CHAPTER-VI

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6.1 EST, a sub-field of ESP, has now grown independently into a fast-moving discipline. It is linked with the changing social, academic and professional needs of the learners and hence it has given rise to the purpose oriented forms of language, which depend largely on a specialist subject matter. EST has thus emerged to cater to the immediate and specific needs of the students.

The present study seeks to explore two aspects of EST, the theoretical and the empirical. Linked with the theoretical aspect of EST is the study of its theoretical framework. Hence the major issues pertinent to the theoretical framework of EST have been examined in earlier chapters. The first three chapters contain an elaborate discussion on the structural and discoursal aspects of EST which encompass syntactical, semantic, grammatical and lexical aspects of scientific English.

The second aspect of EST is based on the empirical study of how scientific English is used in scientific journals and what distinct format the entire scientific community follows in writing scientific research articles. Therefore, 8 scientific research articles (refer to appendix) written by non-native users of English have been drawn from Natural and Medical Sciences to substantiate the empirical findings.
In fact, it is from Natural and Medical Sciences that the research articles have been selected for analysis, because the English language used therein is more understandable and analysable.

Though there is little need to reiterate the whole findings in conclusion, it will be the right moment to recapitulate, in brief, the findings and some essential features that characterise scientific English used in scientific research articles written by non-native users of English.

It has been found that the format of scientific research articles by non-native users of English is based on such distinct constituents which incorporate Introduction, Method, Result and Discussion sections. The format, also called, ‘IMRD sections’, is, in fact, followed by the entire scientific community.

The scientists, in order to remain objective and impersonal, choose passive forms in their scientific research articles because the important idea is not who did something but what was done. In addition, the scientists shun Active Voice because they feel that it will be too strong and it will not fit their professional needs. Therefore the overall ratio of Active Voice used in IMRD sections of 8 scientific research articles is only 140 (35.3%) whereas the overall ratio of passive voice is 256 (64.6%) of the total number of 396 running verbs.
Hedging, the expression of tentativeness has been found to be an important feature of scientific English. The scientists tend to use hedging device where exact reference or precise numerical is unobtainable or unnecessary in view of the needs of the audience.

It has also been found that the native users of English can speak and write in English with absolute propriety and grammatical accuracy because they acquire language components innately and develop deep sense of using well-suited terminologies. On the other hand the non-native users of scientific English have been found incapable of writing English with ease because they have neither rich vocabulary nor they innately acquire grammatical accuracy. So their skill for writing is inadequate. Owing to this, numerous mistakes and pitfalls have been found in scientific research articles written by non-native users of English. They are as follows:

1. faulty parallelism
2. mistakes in making proper agreement between subject and predicate.
3. use of dangling participles and infinitives.
4. overuse of noun clusters.
5. mistakes in the use of active verbs with inanimate subjects.
6. excessive use of abbreviation and footnotes.

Now it seems also indispensable to undertake the pedagogical aspect of EST curriculum so that the remedial measures could be suggested to the students of science in order to develop their language accuracy and communication skills. Hence it will be extremely useful to discuss how to improve language accuracy and communicative skills that the students of science really need in their academic as well as in their professional pursuits. Hence some innovative strategies are recommended below in order to enhance the communicative competence of the students.

Communicative competence comprises grammatical accuracy, spelling, pronunciation, an appropriate choice of words and the ability to communicate well in every given situation. A considerable degree of competence in English will be an asset to the acquisition of scientific knowledge as well as to popularizing scientific findings. The native users of English innately learn the essence of the language so they know well how to communicate their needs. On the contrary, the non-native users of English have varied degree of proficiency. Some of them who are well exposed to English can speak and write with ease but many science students who have obtained their secondary level education from Hindi medium schools are
inefficient so they tolerate English as an inevitable nuisance in pursuit of their professional careers. They learn English only for obtaining a degree qualification in any of the science related profession. They are less motivated to the acquisition of English because they lay full concentration on their science subjects. More particularly when it comes to writing in English the learners are faced with overwhelming problems of vocabulary and grammatical accuracy. They exhibit their inability to write laboratory report, manual and to explain research procedure and result. However what is more discomforting is that classroom practice is neither oriented to the teaching of the basic skills nor it is based on the major facts of the communicative approach such as the choice of materials, teaching of vocabulary and the teaching of grammar. These variables had never been incorporated in syllabus. The teaching materials had never been made specific to the learners' needs whereas it will prove a better panacea for EST students if the teaching materials are modulated to suit their specific goals. In fact the students learn more effectively and rapidly if they have a reason for doing things.

In fact, vocabulary teaching has always been taken up in haphazard manner and grammar is taught adopting conventional methods. Besides, what goes on in the name of English classes is making science students plod through the lessons. The method
of teaching is also not skill oriented. The teacher of English is more apt to summarize the lessons which is not conducive, at all, to the development of skills and communicative competence. Mere summarizing the lessons or lecture oriented method has proved less rewarding. So the teaching must be reassessed towards a more skill oriented strategies and the teacher of English should also be willing to renew their vision of teaching.

6.1.1 So far as the teaching materials are concerned the inclusion of literature in language programs still remains an issue in the discussion on the second and foreign language teaching. At present it is a bone of contention between those who maintain that it should only be taught as a subject and others who advocate its use as a source for language learning. However in recent years doctors, biologists and physicists-turned writers have raised science and high-tech topics to the level of hot literary commodities termed as technothrillers.¹

Technothrillers are fiction stories which are based on scientific facts and findings. The students of science in advanced countries have enthusiastically welcomed the introduction of technothrillers into EST course. The language activities derived from such materials have been enjoyed and valued as something very different from

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previous learning experiences. Technothrillers stand as invaluable materials not only for strengthening study skills but also for fostering the development of critical reading and thinking skills.

It is hence recommended that besides literature oriented lessons, technothrillers should also be introduced for the students of science to sustain their interest and to promote their self confidence. As a matter of fact, science students take least interest in literature oriented materials such as stories plays and novels because they become more concerned with facts and findings owing to their copious reading of science books. They also feel that stories and plays are irrelevant and do not cater to their utmost social needs. So more science based materials should be introduced in academic curriculum for the teaching of English to the students of science. In this case they will be doubly benefitted because science based materials will increase their scientific knowledge as well as their language competence. In addition, the EST students will progressively experience success in dealing with these representational materials and hence will regard technothrillers as the stepping stones towards reading more linguistically, complex text in the foreign language.

6.1.2 One of the major obstacles to the fast acquisition
of communication skills is the learner’s poor vocabulary. The novice non-native users of English for their being less exposed to English language have poor vocabulary so they manifest their inability to decipher the writer’s intended meaning in the given text. They cannot speak or write with ease. There is no doubt that the knowledge of substantial vocabulary assists the learner’s proficiency in all the integrated skills but it is quite ironical that the vocabulary teaching which is a key to success in the development of language skills has always been given a short shrift in the class. It has been taken up in a haphazard manner. No attempt has ever been made to adopt effective strategies for vocabulary teaching. The development of vocabulary mostly relies on the learner’s special interest. So only enthusiastic learners who have implicit motivation usually make extensive reading of novels in order to enrich their vocabulary. On the contrary less motivated students remain handicapped. The basic reason for the students’ lack of motivation is that the vocabulary teaching has neither been a part of curriculum nor the preoccupation of the teacher. Therefore the focus should also be laid on vocabulary teaching which is quite significant for promoting communication skill.

It is quite indisputable that EST has emerged to cater to the learners’ specific needs but with a view to
developing extensive vocabulary of EST students both literary as well as scientific texts should be incorporated in the curriculum. As a matter of fact EST students for their frequent exposure to scientific language can understand scientific texts with ease but they feel ill at ease with day to day communication. So different strategies are recommended below in order to develop the extensive vocabulary of EST students.

6.1.3 The ability to guess the meaning from context is clearly a valuable skill and one that plays a key role in textual exploitation in the class. It is undeniably true that students can not bring dictionary with them all the time. So ultimately the teacher should develop the students' habit to determine the meaning of an unknown word by means of contextual clues. The scientific and literary paragraphs laden with necessary vocabulary should be given to the science students in the class to guess the meanings of difficult words at one go, but close look will make them easier to understand. So the teacher should teach the students to puzzle out the meanings of difficult words in a given text. In other words, in teaching vocabulary items, context is more important and hence words should not be taught in isolation. The students should also be made aware of the fact that no word has implicit meaning but words get their full meanings from the context.
6.1.4 Another widely acknowledged way to build vocabulary is through the teaching of word-formation process sometimes called *derivational morphology*. A word is easily understood with reference to its derivational process. More so, many words when analyzed into their constituent parts yield their own definition. Such analysis of word formation is the model of generative vocabulary which is really a short cut for vocabulary development. Certain basic principles for the teaching of generative vocabulary are as follows:

I Learning to look analytically at word form.

II Recognizing the underlying stem through the knowledge of affixation.

III Discovering the meaning of the whole by analyzing the parts.

VI Discovering the meaning of strange words by establishing meaningful association.

So the learner can at least get the import of the difficult words if the study of root-affix elements is undertaken. First the teacher should take initiative to analyze and dissect the combination of these elements in the class. Then the students should be given numerous words for practice. Thus a systematic study of their roots and their etymology would enable the learner to make practical association between the root and the added words.
and hence enrich the learner's range of vocabulary.

6.1.5 In addition, a systematic way of developing vocabulary includes words in a variety of ways and presenting them through various types of tasks and games. There are several ways of putting words in groups: collocation, word network, synonyms and antonyms. Collocation is an interesting feature of language. In English certain words go together and it does not make sense to collocate or put together certain other words. In other word, collocation is a frequent co-occurrence of certain words such as distant relative, remote area, strong tea etc.

**Hyponymy:** The teacher should teach the students how to group together words which belong to some parent words or which fall under some specific domain such as:

**Stationary:** pen, pencil, ink paper

The teacher should express this sense relation by saying that stationary is the super-ordinate word and pen, pencil and ink are hyponyms of stationary.

To collect words of some specific domain also builds up an extensive vocabulary such as the words that describe all kinds of people or the words that are related to medical specialists such as:

egoist = self seeker
egotist = self admirer
altruist = generous, benevolent
introvert = self centred, reclusive
extrovert = extremely sociable
ambivert = neither extreme

Medical Specialist: A gynaecologist, an obstetrician, a paediatrician, an ophthalmologist, an orthopaedist a cardiologist, a neurologist etc.

If such vocabulary listing of various streams is undertaken in the class it will yield successful result and equip the learners with the words of varied streams.

The frequent occurrence of long words in scientific texts is a major problem for the students of science. They cannot understand the meanings of such formidable words. To overcome this problem, the teacher should simplify the long words by breaking them into prefixes, suffixes and roots. There is no doubt that medical lexicons are relatively long but their length as has been seen in chapter 5.6.1 is no bar to their understanding if their constituents are analyzed separately. Once these constituents have been mastered they become self explanatory and hence there is
no difficulty in discovering the meanings of such long words.

6.1.6 Compounds, however, are a more difficult problem. It is often useful to cull the students' individualized assignments for compounds that can be presented to the class as a whole for analysis and discussion. A compounding exercise that helps students improve the reading skill should be given to the students in the class itself. The teacher should give the students lists of words from their own fields and let them make, for example, several two-word and several three-word compounds. The teacher can also point out the difference between head word and modifiers. In addition, the science students may also be made to realize that many common words in general English as has been discussed in chapter 5.6.2 have specialized meanings in their particular scientific or technical fields.

6.2 The skill for written communication which is so crucial to master has always been neglected in the academic curriculum. No systematic practice for writing is given to the science students in the class where as the tremendous success in the exam as well as in popularizing research findings worldwide depend mostly on the fair command in written communication, but both the teachers
and the students lack motivation for writing skill. On the one hand teachers are less trained to monitor tactfully the students’ writing assignment in the class and on the other hand the students also find writing practice so strenuous that they become regularly irregular in the class when they are given writing practice. As a result of this a large number of science students remain handicapped in written communication. Such students send their research articles for publication in reputed journals and magazines of science but language inadequacy becomes a major barrier to their acceptance. Hence it is essential to discuss some viable strategies in order to improve the writing skill of the students in general and the students of science in particular.

Writing is of varied nature and varied style but here has been touched upon only those varieties which the students of science are really faced with.

Technical and scientific written communication includes writing of scientific research articles, critiques, laboratory reports, manuals, explaining the result of research, describing procedures and objects and developing paragraphs. In addition to this, technical writers communicate visually with graphs, tables, and drawings.
To develop competence in any of the aforesaid areas depends mostly on students’ regular practice in the process of writing because the competence in writing will not increase overnight but it requires regular and systematic practice.

6.2.1 So for as the process of writing is concerned, the teacher should unfold the necessary stages that the students are supposed to undergo. The first stage is concerned with preliminary draft in which the learners are supposed to accommodate as many points as possible. The students may generate ideas by interacting with peers and with resource persons in their concerned fields. The teacher may announce a familiar topic in the class telling the students to develop ideas. The students in this pre-writing would not be possessed by language accuracy least they should interrupt the spontaneous overflow of ideas. However in the second draft grammatical accuracy, use of appropriate words, substitution of sentences and the organization of words and sentences may be undertaken with utmost care. Though the written script which is produced in the class room cannot be incubated but the research articles may certainly be incubated. As a matter of fact if the research articles are examined few days after their completion, the mistakes will easily be detected and
hence they may be rectified with ease. In such incubating technique the writer becomes critical of his own research article. The points to be looked into in a written communication are grammatical and syntactic accuracy, formation of well knitted sentences and logical organization of sentences. In addition, the students of science should also be taught that the facts of the matter should truly be represented by the choice of words, for example if one is writing a manual for a machine that has sharp whirling part under a protective cover. This dangerous part could slice off a user's fingers. When one tends to explain how to clean the part one should inform the reader of the danger in manner that prompts him to act cautiously. It will be inappropriate to write "A hazard exists if contact is made with this part while it is whirling". This sentence is not urgent or specific enough to help a user preventing injury. Instead one should write. "Warning", Turn of all power before you remove the cover, the blade underneath could slice off your fingers".

6.3. An essential part of the teaching of any language is the teaching of its grammar. Grammar is the term of great antiquity which includes a total mechanism that a language possesses or which determines the rules that the learners use while speaking or writing a language.
Hence the knowledge of grammar will enable the learners to use English appropriately and distinguish between well formed and ill formed sentences.

Etymologically the word grammar is related to the word glamour but it has now become the most unglamourous thing in the world because the formal method of teaching grammar is adopted at every level. The teachers of English regardless of levels, apply the same monotonous methods of teaching grammar again and again. It has become highly uninspiring and boring. So the method of teaching grammar has to undergo an inevitable reappraisal and new strategies have to be evolved. There is no doubt that the teachers of English must teach the formal knowledge of grammar but the repetition of the same methods and materials must be avoided at the higher level. Formal grammar must be taught at tertiary level but at the higher level some new methods of teaching of grammar must be evolved. Here I would like to recommend some innovative methods that have emerged from my own practical experience of teaching grammar at higher level.

1. Generative grammar should be taught to the students of science at higher level so that they can produce infinite number of sentences. Grammatical explanation should be accompanied by numerous
illustrations in order to simplify its entire mechanism.

II The teacher can also select passages from the text which can be analyzed to illustrate certain grammatical principles. He has to decide in advance which part of the grammar the learners need to master.

Analyzing the paragraph the teacher can state the rules of sentence formation and illustrate how these rules have been observed in the paragraph. In this way what the students have learned formally about grammar at tertiary level will be reinforced and hence they can achieve more grammatical accuracy.

Editing is also an important means for checking grammatical inaccuracy. The students should be given to write a paragraph on the spot. Thus the students should be made aware of the mistakes they have committed in their scripts. Here the teacher should teach prescriptive grammar to the students approving all those sentences which observe the grammatical rules and disapproving those sentences which breach the grammatical rules in some way or the other. In addition to this, the descriptive grammar should also be taught to the students. Here the teacher can state the facts of language as they exist and record sentences
as they are spoken or written systematically by a large number of speakers.

To sum up, the pedagogical suggestions that have been given above with regard to the development of vocabulary, writing skill, course materials and grammatical accuracy are essential for promoting the communicative competence of the students of science. It has thus been suggested that the skill of writing, vocabulary of the students of science will increase substantially if they are taught and monitored tactfully by the teacher in the class itself. The use of technothriller as the course materials will substantiate the motivation of the students of science and technology. Meticulous insight into grammar may also be instilled if the students of science are motivated to examine the grammatical devices very carefully in the given paragraph. Hence a considerable degree of competence in English will be obtained if the remedial measures offered above are followed with utmost care.