-type Alkaline-Manganese[9] batteries, lithium coin batteries, and Lithium[10] paper batteries, Rechargeable Polymer Lithium Battery, Electric Double-layer Capacitor[11], 1.5V Lithium Button Battery[12].

Features

1. Superior leakage-proofness[13]

With the precision machinery, equipment, measuring instruments and apparatus including quartz watches using the micro-batteries, electrolytic leakage causes damages to electric connection with their terminals.[14]

---

[3] developed
[4] continuing
[5] in miniaturizing electronic technology
[6] are now being demanded
[7] an extremely wide range of user needs
[8] Revise the whole paragraph.
[9] Use lower case.
[10] Use lower case.
[11] Use lower case and put "electric double-layer capacitor" after "1.5V lithium button battery" or delete.
[12] Use lower case.
[13] Superior anti-leak sealing
[14] Electrolytic leakage causes damage to electric connections with their terminals of precision machinery, equipment, measuring instruments and other apparatuses including quartz watches, which use the micro-batteries.

This interferes the stable operations.[15]

Our micro-batteries have an excellent leakage proofness under any conditions, through our special sealing materials and superior processing technologies.[16]

2. High capacity

A battery having a large capacity or a large energy per volume is[17] required so as[18] to extend the operating time of the machinery and equipment as much as possible within the limited[19] battery space.

In our micro-batteries, a high capacity can be[20] obtained through our original design technologies and by use of high purity materials.

3. Stable operating voltage

The battery voltage depends on the temperature and the depth of discharge[21]. Since the change of the voltage influences the characteristics of the machinery and equipment, it is necessary that the operating voltage is[22] stable.

Our micro-batteries always have a stable operating voltage in[23] a wide operating temperature range and in a depth of discharge.[24]

4. High reliability

---

[15] Delete the whole sentence.
[16] Our batteries use special sealing materials and superior processing technology to prevent leakage under any conditions.
[17] Batteries ～ are
[18] Delete the underscored part.
[19] within the given limits on
[20] is
[21] "the depth of discharge" is unclear.
[22] be
[23] over

Batteries are always required to have high performance, that is, high reliability.

Our micro-batteries are manufactured through our high quality control.
Only those batteries having such the high quality[25] are delivered.

[My Revision]

The ABC, Co. Ltd. leads in developing the various micro-batteries necessary to power today's miniature electronic products such as watches, calculators, cell phones, hearing aids, pocket-organizers, and a host of other miniature electronic devices. These micro-batteries include the button-type alkaline-manganese battery, the lithium coin battery, lithium paper battery, the rechargeable polymer lithium battery, and the 1.5V lithium button battery.

The key features of all ABC's micro-batteries are high reliability, stable operating voltage, large energy capacity, and superior protection from leakage.

High Reliability

Our micro-batteries are manufactured in accord with the most rigorous specifications. Only those batteries meeting our high quality standards are delivered.

Batteries are always required to have high performance, that is, high reliability.

Stable Operating Voltage

---

[24] Unclear
[25] meeting our high standards

Our micro-batteries always provide a stable operating voltage over a wide operating temperature range and at different degrees of discharge.

Battery voltage depends on temperature and the degree of discharge. Since any changes of voltage influence operation or performance of electronic devices, the operating voltage must be stable.

Large Energy Capacity

Our micro-batteries provide a large electric capacity through our original design technologies and high purity materials.

Batteries having large energy per volume are required to extend the operating time of machinery and equipment as much as possible.

Superior Protection from leakage

Our micro-batteries prevent leakage under all conditions by our special sealing materials and superior processing technology.

Electrolytic leakage damages the terminals of quartz watches and other precision machinery using micro-batteries. This damage causes precise electric connections to be destroyed which result in unstable operation of the devices.

My revision starts with an overview of this catalog, that is, a summary statement of the content of this catalog. And then, point-by-point presentation of the whole, arranged in descending order of importance. And the final section explains each item step-by-step which is clarified in the preceding chapter.

As my last example for this section, let me use a fax message sent to an American company by a Japanese company in Japan.

Example 12　Fax message

[Original]

Subject: Request on the tester harmonization for ABC & XYZ vehicles

In reference to our FAX dated on November 27, 1992.　We would like to inform you new data link connectors pin layout for F-cars with Michigan power plant. (See Attachment 1.)

The ABC Corporation has decided to adopt this pin layout for '94 model and the communication terminals for Michigan power plant are assigned to the reserved terminals of ABC12-way connector.

In consequence. we think Michigan plant does not need to prepare another new adaptor harness for '95 XYX vehicles with Michigan power plant, which is informed you by our previous FAX.

Note:　Although the No. 5 pin of 12 way connector is assigned to ABC SCI communication system and Michigan SCI-II communication system, we think DRB-111 can communicate with the both system by modifying the DRB-III program.

By adopting this pin layout, we can satisfy the following requirements:

(1) Standardization of designing the wiring harness for XYZ vehicles

(2) Serviceability of the vehicles for Michigan and ABC channels

Please feel free to ask us if you have any question.　We hope those are helpful to you.

Best Regards

This example lacks “Clarity of Purpose,” “Effective Heading,” “Clear Sentence Style,” “Good Grammar and Mechanics,” etc. (See Appendix G.) The name of the companies has been changed. This example could be revised:

Subject: Request for a New Layout for Data Link Connector Pin

In reference to our FAX of November 27, 1992, you should adopt the new layout of the data link connector pin for ’95 F-cars assembled at Michigan Power Plant.

The ABC has decided to adopt this new layout (see Attachment) for ’94 ABC vehicles. Michigan Power Plant does not need to design a new adapter harness for ’95 XYZ vehicles because this new layout can use the data link connector pin for the AAA ’94 model and the communication terminals for Michigan Power Plant are assigned to the reserved terminals of ABC 12-way connector.

The two features when adopting this new pin layout are:

1. Standardization of the design for the wiring harness for XYZ vehicles
2. Serviceability of the vehicles for Michigan and ABC channels

Although the No 5 pin of the 12-way connector is assigned to the ABC SCI communication system and the Michigan SCI-II communication system, DRB-III can communicate with both systems if the DRB-III program is modified.

Best regards,

Appendix G shows an illogical letter written by an American. Even an American, he or she writes illogical documents.

5.5.2 Academic Area

Example 1. Synopsis 1.

[Original]

A STUDY ON THE PRODUCTION SYSTEM MANUFACTURING PRODUCTS CONSISTED OF BOTH STANDARD PARTS AND SPECIAL PARTS ORDERED BY CUSTOMERS. A DESIGN METHOD FOR MIXED BUFFER PRODUCTION SYSTEMS FOR MANUFACTURING THE COMPONENTS OF PREFABRICATED HOUSES VIA PRECAST CONCTRETE PANELS

The object of this paper is to determine the most economical buffer capacity in the production systems for the manufacture of prefabricated houses using precast concrete panels, via an analysis of the various kinds of buffer systems inherent in those systems. Two types of the component (precast concrete panels) are manufactured; a standard form for standard components, and a special form for the special components required by each individual customer. While the standard forms can be produced beforehand and used for many different projects, the special forms are customized-made-to-order-for each particular project and cannot be produced until the order for that project has been received. Generally, then, manufacturing policy is determined by the average value of standard ratios, that is, the proportion of standard components out of the total number of components of each order.

In this system, the number of standard forms can be ascertained from total demand and the standard ratio. However, the number of standard forms determined by this method might precipitate supply into a shortage on demand and change the lead time for shipping. This is due to three types of fluctuations; arrival intervals of orders, standard ratios of orders and special

form processing times. In this paper, mixed buffer production systems are proposed in order to decrease the shortage of standard component and the shipping lead time, both of which could be affected by the three types of fluctuation mentioned above.

Aims of this study are as follows;

1) To clarify the relationships among the number of standard forms, the level of the safety stock of standard component, term-end inventory of standard component and the shipping lead time under the above three kinds of fluctuation.

2) To propose the procedures as design of the mixed buffer production system combined with the additional standard forms and the safety stock in order to decrease the lead time economically against the above three kinds of fluctuation.

Approaching steps for the aims are as follows;

1) To build the production management system models which describe characteristics of the manufacturing processes and demand for products in the production systems for the components of prefabricated houses via precast concrete panels.
2) To analyse the system characteristics under the conditions of demand for product.
3) To analyse the effects of some buffer systems to control the system characteristics.
4) To propose the design procedures for production management systems with a mixed buffer system.

As a result, conclusions are summarized as follows;

1) In order to determine a basic number of standard forms, a deterministic model is analysed and the formation of a basic number of standard forms is derived, in which the relationship among the number of standard forms, average standard ratio, and load ratio is clarified.

2) Under the periodical production ordering system model with the basic number of standard forms, the relationships among the conditions of demand, term-end inventory of standard component and the shipping lead time are clarified as structural formulations. The conditions of demand are fluctuations, that is, of demand quantity of standard component, of forecasting error, of the differences between forecasting values, of standard ratios, and of processing time of special forms.
3) In order to control the system characteristics under the above conditions of demand, the effect of additional standard forms, safety stock of standard component, and mixed buffer combined with above two buffers to term-end inventory of standard component and the shipping lead time are clarified as structural formulations. And algorisms to calculate the effects of mixed buffer production systems are developed.
4) Based on the above analyses, some design procedures for mixed buffer production systems are proposed according to some management needs. Usefulness of the proposed procedures are shown in some numerical examples.

This synopsis is the summary of a paper presenting the results of research of a certain Japanese professor. These comments present my suggestions for revising and editing this synopsis.

I present two types of commentary: rhetorical analysis and editorial commentary. The rhetorical analysis is the most important, although my editorial comments suggest ways to make the synopsis easier to read and understand.

My analysis is based on the assumption that this synopsis essentially should be an extended abstract of the paper. Therefore

this synopsis should embody the principle of an abstract. It should be a true summary of the paper, and it should be informative. (See Appendix H.)

As a true summary, the synopsis should follow the organization of the paper. A paper presents the results of original research, so almost always in science and engineering the paper is organized according to the method of investigation and analysis of the research. This organization usually consists of the following sections: an introduction to establish the objectives of the research, an explanation of the methods and experimental procedures of the research, the results of the research, and the discussion of the results and the conclusions of the research.

My analysis and comments on this synopsis are based on suggestions in the *Designing Technical Reports* and the *Guidelines for Abstracts* by ANSI/NISO.

These rhetorical comments follow the organization of the synopsis. I comment on each paragraph or section, using the document's numbering to distinguish between the sections of the synopsis. The divisions in the synopsis itself, however, need to be clarified by format and transitional devices.

In general, this synopsis is quite unclear in terms of the actual research accomplished. Furthermore, this synopsis essentially presents only methodology. It has no information on results, analysis, or conclusions; it just indicates what readers can find in the paper if they want to read it. It has little "substance."

1. The title is too long. (See Appendix I.)

2. The first three paragraphs summarize the objective of the research. In my opinion, this is done rather inefficiently because there are considerable details in the first two paragraphs as the writer tries to define terms and explain the problem.

The primary difficulty with the first section of the synopsis is that the specific reason for the research is unclear. What exactly is the current algorithm and what are its deficiencies? The reader has to infer that the current manufacturing algorithms for these components do not include any aspects of a mixed buffer production system. The reader has to assume that the existing algorithms cannot meet any aspects of the two aims of the study.

Unfortunately, this problem recurs throughout the entire synopsis, as my editorial commentary on the page proof indicates and as I explain below.

3. The second section of this synopsis summarizes the four-step methodology of the research. However, as my annotations indicate, the assumptions behind this methodology are quite unclear. Step one assumes there are no existing production management system models, although an "average value" model is introduced in the first paragraph of the synopsis. What exactly does step one involve?

Step two either assumes an existing model or assumes a model developed in step one. How exactly does step two relate to step one? It could be a circular methodology, as a model including both the system characteristics and demand for product seems to be the objective of step one. What, then, is the objective of step two? If it is to analyze existing or hypothetical production practices, then how do these differ from those used to develop the model in step one?

Step three introduces "some buffer systems." What are these? Are these a "mixed buffer system"? If so, how do mixed buffer systems differ from other buffer systems and existing buffer systems? Assuming that the writer means, a "mixed buffer system," then serious questions arise about the methodology and the synopsis of the methodology. Is a "mixed buffer system" an hypothesis to be evaluated or confirmed, or is such a system the result of an analysis

in step three?

Step four is clear, but is based on assumptions not too clear in steps one, two, and three.

4. The third section of the synopsis purports to summarize the conclusions of the study. It suffers from the same problems as the previous sections. Again, a two-buffer model is alluded to and a mixed buffer model is introduced, but the assumptions about exactly what is happening methodologically are unclear.

The third section is entirely methodological and descriptive; it presents no conclusions. Steps one, two, and three are purely methodological and are just detailed expansions of steps one, two, and three of the second section of the synopsis. No results are presented. Step four has no substance.

In sum, the methodology of the research is quite unclear. In addition, the structure of the paper is unclear. The entire synopsis, except for the last two sentences (step four), could come from the first chapter of the paper, and conclusions of the research are not summarized, assuming there were results, analysis, and conclusions.

I suggest that this synopsis, starting with stating the two purposes of the study, begin as follows:

> The recent manufacturing policy for the production of standard concrete panels of prefabricated houses determines the quality from the average value of the ratios of standard components to total components. However, this method may cause a shortage of standard components on depending demand or the increase of the lead time for shipping. Hence an investigation was made to determine the most economical buffer capacity. This paper proposes the adoption of mixed buffer production systems to decrease panel shortage as well as shipping lead time.

Now I can proceed to the editorial comments to make the

synopsis easier to read and understand. The footnotes show my revisions for this synopsis.

A STUDY ON[1] THE PRODUCTION SYSTEM MANUFACTURING PRODUCTS CONSISTED[2] OF BOTH STANDARD PARTS AND SPECIAL PARTS ORDERED BY CUSTOMERS.[3] A DESIGN METHOD FOR MIXED BUFFER PRODUCTION SYSTEMS FOR MANUFACTURING THE COMPONENTS OF PREFABRICATED HOUSES VIA PRECAST CONCRETE PANELS[4]

The object of this paper is[5] to determine the most economical buffer capacity in the production systems for the manufacture of prefabricated houses using precast concrete panels, via[6] an analysis of the various kinds of buffer systems inherent in those systems. Two types of the component ([7]precast concrete panels)[8] are manufactured;[9] a standard form for standard components, and a special form for the special components required by each[10] individual customer. While the standard forms can be produced beforehand and used for many different projects, the special forms are customized-made-to-order-for each particular project[11] and cannot be produced until the order for that project has been received. Generally, then, manufacturing policy is determined by the average value of standard ratios,[12] that is, the proportion of standard components out of the total number of

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1. Delete
2 Revise to: CONSISTING
3 Revise to:—
4 Should be subtitled
5 Revise to: research was
6 Revise to: parts. This was determined through
7 Delete
8 Delete
9 Revise to: :
10 Revise to: an
11 Revise to: customized-made-to-order for each particular project,
12 Revise to: the ratios of standard components,

components of each order.

In this system, the number of standard forms can be ascertained from total demand and the standard ratio. However, the number of standard forms determined by this method might precipitate supply into[13] a shortage on demand and change[14] the lead time for shipping. This is due to three types of fluctuations;[15] arrival intervals of orders, standard ratios of orders and[16] special form processing times. In this paper, mixed buffer production systems are proposed in order to decrease the shortage of standard component[17] and the shipping lead time, both of which could be affected by the three types of fluctuation mentioned above.

Aims of this study are as follows;[18]

1) To clarify the relationships among the number of standard forms, the level of the safety stock[19] of standard component, term-end inventory[20] of standard component[21] and the shipping lead time under the above[22] three kinds of fluctuation.
2) To propose the[23] procedures as design of[24] the mixed buffer production system combined with the additional standard[25] forms and the safety stock[26] in order to decrease the lead time economically[27] against[28] the above[29] three kinds of fluctuation.

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[13] Revise to: result in
[14] Revise to: increase
[15] Revise to: :
[16] Revise to: orders, and
[17] Revise to: by the shortage on demand of standard components
[18] Revise to: The aims to this study were:
[19] Revise to: the margin of safety of
[20] Revise to: of the standard component
[21] Revise to: to components
[22] Delete
[23] Delete
[24] Revise to: to design
[25] Unclear.
[26] Revise to: the margin of safety stock
[27] Revise to: for shipping
[28] Unclear.
[29] Delete:

Approaching steps for the aims are as follows;[30]

1) To build[31] the production management system models which describe characteristics[32] of the manufacturing processes and demand for products in the production systems for the components of prefabricated houses via[33] precast concrete panels.
2) To analyse the system characteristics under the conditions of demand for product.
3) To analyse the effects of some[34] buffer systems to control the system characteristics.
4) To propose the[35] design procedures for production management systems with a mixed buffer system.

As a result, conclusions are summarized as follows;[36]

1) In order to determine a basic number of standard forms, a deterministic model is analysed and the formation of a basic number of standard forms is derived, in which the relationship among the number of standard forms, a average standard ratio, and load ratio is clarified.[37]
2) Under the periodical production ordering system model[38] with the basic number of standard forms, the relationships among the conditions of demand, term-end[39] inventory of standard component[40] and the shipping lead time are clarified as structural formulations.

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[30] Revise to: A four-step procedure was used:
[31] Revise to: to develop
[32] Revise to: describes the characteristics.
[33] Revise to: with
[34] Revise to: mixed. What is meant by "some"? But how do we get the "mixed buffer system"?
[35] Delete
[36] Revise to: The study yielded the following conclusions:
[37] 1) is not a conclusion. "is analyzed, derived, and clarified" are probably results. Is "formulation derived" a mathematical model?
[38] What is the source of this model? Is it a model developed in the study, or an existing model that the study evaluated?
[39] Revise to: the term-end
[40] Revise to: components

The conditions of demand are fluctuations, that is, of demand quantity of standard component, of forecasting error, of the[41] differences between forecasting values, of standard ratios, and of processing time[42] of special forms.

3) In order to control the system characteristics under the above[43] conditions of demand, the effect of additional standard forms, safety[44] stock of standard component,[45] and mixed buffer combined[46] with above two buffers[47] to term-end inventory of standard component and the shipping lead time are clarified as structural formulations. And algorisms[48] to calculate the effects of mixed buffer production systems are developed.

4) Based on the above[49] analyses, some design procedures for mixed buffer production systems are proposed according to some management needs. Usefulness[50] of the proposed procedures are shown in some[51] numerical examples.

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[41] Revise to: in the demand for standard components, in forecasting errors, in
[42] Revise to: in standard ratios, and in processing times
[43] Devise to: these
[44] Revise to: forms, of the margin of safety.
[45] Revise to: components.
[46] Revise to: of a mixed buffer system are combined
[47] What does “above two buffers” refer to? What system is that?
[48] Revise to: Algorithms
[49] Revise to: these
[50] Revise to: The usefulness
[51] Revise to: is illustrated by

Example 2　Synopsis 2

[Original]

STUDY OF THE STATIC AND DYNAMIC CHARACTERISTICS
OF HYBRID PLAIN JOURNAL BEARINGS

A hydrostatic plain journals bearing can be designed to take advantage of both hydrostatic and hydrodynamic bearing principle. Such a bearing has high load carrying and stiffness in the wide range from zero to high rotational speed or from low to high eccentricity.

This thesis deals with a hybrid plain journal bearing having many capillary restrictors at the mid plane, which is lubricated with an incompressible fluid. The static and dynamic characteristics of the bearing are studied theoretically and experimentally. The purpose of this study is to make clear the bearing characteristics in order to give the fundamental design rules which have little been known.

The thesis is composed of six chapters. Chapter 1 explains the background of the study and surveys the literature on hydrostatic and hybrid journal bearings.

In Chapter 2 the bearing characteristics are analyzed based on the isothermal lubrication theory. When solving the Reynolds equation for the lubricating fluid film, a difficulty arises in prescribing the boundary condition of the film pressure at the feeding position of the fluid where the fluid flow is very complicated. In order to overcome the difficulty, a row of the feeding holes is replaced by band source distributed continuously in the circumferential direction, and the restricting effect is simply expressed by constructing flow models in the vicinity of restrictor. Using this replacement and expression, the boundary condition is given in simple form to make the analysis, easy. Then, the Reynolds equation for the fluid film is solved analytically by the perturbation method. The static characteristics, such as the load carrying capacity and the flow rate, and the dynamic errors, such as the stiffness and

damping coefficients, are calculated by integrating the obtained film pressure over the bearing surface. And the whirl onset speed is evaluated by investigating the motion of a rigid rotor supported by the bearings.

Chapter 3 describes the experiments on the bearing characteristics to determine whether the assumptions and models used in the theoretical analysis are good or not. The flow rate of the fluid and whirl onset speed of the rotor are investigated experimentally, and the experimental values are compared with the theoretical results presented in Chapter 2. An agreement between the experimental and theoretical results is good in the range of the low flow rate where the bearing is operated practically. Therefore, the assumptions and models are proper to simulate the actual flow phenomena, and the theory can be applied to a practical bearing design with reasonable accuracy. When the flow rate exceeds a certain value, the agreement is not so good because the contraction flow is developed around the feeding holes. The limit of the theory is prescribed by the Reynolds number with respect to the flow in the annular curtain area close to the outlet of a capillary.

Chapter 4 is devoted to the theoretical analysis of thermal effects on the bearing characteristics. The heat generation due to the viscous friction of the fluid is considered in the analysis, assuming that the flow is adiabatic and that the journal eccentricity and vibration are small. The simultaneous solutions of the Reynolds equation and the energy equation are obtained by using a new method by which the fluid temperature is separated into static and dynamic components, as well as the pressure. Characteristics such as the temperature rise, load carrying capacity and whirl onset speed are clarified and compared with those calculated in the isothermal condition. It is found that the temperature rise increases with the increase in the rotational speed of the journal and that the thermal effects cause the decrease in the load carrying capacity and the whirl onset speed.

Chapter 5 presents the theoretical analysis of fluid effects on the dynamic behavior of the lubricating fluid film. In developing the analysis, the

three-dimensional boundary-layer equations for unsteady flow are linearized by the perturbation method on the assumption that the eccentricity and vibration are small. It was found that in general the fluid inertia effects on the spring and damping action of the film increase with the increase of the rotational speed and the supply pressure, and that the inertia generates a reaction force proportional to the journal in the film. It is also found that the inertia contributes to the improvement of stability when the rotor mass does not exceed a certain value which increases with the decrease of the supply pressure and the bearing radial clearance.

Chapter 6 states the general conclusions of this study.

This synopsis is the summary of a certain Japanese professor of a paper presenting the results of research. These comments present my suggestions for revising and editing this synopsis.

I also present two types of commentary: rhetorical analysis and editorial commentary. The rhetorical analysis is the most important, although my editorial comments suggest ways to make the synopsis easier to read and understand.

In general, there is considerable substance in this synopsis on hybrid plain journal bearings. However, it can be revised to be even more informative.

1. The first three paragraphs present the objective of the research. Presumably they summarize the introduction and first chapter of the synopsis. The objective of the research and the conclusion of the research are stated directly, which is excellent. I do not mind stating the conclusion in the first paragraph, which is a strong opening. Some persons might reverse the order of the first two paragraphs so that the conclusion of the study comes after the statement of the research objective and basic method of investigation taken to meet the objective. That, of course, is the logical order.

The first two sentences of the second paragraph, regardless of whether that paragraph is first or second, could be combined to be much stronger. The second sentence explains what the vague phrase, "deals with," of the first sentence means.

The reason for the research is not stated. The design rules "have been little known to date" is the unknown which is the reason for the research. The third paragraph then is very weak because it is not informative. The purpose of the background and literature review is to establish what is known and what still is unknown about hydrostatic and hybrid journal bearings. What is not yet known is what needs to be stated in order to justify the research.

2. Chapter 2 presents the theoretical study. I assume a mathematical model of the bearing was developed. Neither "theory" or "mathematical model" appears in the paragraph. The first sentence of the paragraph should state that this was the purpose of this section of the research.

Basically, the paragraph is not very informative because it merely follows the modeling methodology without stating the purpose, the results, and the conclusions. Assuming that development of the mathematical model was the writer's own research, not part of the literature review, the actual model should be presented unless it is too long and complicated. The symbols would be very useful when summarizing Chapter 3.

3. This paragraph summarizing Chapter 3 is much more informative than that summarizing Chapter 2. However, the conclusions of the comparison between theoretical and experimental values are stated qualitatively. Mathematical symbols from the theoretical model could be used to specify if not quantify the comparison and contrast. For example, "when the flow rate exceeds a certain value," is very vague and indeed is perhaps the most

important point of the experiment. What is this value? What are the reasons it has this value instead of a higher or lower value? The paragraph fails to state why agreement below that flow rate makes the model reliable for practical design purposes.

4. This paragraph summarizes Chapter 4. Except for being qualitative, as explained above, it flows in the same order as the previous paragraph: subject, method, conclusions. A transitional sentence is needed, however, to explain why the thermal effects needed to be modeled. (Presumably, they were not in the original mathematical model developed.) The reader also might want to know why experiments were not conducted to verify the thermal model.

5. This paragraph summarizes Chapter 5. My comments on this paragraph are the same as those for the previous paragraph. It follows the standard order of subject, method, and conclusions. However, it also is qualitative and it does not state the reason for modeling the effects of fluid inertia.

6. The single sentence paragraph summarizing Chapter 6 has no content. What were the conclusions of the study? What is the writer's assessment of the validity of the conclusions and the extent to which bearing design methodology can be improved? What specific new knowledge did the research produce?

Now I can proceed to the editorial comments to make the synopsis easier to read and understand. The footnotes show my revisions for this synopsis.

STUDY OF[1] THE STATIC AND DYNAMIC CHARACTERISTICS OF HYBRID PLAIN JOURNAL BEARINGS

A hydrostatic plain journals bearing can be designed to take advantage of both hydrostatic and hydrodynamic bearing principle.[2] Such a bearing has high load carrying and stiffness in the[3] wide range from zero to high rotational speed[4] or from low to high eccentricity.

This thesis deals with a hybrid plain journal bearing having many capillary restrictors at the mid plane, which is lubricated with an incompressible fluid. The static and dynamic characteristics of the bearing are[5] studied theoretically and experimentally. The purpose of this study is[6] to make clear[7] the bearing characteristics in order to give the[8] fundamental design rules which[9] have little been known.[10]

The thesis is composed of six chapters. Chapter 1 explains the background of the study and surveys the literature on hydrostatic and hybrid journal bearings.

In Chapter 2 the bearing characteristics are analyzed based on the isothermal lubrication theory. When solving the Reynolds equation for the lubricating fluid film, a difficulty arises in prescribing the boundary condition of the film pressure at the feeding position of the fluid where[11] the fluid flow is very complicated. In order to overcome the difficulty, a row of the[12] feeding holes is replaced by band source distributed continuously in the

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[1] Revise: DESIGN RULES FOR
[2] Revise: principles
[3] Revise: a
[4] Revise: speeds
[5] Revise: were
[6] Revise: was
[7] revise: determine
[8] Revise: develop
[9] Revise: rules, which
[10] Insert: to date
[11] Revise: fluid, where
[12] Delete

circumferential[13] direction, and the restricting effect is simply expressed by constructing flow models in the vicinity of restrictor. Using[14] this replacement and expression, the boundary condition is given[15] in simple form to make[16] the analysis, easy[17]. Then, the Reynolds equation for the fluid film is solved analytically by the perturbation method. The static characteristics, such as the load carrying capacity and the flow rate, and the dynamic ones[18], such as the stiffness and damping coefficients, are calculated by integrating the obtained film pressure over the bearing surface. And the[19] whirl onset speed is evaluated by investigating [20] the motion of a rigid rotor supported by the bearings.

Chapter 3 describes the experiments on the bearing characteristics to determine whether[21] the assumptions and models used in the theoretical analysis are good or not[22]. The flow rate of the fluid and whirl onset speed of the rotor are[23] investigated experimentally, and the experimental values are[24] compared with the theoretical results presented in Chapter 2.[25] An agreement between the[26] experimental and theoretical results is[27] good in the range of the low flow rate where the bearing is operated practically.[28] Therefore, the assumptions and models are proper[29] to simulate the actual flow phenomena, and the theory can be applied to a practical bearing design with reasonable

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[13] Ambiguous
[14] Revise: With
[15] Revise: defined
[16] Revise: facilitate
[17] Delete
[18] Revise: characteristics
[19] Revise: The
[20] Unclear method
[21] Revise: if
[22] Revise: reliable
[23] Revise: were
[24] Revise: were
[25] Delete
[26] Revise: The
[27] Revise: are
[28] Unclear meaning
[29] Revise: reliable

accuracy. When[30] the flow rate exceeds a certain value, the agreement is not so good because the[31] contraction flow is developed around the feeding holes. The limit of the theory is prescribed by the Reynolds number with respect to the flow in the annular curtain area close to the outlet of a capillary.

Chapter 4 is devoted to the[32] theoretical analysis of thermal effects on the bearing characteristics. The heat generation due to the viscous friction of the fluid is considered in the analysis, assuming that the flow is adiabatic and that the journal eccentricity and vibration are small. The simultaneous solutions of the Reynolds equation and the energy equation are obtained by using a new method[33] by which the fluid temperature is separated into static and dynamic components,[34] as well as the pressure.[35] Characteristics such as the temperature rise, load carrying capacity [36] and whirl onset speed are clarified and[37] compared with those calculated in the isothermal condition. It is[38] found that the temperature rise increases[39] with the increase in the rotational speed of the journal and that the thermal effects cause the decrease in the load carrying capacity and the whirl onset speed.

Chapter 5 presents the[40] theoretical analysis of fluid effects on the dynamic behavior of the lubricating fluid film. In developing the analysis, the three-dimensional boundary-layer equations for unsteady flow are linearized by the perturbation method on the assumption that the eccentricity and vibration are small. It is[41] found that in general the fluid inertia effects on the spring and damping action of the film increase with the increase of the rotational

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[30] Revise: However, when
[31] Revise: a
[32] Revise: a
[33] Unclear.
[34] Insert: as well as the pressure. Delete comma.
[35] Delete
[36] Revise: Need comma
[37] revise: were
[38] Revise: was
[39] Revise: rises
[40] Revise: a
[41] Revise: was

speed and the supply pressure, and that the inertia generates a reaction force proportional to the journal in the film. It is[42] also found that the inertia contributes to the improvement of[43] stability,[44] when the rotor mass does not exceed a certain value which increases with the decrease of the supply pressure[45] and the bearing radial clearance.

Chapter 6 states the general conclusions of this study.

There are many ways to revise articles and documents, but in this paper I have adopted those learned from Professors J. C. Mathes and Dwight W. Stevenson of the University of Michigan.

[42] Revise" was
[43] Revise: improves
[44] Delete
[45] Unclear meaning

Chapter 6

Conclusion

This paper is an early effort to show what should be taught in English technical and scientific writing and, more specifically, what relevant factors are involved in the overall teaching process to Japanese professional business people, technical translators, engineers, scientists, managers, teachers, and students.

John Swales explains in *Writing Scientific English* (1971) that TSW possesses a set of approximately twelve formal syntactic and lexical properties such as the "simple present tense," "the passive," "compound nouns," etc. A. J. Herbert writes in *The Structure of Technical English* (1969) about twenty-eight patterns such as "make + *Noun* + *Adjective*," "Enable, Allow, Make, etc. + Infinitive," "The Use of Will, Can and May," "The Impersonal Passive," "Passive Verb + By + *Noun* (agent), "Contracted Relative: Passive," "Prepositions with 'which'," "When, Once, If, etc. + Past Participle," "It is + Adjective + to," etc.

A consideration of these writers' linguistic elements might lead me to the view that technical and scientific writing (TSW) is a register of General English which should be analyzed as much as possible with reference to its formal linguistic criteria. They are lacking in the explanation of the common weakest elements and the most important elements for Japanese practitioners in TSW. TSW is essentially functional and serves a need. Therefore TSW should be taught in such a way as to give its formal properties their real communicative values because it should be used as a means of

interactions and communication.

Through my experiences, I have found the common pitfalls Japanese writers encounter when they produce industrial documents and technical research papers. Although there are many areas, this paper presented the most common, frequent errors and the weakest elements: vocabularies, styles, and logic in the industrial documents and the research papers (see Chapter 4). Its goal is to help Japanese writers learn to communicate effectively in English. I believe this methodology will be also helpful in teaching this field of English.

6.1 Summary

In this paper, I have explained some common weak and unfamiliar points for Japanese learners and teachers in English technical and scientific documentations. I have forged one of the most appropriate approaches for Japanese learners and teachers who want to acquire the quintessence of English TSW. This study was based on the assumption that rhetoric and linguistic areas are essential to the foundation of English TSW teaching in Japan. This study also demonstrated the need for Japanese instructors in this field to develop and cultivate English TSW in Japan, which few Japanese teachers have tried to study and teach.

As we are now in the IT age and the study of TSW has become extremely important and indispensable to Japan, in Chapter 1 I explained the scope of TSW as well as the most appropriate teaching areas in this field. In this chapter, the most appropriate naming of this field was decided. Furthermore, the relationships of ESP and TSW were explained because EST originated in ESP. The reason, the purpose, and scope of the study in TSW for Japanese practitioners and students were also explained.

In Chapter 2, a brief history of English TSW was introduced

from the origin to the present as well as the present situations in the United States and in Japan. The first step in the investigation was to indicate the grounds for viewing TSW as a distinct human activity and the second step, to introduce how to inherit the shadow of TSW to this century.

We could easily catch a glimpse of English TSW which has been supporting the lives of each individual age from ancient times.

In Chapter 3, in order to grasp the true figure of English TSW for helping us teach it to Japanese learners as well as teachers, the definition of English TSW was attempted. The results show that there is no clear consensus in the field about areas and methods of instruction. The professors and authorities in the United States and in the United Kingdom define TSW in various ways.

As anything follows the same route when it has come of age, now that TSW is a discipline in its own right, and definitions abound, then why ask the question again? Indeed, in the 1980s with the rapid development of science and technology, such a question completely disappeared.

The way to arrange ideas in teaching English TSW is culturally specific. Therefore, the methodology created for native speakers of English may be unsuitable for Japanese learners in this field if they do not acquire the proper teaching methodology best suited for nonnative speakers of English.

Chapter 4 plays the most significant part of this paper. Writing on the job varies to a considerable degree across a number of variables. It is true that writing formats predominate: business-engineering letters, fax messages, memos, instruction manuals, research papers, etc. are frequently recurring genres in workplaces. However, Japanese teachers should teach more important elements such as vocabulary, style, sentence construction,

paragraph arrangement, and organization in English TSW. Rhetoric and communicative grammar have similar and common genres even if documents are diverse. Instructors must also stress the need for clarity, concision, and logical organization based on "writer's responsibility."

A large number of employees in industry are now required to write extremely important messages in English almost every day. Almost all Japanese workers in industry have difficulty in writing these documents because of ignorance of a clear cognitive frame of English TSW. They are usually engrossed in producing English documents without any knowledge of rhetoric of writing in this field.

My methodology, explained in Chapter 4, may be far from what the authorities and professors of native speakers of English have defined, but considering it from the writer's responsibility's view while teaching and learning English TSW it will be helpful to Japanese learners.

Chapter 5 explains the real and effective methodology to correct and edit English and scientific documents of both the business-engineering world and the academic area. Following my instructions, explained in Chapter 4 and Chapter 5, learners and instructors can easily correct and edit documents in this field.

6.2 Recommendations

While Japanese people are spending an unbelievable amount of time studying English, the results are poor. This is because Japanese people are said to be weak at learning foreign languages. This view, however, may not be very useful unless the causes of the weakness are investigated. The results of recent research and my experience as an English teacher lead me to the conclusion that the weakness arises from our learning methods which have emphasized mechanical

repetition of words or grammatical knowledge with little or no study of the thinking process or the logical relationship between thoughts. In Japan, few teachers, to my knowledge, teach the logical aspects through sentence, paragraph, and document writing. In fact, the influence of this traditional way of thinking has been so strong that Japanese people are not able to express their ideas logically in Japanese, much less in English.

To correct these shortcomings, the TEP Test was developed by the University of Michigan and Waseda University. The Test measures communication skills with a focus on logical thinking, and further, does this without using true-false or multiple choices test methods.

In light of the present status of English as an international language, all engineering and science universities and colleges in Japan should include English TSW in the curriculum as a required subject because clear, effective TSW may no longer be regarded as an option – it is unquestionably a necessity. If Japanese teachers do not pay attention to these areas, English will remain in an ineffective condition. Therefore in English documents, Japan will not be ranked among the leading nations of the world.

Through my research and the hypotheses proposed in this paper, recommendations may be derived to construct a TSW pedagogy.

1. Universities and colleges should establish a department which confers a Bachelor, Master, or Ph.D. degree in TSW.
2. Those who teach English TSW should be trained in the proper institutions.
3. TSW should be taught in the most appropriate linguistic and rhetorical contexts to facilitate communication competence.
4. Instructors should teach effective use of various rhetorical modes.
5. Instructors should also teach how to select the proper

vocabulary, effective sentence structures, and precise paragraph organizations. If teachers do not understand the content, they should ask the students who are specialized in it.

6. Technical and scientific objects should be taught not by English teachers but by the specialists of their own fields.
7. Technical and scientific students and practitioners should take the TEP Test which evaluates their communication abilities in science and technology.
8. In applying the fundamentals of effective TSW, students should be especially focused on keeping their English messages clear, concise, correct, short, and simple.
9. Students should follow the style manuals prepared by individual organizations.
10. Students should follow the fundamental elements in composing their documents such as “Heading,” “Purpose Statements,” “Abstract,” “Summary,” “ Visuals,” and “Formatting.”
(See Appendix I.)

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We can say that Japan has lagged far behind other countries in this field. In order to make a peaceful world we must become better technical and business communicators by studying technical and business communication.

Now we live in one world. We live in one world market. We live on the only earth. By misunderstanding, friction, and tension; by inaccurate, impolite documents; another world war may occur. By avoiding these situations and by promoting intercultural understanding, we will produce a better world in which we can live and work together.

Appendices

Appendix A

Some Institutions of Higher Education Worldwide which Provided Instruction in Technical Communication, 1998

This appendix lists some graduate, undergraduate, and certificate opportunities.

Institution	Location
Alderson-Broaddus College	USA–West Virginia–Philippi
Alexandria Technical College	USA–Minnesota–Alexandria
American River College	USA–California–Sacramento
American University of Paris	France–Paris
Austin Community College	USA–Texas–Austin
Auburn University	USA–Alabama–Auburn University
Austin Community College	USA–Texas–Austin
Baylor University	USA–Texas
Belleville Area College	USA–Illinois
Bentley College	USA–Massachusetts–Waltham
Black Hawk College	USA–Illinois–Moline
Boise State University	USA–Idaho–Boise
Bob Jones University	USA–South Carolina
Bowling Green State University	USA–Ohio–Bowling Green
Brigham Young University	USA–Utah–Provo
Burlington County College	USA–New Jersey
California Polytechnic State University	USA–California–San Luis Obispo
California State University, Chico	USA–California–Chico
California State University, Fullerton	USA–California–Fullerton
California State University, Hayward	USA–California–Hayward
California State University, Long Beach	USA–California–Long Beach
California State University, Sacramento	USA–California–Sacramento

California University of Pennsylvania	USA–Pennsylvania–California
Capilano College	Canada–British Columbia–North Vancouver
Capitol College	USA–Maryland
Carnegie Mellon University	USA–Pennsylvania–Pittsburgh
Case Western Reserve University	USA–Ohio
Cedarville University	USA–Ohio–Cedarville
Christchurch Polytechnic, New Zealand	New Zealand–Christchurch
Clark College	USA–Washington–Vancouver
Clarkson University	USA–New York–Potsdam
Clemson University	USA–South Carolina–Clemson
Colorado State University	USA–Colorado
Christchurch Polytechnic, New Zealand	New Zealand–Christchurch
Cedarville University	USA–Ohio–Cedarville
Cincinnati State Technical and Community College	USA–Ohio–Cincinnati
Cincinnati Technical College	USA–Ohio–Cincinnati
Clark University	USA–Massachusetts–Worcester
Clarkson University	USA–New York–Potsdam
Clemson University	USA–South Carolina
College of Dupage	USA–Illinois–Glen Ellyn
College of Lake County	USA–Illinois–Grayslake
Colorado State University	USA–Colorado–Ft. Collins
Columbus State Community College	USA–Ohio–Columbus
Concordia University Centre for Continuing Education	Canada–Quebec–Montreal
Cooper Career Institute	USA–Virginia–Hampton
Cuyahoga Community College	USA–Ohio
Cyber State University	USA–California–Lafayette
Danube-University Krems	Austria–Krems
De Anza College	USA–California–Cupertino
Drexel University	USA–Pennsylvania

Durham Technical Community College	USA–North Carolina–Durham
East Carolina University	USA–North Carolina–Greenville
Eastern Michigan University	USA–Michigan–Ypsilanti
Eastern New Mexico University	USA–New Mexico
Eastern Washington University	USA–Washington–Cheney
Ecole Nationale DAerotechnique	Canada–Quebec–Saint–Hubert
Edison Community College	USA–Ohio–Piqua
Elizabethtown College	USA–Pennsylvania–Elizabethtown
Elmhurst College	USA–Illinois–Elmhurst
Embry-Riddle Aeronautical University	USA–Florida–Daytona Beach
Eindhoven University of Technology	Netherlands–5600 MB Eindhoven
Fachhochschule Giessen—Friedberg	Germany–Giessen
Fairleigh Dickinson University	USA–New Jersey– Teaneck
Ferris State University	USA–Michigan–Big Rapids
Fitchburg State College	USA–Massachusetts–Fitchburg
Florida Atlantic University	USA–Florida
Florida Institute of Technology	USA–Florida–Melbourne
Front Range Community College	USA–Colorado–Westminster
Gannon University	USA–Pennsylvania
Gateway Technical College	USA–Wisconsin–Racine
George Brown College	Canada–Ontario–Toronto
George Mason University	USA–Virginia–Fairfax
Georgia Institute of Technology	USA–Georgia–Atlanta
Golden West College	USA–California–Huntington Beach
Grambling State University	USA–Louisiana–Grambling
Grand Canyon College	USA–Arizona–Grand Canyon
Highline Community College	USA–Washington
Hinds Community College	USA–Mississippi
Houston Baptist University	USA–Texas–Houston
Humber College of Applied Arts & Technology	Canada–Ontario–Etobicoke

Illinois Institute of Technology	USA–Illinois–Chicago
Indian National Scientific Documentation Center, A Constituent of Counsil of Scientific and Industrial Research, DST, Govtt. of India	India–New Delhi
Illinois State University	USA–Illinois
Iowa State University	USA–Iowa
James Madison University	USA–Virginia–Harrisonburg
Johnson County Community College	USA–Kansas–Overland Park
Kirkwood Community College	USA–Iowa–Cedar Rapids
Lawrence Technological University	USA–Southfield
Louisiana State University	USA–Louisiana
Louisiana Tech University	USA–Louisiana–Ruston
Madonna University	USA–Michigan
Mankato State University	USA–Minnesota–Mankato
Memphis State University	USA–Tennessee
Mercer University	USA–Georgia–Macon and Atlanta
Metropolitan State College of Denver	USA–Colorado–Denver
Metropolitan State University	USA–Minnesota–St. Paul
Miami University	USA–Ohio–Oxford
Middlesex Community College	USA–Massachusetts–Bedford
Michigan Technological University	USA–Michigan–Houghton
Milwaukee School of Engineering	USA–Wisconsin–Milwaukee
Minnesota State Univ, Mankato	USA–Minnesota–Mankato
Missouri Western State College	USA–Missouri–St. Joseph
Montana College of Mineral Science and Technology	USA–Montana
Montana Tech of the University of Montana	USA–Montana–Butte
Montgomery College	USA–Maryland–Germantown
Moorhead State University	USA–Minnesota–Moorhead
Mount Royal College	Canada–Alberta–Calgary
Murray State University	USA–Kentucky–Murray

Nazareth College of Rochester	USA–New York–Rochester
New Jersey Institute of Technology	USA–New Jersey–Newark
New Mexico State University	USA–New Mexico
New Mexico Tech	USA–New Mexico–Socorro
New York Institute of Technology	USA–New York–Old Westbury
North Carolina State University	USA–North Carolina–Raleigh
Northeastern University	USA–Massachusetts–Boston
Northern Illinois University	USA–Illinois–Dekalb
Northwestern College	USA–Minnesota–St. Paul
Ohio State University	USA–Ohio
Ohio University	USA–Ohio
Oklahoma State University	USA–Oklahoma–Stillwater
Online-Learning Com	Canada–Ontario–Waterloo
Orange Coast College	USA–California–Costa Mesa
Oregon Institute of Technology	USA–Oregon–Klamath Falls
Oregon State University	USA–Oregon–Corvallis
Ouachita Technical College	USA–Arkansas–Malvern
Penn State University	USA–Pennsylvania–University Park
Pennsylvania College of Technology	USA–South Carolina–Williamsport
Pittsburgh State University	USA–Kansas–Pittsburgh
Polytechnic University	USA–New York–Brooklyn
Portland Community College	USA–Oregon–Portland
Portland State University	USA–Oregon–Portland
Purdue University Calumet	USA–Illinois–Ramsey
Ramsey High School	USA–Illinois–Ramsey
Red River College	Canada–Manitoba–Winnipeg
Rensselaer Polytechnic Institute	USA–New York–Troy
Rochester Institute of Technology	USA–New York–Rochester
Rock Valley College	USA–Illinois
Rocky Mountain College of Art & Design	USA–Colorado–Denver

San Diego State University	USA–California–San Diego
San Francisco State University	USA–California–San Francisco
San Jose State University	USA–California–San Jose
Seneca College of applied Arts & Technology	Canada–Ontario–Toronto
San Jose State University	USA–California–San Jose
Sheffield Hallam University	United Kingdom–Sheffield
Simon Fraser University at Harbour Centre	Canada–British Columbia–Vancouver
Simmons College	USA–Massachusetts–Boston
Southern Illinois University	USA–Illinois
Southern Polytechnic State University	USA–Georgia–Marietta
Southeastern Louisiana University	USA–Louisiana
Southwest College	USA–Texas–Houston
Southwest Missouri State University	USA–Missouri–Springfield
Southwest State University	USA–Minnesota–Marshall
Southwest Texas State University	USA–Texas–San Marcos
St. Louis Community college, Florissant	USA–California–Florissant
SUNY Institute of Technology	USA–New York–Utica
Tarrant County Junior College	USA–Texas
Technical and Professional Writing College of the Humanities	USA–California–San Francisco
Tennessee Technological University	USA–Tennessee–Cookeville
Terra Technical College	USA–Ohio–Fremont
Texas A & M University	USA–Texas–College Station
Texas Tech University	USA–Texas–Lubbock
The College of Great Falls	USA–Montana
The University of Memphis	USA–Tennessee–Memphis
Thomas Nelson community College	USA–Virginia
Towson State University	USA–Maryland–Baltimore
Universit de Sherbrooke	Canada–Quebec–Sherbrooke

University of Akron	USA–Ohio–Akron
University of Alabama in Huntsville	USA–Alabama–Huntsville
University of Arkansas	USA–Arkansas–Little Rock
University of California Extension, Santa Cruz	USA–California–Cupertino
University of California, Riverside	USA–California–Riverside
University of California, Santa Clara	USA–California–Santa Clara
University of California, Berkeley Extension	USA–California–Berkeley
University of Central Florida	USA–Florida–Orlando
University of Cincinnati	USA–Ohio–Cincinnati
University of Colorado	USA–Colorado–Denver
University of Delaware	USA–Delaware–Newark
University of Denver	USA–Colorado–Denver
University of Findlay	USA–Ohio–Findlay
University of Hartford	USA–Connecticut–Hartford
University of Houston	USA–Texas–Houston
University of Illinois	USA–Illinois–Urbana
University of Karlstad	Sweden–Karlstad
University of Maine	USA–Maine
University of Maryland	USA–Maryland
University of Massachusetts	USA–Massachusetts–Amherst
University of Michigan	USA–Michigan–Ann Arbor
University of Minnesota	USA–Minnesota–St. Paul
University of Minnesota, Crookston	USA–Minnesota–Crookston
University of Missouri	USA–Missouri–Rolla
University of New Mexico	USA–New Mexico–Albuquerque
University of North Carolina	USA–North Carolina–Charlotte
University of North Texas	USA–Texas–Denton
University of Pittsburgh	USA–Pennsylvania–Bradford
University of South Florida	USA–Florida
University of Southern California	USA–California–Los Angeles

University of Southwestern Louisiana	USA–Louisiana–Lafayette
University of Tennessee	USA–Tennessee–Knoxville
University of Texas at San Antonio	USA–Texas–San Antonio
University of Twente	The Netherlands–Enschede
University of Washington	USA–Washington–Seattle
University of Wisconsin	USA–Wisconsin–Eau Claire
Utah State University	USA–Utah–Logan
Washtenaw Community College	USA–Michigan–Ann Arbor
Wayne State University	USA–Michigan–Detroit
Webster Institute of Technical Writing	USA–California–San Francisco
Wentworth Institute of Technology	USA–Massachusetts–Boston
Western Washington University	USA–Washington–Bellingham
Western Wisconsin Technical College	USA–Wisconsin–La Crosse
Westminster College of Salt Lake City	USA–Utah–Salt Lake City
Worcester Polytechnic Institute	USA–Massachusetts–Worcester
Wright State University	USA–Ohio–Dayton
York University	Canada–Ontario–Tronto
Youngstown State University	USA–Ohio–Youngstown

– From Society for Technical Communication, 1998 (http:www.stc.va.org/)

Appendix B

Technical and Scientific Writing: Some Related Professional Associations Worldwide (Excluding Japan), 1998

1. United States

American Medical Writers Association (AMWA)

American Society of Indexers (ASI)

American Society for Information Science (ASIS)

American Translators Association (ATA)

Association for Business Communication (ABC)

Association for Business Language Education(A.B.L.E.)

Association for Educational Communications and Technology

Association for Women in Communications (AWC)

Council for Programs in Technical and Scientific Communication (CPTSC)

Council of Biology Editors (CBE)

Graphic Communication Association (GCA)

Information Technology Communicators Association (ITCA)

Institute of Electrical and Electronics Engineers' Professional Communication Society (IEEE/PCS)

International Association of Audiovisual Communicators (IAAVC)

International Association of Business Communicators (IABC)

International Interactive Communications Society (IICS)

International Society for Technical Illustrators (ISTI)

National Association of Government Communicators (NAGC)

National Council of Teachers of English (NCTE)

2. Other Countries

Australia – Australia Society for Technical Communication (ASTS)

Canada–Societe Quebecoise de la Redaction Professionelle (SQRP)

Denmark – Dantekom

France – Conseil des Redacteurs Techniques (CRT)

Germany–Gesellschaft fuer Technische Kommnuikation (TEKOM)

The Netherlands – Studiekring voor Technische Informatie and Communicatie (STIC)

Norway – Norsk Forening for Teknisk Informasjon (NFTI)

South Africa – Institute of Technical Communicators in Southern Africa (ITCSA)

Sweden – Foreningen Teknisk Information (FTI)

Switzerland – Gesellschaft fur Technische Kommunikation Schweize (TECOM Schweiz)

United Kingdom – Institute of Scientific and Technical Communicators (ISTC)

Appendix C

Officers of Japan Society for Technical Communication, 1980

The officers of JSTC, 1980, were as follows:

President:	Tsukasa Shimizu, President of Waseda University
Vice-presidents:	Kazuo Iwama, President of Sony Corporation
	Akira Totoki, President of the Japan Management Association
Executive Directors:	Yoshiaki Shinoda, Professor at Waseda University
	Yoshio Hatakeyama, Senior Executive Vice-president of the Japan Management Association
General Secretary:	Nobuo Ogawa, Director of the Japan Management Association

Appendix D

Some Comments about the Importance of Technical and Scientific Writing

TSW plays a key role in the success of all technical professionals and managers. Conducted by the National Aeronautics and Space Administration (NASA) in 1989, the survey canvassed managers in profit-making and nonprofit organizations in the field of aeronautics. As Figure 13 shows, 100% of the profit managers and 98% of the nonprofit managers in the study consider technical communication a "somewhat important" or "very important" part of their jobs.

Now let me list the various fields of TSW.

Correspondence: In-House or Extend

- Memos to your boss and to your subordinates
- Routine letters to customers, vendors, etc.
- "Good news" letters to customers
- Sales letters to potential customers
- Electronic mail (e-mail) messages to coworkers or customers over a computer network

Short-Reports: In-House or External

- Analysis of a problem
- Recommendation
- Equipment evaluation
- Progress report on project or routine periodic report
- Report on the results of laboratory or field work
- Description of the results of a company trip

Long Reports: In-house or External

- Complex problem analysis, recommendation, or equipment evaluation
- Project report on field or laboratory work

- Feasibility study

Other Documents

- Proposal to boss for new product line
- Proposal to boss for change in procedures
- Proposal to customer to sell a product, service, or idea
- Proposal to funding agency for support of research project
- Abstract or summary of technical article
- Technical article or presentation
- Operation manual or other manual

Figure 13　Examples of technical writing

Table 3　Importance of Technical Communications

	Profit Managers		Nonprofit Managers	
How Important	No.	%	No.	%
Very	86	92.5	43	84.3
Somewhat	7	7.5	7	13.7
Not at all	0	0.0	1	2.0
Total	93	100.0	51	100.0

Appendix E

Weiss: A Short Critique

Weiss' tactics can be improved upon. Let me say a word about each item on his list.

In 1, he mentions that we should use Basic English. We should not use Basic English because Basic English is controlled English. Therefore, if Basic English is used in any documents, we must judge what it means. Some persons take it in one way, others in an entirely different way. The person who reads, therefore, misunderstand by the words.

In 2, I agree with his idea because he suggests that we should avoid using "make," "take," "have," "get," etc. These short verbs are called "weak verbs" because they have multi-meaning and they are ambiguous.

In 3, he mentions that "many of the world's dictionaries still honor the custom of listing the oldest meanings or a word first. The first three or four word definitions in a listing may be rare or archaic"(12). This is not true. When we check these dictionaries, the most frequent uses of the meaning are listed in the first place and the rare or archaic meanings are placed in the last part.

In 4, he suggests that we should replace two-word verbs such as *look on* or *carry on* with *examine* or *continue*. This ideas of his is opposite to his explanation in 1. I oppose to his explanation in 1; therefore I completely agree with his in this explanation. He continues to explain that we should avoid *put up with* or *make a fool of*; use *tolerate* or *embarrass.* These multiword verbs should be used in conversation, not in written communication.

In 5, he suggests that we should avoid the emphatic and progressive English tenses. Instead of *Do you have,* use *Have you*.

Instead of *we will arriving*, use *we will arrive*. He does not explain the reason; therefore I do not understand why he mentions this idea, because this has no connection with technical writing or communication.

In 6, he suggests that we should use active before passive; avoid *it has been determined that* and especially *should it be determined that*. This explanation of his also I do not understand because active voice or passive voice is automatically decided according to the situation.

In 7, he suggests that we should define all special terms in a glossary. I agree with this idea of his, but he does not mention how we define the word. He should mention the Aristotelian, or academic definition (or technical definition); that is "Term = Genus + Differentiation."

As for 8, his advice is germane when products, systems, or companies are named. Therefore this is little concerned with writing technical articles.

In 9, he suggests that we should not coin or invent a word. This can be applied not to use any English word coined in Japan.

In 10, he suggests that we should avoid using long-winded expressions on "time," "place," "distance," or "sequence." However he should not limit only four areas, because other classes are included such as "red in color," "in the field of electronics," etc.

From 11 to 18, his advices are applied to all other fields of writing, not applied only in TSW.

In 19, he suggest we should "construct simple sentences." A report or letter written in complex and complex-compound sentences is far difficult to understand than simple and compound sentences. Therefore this advice of his is welcomed by L1 readers.

In 20, he advises us that we should use "optional *that,*" giving an

example as “We predict *that* the cost will not change.” However if this kind of *that* can be omitted to understand an English sentence, we had better avoid it in view of economy of word.

In 21, he suggests that English for international audiences should be over-punctuated. This advice of his, however, is not only for TSW.

In 22, the proper layout and typefaces are suggested. This advice, however, differs according to the type of written documents.

In 23 and 24, “lists instead of paragraphs” and “tables instead of prose” are taken as a matter of course, not to be limited to only TSW.

In 25, he mentions to “be polite.” This advice is important, not to be limited only in TSW.

His 25 advices on international English documents are concluded that he neglected the weakest area; that is to say, “rhetoric.”

Appendix F

Native Speakers' Views of English Documents Written by Japanese Practitioners: A Critique

Nancy L. Hoft (1995) considers individuals from different cultures that might have different communication expectations in similar organizational settings. Native speakers of Japanese, although apparently strong in quantitative reasoning, experience repeated difficulties in expressing themselves adequately in written English. As each nation has its individual character and history, Japanese specialists and students have their common weak areas as well as strong ones in learning and mastering English.

Kohl et al. (1993) point out that "we have gained a reasonably accurate conception of the key factors that influence Japanese technical communication: the ambiguity of the Japanese language, Japanese attitudes toward ambiguity, and the influence of ambiguity on Japanese communication" (63). They mainly focus on the ambiguity of the Japanese language. Their proposals are applied in almost any field of Japanese language, not just for English TSW. Their article unfortunately does not target the TSW by Japanese practitioners (Appendix D).

My opposition to their theory arises from their ideas that the Japanese language is ambiguous. If the Japanese language were ambiguous, we could not build sophisticated electric appliances such as computers, digital cameras, among other things, or the intricate old shrines that are seen in Kyoto, Nikko, and other places in Japan. The Japanese language is not ambiguous, but Japanese people themselves do not try to express their ideas clearly and precisely. Japan is not a melting pot of ethnic groups, but is an extremely homogeneous society because Japan developed for centuries with

relatively little outside influence. Japanese people, therefore, almost always rely on perfect coordination in the context of everyday life. Japanese people almost always try to grasp the concept of what another person says. This is to say that for the Japanese it is the "listener's responsibility" to grasp the meaning. This is also applied to written communication. In Japan the reader is primarily responsible for the success of communication, that is, the "reader's responsibility." If readers cannot understand documents especially those from one's superior, the reader is blamed even if the document is written ambiguously.

It is apparent that the teachers and professors in the United States and in the United Kingdom pay particular attention to "audience," "rhetoric," "editing sentences," "constructing paragraphs," "grammar," "style," "clarity," "conciseness," "oral presentation."

Concerning "audience," native speakers of English require focusing on different audiences but nonnative speakers, especially Japanese business writers in TSW, find difficulty focusing on the audience because their purpose is almost always decided. This audience is usually the boss because they almost always must satisfy the boss. Japanese business people as well as technical and science people usually think, "if we write, the readers will understand us." That is to say, "reader's responsibility."

Regarding "rhetoric," (I quoted Richards, Platt and Platt's definition on page 21) this field is not taught in Japanese schools. Therefore, those teaching Japanese must emphasize this field in the teaching of English.

"Constructing a paragraph" and "editing sentences" are also important areas in the teaching of English in Japan.

As for "grammar," there is little emphasis on communicative grammar because fundamental prescriptive grammar occupies almost

all explanations in Japan.

"Clarity," "conciseness," and "word choice" are also very important for any person who must write technical and scientific articles, because any word in writing can be compared to a bullet in a loaded gun: misuse of a single word can destroy his or her communication proficiency.

"Style" usually covers a wide field of language. English has no *keigo*, or honorific expressions. Therefore those who use English must control their expressions by choosing words and altering expressions.

In "oral presentation," the rhetorical way of thinking must not be overlooked because any presentation consists of rhetorical thoughts and processes of expressions.

We, however, must always remember the pivots of English TSW. They are "proposals," "resumes," "letters," "reports," and "research papers."

Summarizing from the critical points Professor J. C. Mathes and Dwight W. Stevenson suggested to me, I can easily conclude that the writer or the translator lacks (1) a good knowledge of "Clear and Effective Arrangement of Information," "Clear Subdivisions of Information," "Effective Formatting and Use of Heading, Numbering," "Clear Paragraphing," "Good Use of Visuals," "Tables," "Figures," "Clear Sentence Style," "Good Grammar and Mechanics," "Effective Word-choice," etc.

In order to grasp the real figure of TSW, subject matter is extremely important for native speakers of English, but to trainers and translators in EST it is of little importance because they must translate the original documents into English faithfully and literally. The definitions explained in Chapter 3 speak to people who know less about TSW than the authors. The reason I quote several definitions

by native speakers of English in this paper is to introduce the real nature and thought of native speakers of English in the United States and in the United Kingdom.

The teaching methodologies that emerged based on the above definitions have been developed mostly for native speakers of English, not for EFL students and professionals. Authors of such works have not been concerned with those of us who speak English as a foreign language. English is a foreign language to almost all Japanese people and the language structures of English and Japanese differ completely. We are, therefore, compelled to face the challenge of providing appropriate instruction for Japanese students, specialists, and translators who have not been taught with English TSW. To achieve this end, I have developed different methodologies best suited for them and explained them in this paper.

Appendix G

An Illogical Letter by a Native Speaker of English

Let's look at an example written by an American. This letter was sent to a certain English Conversation School in Tokyo. This was originally written in Japanese (Figure 14), and I translated the Japanese into English as closely as possible.

原文入れる

Figure 14　A letter Written by an American

Gentlemen,

I have a favor to ask of you.

I am an American. I lived in Japan from 1965 to 1967. I liked it very much.

Now I would like to come back to Japan. I would like to go to your school and to be an English teacher.

I studied at ☼☼☼ University. I spent seven years in a school on Guam. I can speak English. I can speak French and Spanish a little.

I am sorry I cannot speak Japanese.

Thank you very much.

(Signature)

In terms of practical English, we should not have to guess what she wants to express because, if we consider a meaning other than that which the writer intended, we could claim that "You should have asked me to clarify what I was requesting you misunderstand the meaning. That is not my fault. You should take responsibility for it." Therefore, what the writer is requesting in the letter should be clear and to the point. As it turns out, this letter was received by a Canadian chief manager of this company who very promptly and unceremoniously threw it in the wastebasket. Why does she wish to be an English teacher at the school? The reader of this letter does not know. What did she study at ☼☼☼ University? And when? The reader is left to guess. What school did she attend on Guam, and what did she study? Again, the reader does not know. Nor do we know what is meant by "a little" French and Spanish. An appropriate letter would read as follow:

To Whom It May Concern:

I am interested in securing a position as an English conversation instructor. I enclose my resume. I will be free from September 1994.

I look forward to your reply.

Sincerely,

(Signature)

A simple letter of only four lines convey her intention clearly. Were a company to write in the fashion of this young woman's letter, it could lead to its ruin. By the way, if she wrote this letter in English, could she write it in a logically effective method? I am compelled to doubt it.

Appendix H
Abstract and Summary

1. Abstract

Regarding the abstract, the ANSI standard for *Guidelines for Abstracts* (1996, 4) notes that "informative abstracts should state the purpose, methodology, results and conclusions, while indicative abstracts are usually written for documents which do not contain information relating to methodology or results"(4). These guidelines do not explain that we have to present problem(s) and two purposes: technical purpose and communication purpose.

In a problem-solving document, we have to identify the problem, or conflict, or need as perceived by the writer. In order to solve the problem or meet the writer's need, the technical purpose must be specified. The communication purpose is the writer's reason for writing and how the writer intends others to respond to the problem. If we lack these three basic elements in the technical reports or the academic research paper, the document is useless because the reader cannot obtain the intention of the writer.

In addition to checking these elements of information, I recommend that teachers inspect the verbs. The verbs used in the technical purpose are: *analyze, investigate, assess, compare, examine, find, identify, solve,* etc. The verbs for the communication purpose are: *address, advise, ask, authorize, inquire, propose, recommend, request, respond, suggest*, etc. Teachers can easily check these verbs' presence or absence in the problem-solving documents or academic papers.

2. Summary

Regarding the summary, the executive summary is a

comprehensive restatement of the document's purpose, scope, conclusion(s). If needed, methods, results, findings, and recommendations are included. (Brusaw, Alred and Oliu 1997, 214)

Appendix I

Title Formation

The specific matters I have omitted including in Chapter 4, are how to compose "title formation."

When teaching the title, Mathes and Stevenson (1991) recommend that the title include the following information:

- It is specific, including both the topic and purpose (or document type)
- It uses understandable and standard terminology, avoiding abbreviations, acronyms, and jargon.
- It is short (rule of thumb: ten words or fewer)
- It puts important nouns in initial positions.
- It minimizes use of generalized terms such as "study of," "report on," "investigation of." (135)

Charles T. Brusaw, Gerald J. Alred and Walter E. Oliu (1997, 239, 589) also suggest almost the same methods as Mathes and Stevenson.

Appendix J

A Small Course Syllabus (professor, University of Michigan)

Dwight W. Stevenson

College of Engineering University of Michigan

Course Name: TECHNICAL AND PROFESSIONAL WRITING FOR INDUSTRY, GOVERNMENT, AND BUSINESS

(for seniors and graduate students)

Winter 1979

1.Course Rationale and Objectives

Throughout most of his or her professional training, an engineering student writes only in the role of student. Usually this means writing exclusively to individual audiences – professors – in their own areas of specialty. However when the engineering student leaves the university, the student role ends and these student writing experiences ill-equip him or her for the new role as a professional. For one thing there is just a great deal more writing for the professional than for the student. In general professionals spend at least 50% of their time in communication activity. But more importantly the writing situation for the professional differs from those of the student. Audiences for professionally written reports are both complex and diverse. Thus student-written term paper or project report that will satisfy a single professor is one thing; a professionally-written report that will genuinely meet the needs of a complex industrial, governmental, or business organization is something else altogether.

The purpose of this course, then, is to train you in communication of the sort required or practicing engineers and managers on-the-job.

Specifically, you will be taught to design technical reports by following a systematic procedure. This procedure will enable you to analyze the audiences for reports, to state the purpose for reports, to select and arrange report materials, and to prepare and edit a report text. In short, the purpose of this course is to improve your mastery of the whole process of report writing from the pre-writing stages through the final editing stages.

2. Textbook

Designing Technical Reports: Writing for Audiences in Organizations.

3. Writing Assignments

Report #1 Job Letter and Resume (1 page each)
Report #2 Short Informal Report (1-2 pages)
Report #3 Informal Report (perhaps 2-3 pages)
Report #4 Complex Informal Report (perhaps 3-6 pages of text plus attachments)
Report #5 Oral Briefing (time to be arranged)
Report #6 Formal Report (perhaps 10-15 pages of text plus appendices)

4. Other Assignments

In addition to your written reports, you will also have a bluebook, evaluate reports, and do workshop exercises. To contribute fully to the class you are expected to attend regularly. Occasional, necessary absences for plant visits are to be expected but you should notify me in advance and should not let the absence interfere with due dates or evaluation.

5. Grading

The final grade will be computed as follows:

Report #1	10%
Report #2	10%
Report #3	15%
Report #4	20%
Report #5	20%
Report #6	10%
Bluebooks, Evaluations, Exercises, Participation	15%

Select Bibliography

Select Bibliography

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