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THE UNIVERSALITY OF SCIENTIFIC DISCOURSE

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ABSTRACT: *The use of the term EST in the field of TESP (Teaching English for Specific Purposes) has led to a certain amount of confusion. This has been partly because EST (English for Science and Technology) appeared at first on both sides of the EAP/EVP (English for Academic Purposes/English for Vocational Purposes) division, and partly because several attempts to arrive at something 'special' about the language of science and technology were rather inconclusive. In this paper, the question as to whether or not English for Science and Technology (hereafter EST) could be considered part of EAP or part of EVP is raised. This paper also attempts to shed light on the major features related to EST namely the nature of scientific English, the universality of scientific discourse, the three-way translation as seen by Henry Widdowson and finally their implications for EST teachers and learners alike.*

KEYWORDS: English for Science and Technology (EST), Scientific English, universality of scientific discourse, three-way translation procedure, EST teachers and learners.

INTRODUCTION

It needs to be pointed out first of all that EST (English for Science and Technology) is the senior branch of ESP (English for Specific Purposes) – senior in age, larger in volume of publications and greater in number of practitioners employed (Swales 1985). It was in the early days of ESP development, that is, in the second half of the last century, that EST became the focal point of many language teachers, researchers and materials writers. Theoretical discussions heated up as a result in Asia, in Latin America, and more importantly in the Middle East and North Africa; the birth place of ESP. The oil crisis of the early 1970s resulted in English-speaking scholars and expertise flowing into the newly emerging oil-rich countries of the Arab world that were keen to build up their economies on sound scientific and technological grounds. Accordingly, there followed significant endeavors and assumptions in the teaching profession that placed its main emphasis on a comprehensive study and analysis of the language of science and technology. The immediate approach to emerge in response to the prevailing situation there was that of English for Science and Technology. What ensued next was (1) the publication of an array of research articles in the field, (2) the production of specialized teaching materials and (3) the publication of

the first generation of EST textbooks to the satisfaction of thousands of students, teachers and academic institutions worldwide. Hence, various EST courses and textbooks were designed and put into practice by a number of universities keen to rekindle their language teaching curricula and to meet the needs of an ever-demanding population of science and technology clients. Textbooks published in this period include Herbert's *The structure of Technical English* (1965), Ewer and Latorre's *A Course in Basic Scientific English* (1969), Swales' *Writing scientific English* (1971), Allen and Widdowson's *English in Focus Series* (1974), Bates and Dudley-Evans *Nucleus: English for Science and Technology* (1976), and Swales and Fanning's *English in the medical Laboratory* (1980).

In a relatively short time, EST reached its 'peak' of development and widely became the 'a la page' approach among language teaching programmes for specific purposes. (Basturkmen, 2006; Dudley-Evans & St. John, 1998; Flowerdew & Peacock, 2001;García Mayo, 2000; Hutchinson & Waters, 1987; Richards, 2001; Robinson, 1980; Strevens, 1988; Swales, 2001). Hutchinson and Waters (1987) hold the view that Ewer and Latorre, Swales, Selinker, Tarone, and Trimble have been among the prominent EST pioneers and it is of importance to mention here two of the most famous examples of EST research: Lackstrom, Selinker, and Trimble's "Grammar and Technical English" (1972), and Tarone, Dwyer, Gillette, and Icke, "On the use of the passive in astrophysics papers" (1981).

Henry Widdowson, who is widely regarded as an authority in the field of Applied Linguistics and English Language Teaching, also happens to be one of the most influential contributors to the area of EST research and material design. According to Hewings (2003), Henry Widdowson's influence has been felt throughout the history of ESP in general and that of EST in particular. Swales (1985) acknowledges that Widdowson has been ". . . *the single most influential voice in the development of English for Science and Technology*" (p. 69). Describing the present state of ESP, Dudley-Evans and St John (1998) suggested that the early history of ESP was essentially a history of English for Science and Technology (EST). From another perspective, Clapham (1996) asserts that "*So much ESP research has focused on EST, that it is easy to think of ESP and EST as synonymous*". (p. 3). According to Broughton et al (1978) it is widely acknowledged that the current predominant position of EST is seen as being a result of the following: "*Half of the world's scientific literature is written in English*" (P. 3) and "… *two-thirds of engineering literature appears in English but more than two-thirds of the world's professional engineers cannot read English*" (Mackay and Mountford 1978, P. 6). Indeed, what greatly contributed to the present status of ESP is the amount of research and publications that characterized its main branch namely EST. Last but not least, one could say that the predominant position of EST in the field of ESP teaching and research worldwide is seen as being the result of the following:

i. over two-thirds of the world's scientists read in English
ii. half of the world's scientific literature is written in English

ENGLISH FOR SCIENCE AND TECHNOLOGY

Is EST EAP or EVP? This question has prompted a fiery debate among teachers and researchers and shook the arena of ESP for many years. The first attempts to describe ESP go all the way back to the late 1960s and early 1970s of the last century when a wide variety of labels for English for Specific Purposes were publicized. Strevens (1977) made the earliest effort to arrive at a concise categorization of ESP. He has formulated a taxonomy in which ESP is subcategorized into two major branches: EST (English for Science and Technology) and EOP (English for Other Purposes). The former is the major and most popular branch in ESP whereas the latter category encompasses English for Occupational Purposes (EOP) and English for Educational Purposes (EEP). Munby (1978) made a remark about the ambiguity of the relation of EST to all other types of ESP courses by stating that '*the rationale for this distinction between EST and all other types of ESP courses is not clear*' (p. 55). He further assumes that such classification of EST as being an independent category is mainly related to the fact that almost all ESP courses are in fact EST orientated. Another reaction against the wide variety of labels for ESP is that of Coffey (1982) who suggests only two terms other than ESP itself: EAP and EVP (English for Vocational Purposes). From another perspective, Hutchinson and Waters (1987) argue that there is not a clear-cut distinction between EAP and EOP: "*people can work and study simultaneously; it is also likely that in many cases the language learnt for immediate use in a study environment will be used later when the student takes up, or returns to, a job*" (p. 16). This is why they developed the 'Tree of ELT' in which English for Science and Technology (EST) breaks down into two major branches: English for Academic Purposes (EAP) and English for Occupational Purposes (EOP). The main objectives of EAP would be framed in terms of study skills and communicative needs. The students' needs may consist of achieving a sufficiently high standard of the English language quickly and economically in order to pursue a course of academic study. EAP may be either common core or subject specific. If it is common core, it shades off into "language study skills". Furthermore, EAP can be said to relate to the study of a discipline where a designation of the majority of courses is according to subject area. (English for Medicine, English for Electrical Engineering, English for Educational Technology, etc.). On the other hand, EVP (English for Vocational Purposes) courses may be required to satisfy either pre-, in- or post- service use. Pre-service EVP is considered to proceed with job training prospects whereas in-service language training is meant to help the learner make a better use of his or her job experience by learning the language in its context. To put it another way, the major aim of an EVP course would be to develop in the learner the ability to use the type of English that is required for a specific job or function. Thus, EVP relates to a job, an occupation or profession. (English for Secretaries, English for Waiters, English for Air Hostesses, etc.)

Trimble (1985) states that the term EST is originally defined by Larry Selinker as "*the written discourse of English for science and technology*" (p. 2). He then (1985) expands on this by saying that "*EST covers the areas of English written for academic and professional purposes and of English written for occupational (and vocational) purposes, including the often informally written discourse found in trade journals and in scientific and technical materials written for the layman*" (p. 6). According to Swales (1988) EST is most likely to fall into the teaching of

English for Academic Purposes (EAP), an area conducive to the students' survival and success in their academic environments. However, it seems to be generally accepted that EST breaks down into two major categories, namely, English for Academic Purposes (EAP) and English for Vocational Purposes (EVP).

SCIENTIFIC ENGLISH

Scientific English is characterized as being more restricted than general English. Needless to say that the main concern of science is to classify clearly and to record what is consistently true and what may be reasonably predicted (Garwood 1970, p.245). Therefore scientific English differs from General English in its avoiding of its general descriptions which are full of figures of speech. One of the first and most important attempts to study and research into the nature of Scientific English was the one carried out by W.E. Flood (1957). In his study, *The Problem of Vocabulary in the Popularization of Science*, Flood attempted to make science more understandable to the general public by investigating the nature of scientific terminology. This investigation has offered significant new criteria to be used in the selection of vocabulary peculiar to scientific disciplines. Flood (1957, p. 31) assumes that these new criteria limit the selection to scientific words which are most frequently needed, and of value in explaining concepts and with a wide range of application. He further asserts that these words must be known, explicit and must not entail duplication. "Scientific writing is the transmission of clear signals to a recipient. Scientific writing needs no ornamentation. Flowery literary embellishment –metaphor, similes, and idiomatic expressions are very likely cause confusion and should seldom be used[…]". Day and Gastel (2011). Accuracy is therefore of vital importance in scientific discourse writing. "All scientists must learn to use the English language with precision. Day, R.A. & Sakaduski, N. D. (2011).

Another major investigation into the characteristics of scientific English is the one carried out by C.L. Barber (1962) and which was viewed by Swales (1988) in his much acclaimed *Episodes in ESP* as the modern beginning of ESP research and "*the first clear demonstration that the descriptive techniques of Modern Linguistics… could be successfully applied to the language of science and technology*" (P. 14). In his paper entitled '*Some Measurable Characteristics of Scientific prose*', Barber concentrated on two main parts: .i.e. a study of sentence structure and verb forms and a study of vocabulary. This study has proved very influential in that its results confirm the assumption that the present simple active and the present passive are the most common tenses that occur in scientific English texts. Barber (1962) maintains this when he states that "*the great bulk of the (verb) forms fall into two tenses only; the present simple active (64%) and the present simple passive (25%), leaving only 11% divided among the other eight tenses*" (p. 9).

In the early 1970s, Strevens laid emphasis on the significance of the use of "context" in deciding on the nature of scientific English. He assumed that scientific and non-scientific English "*both share the whole of the English system… The whole of English phonology, and only when vocabulary is involved that slight differences arise*" (Strevens, 1971, p. 9). The many concepts

that are known to be peculiar to science and technology need specialized words and expressions to be conveyed to the learner. Observation, measurement, formulation of hypotheses, experimentation, classification and prediction are all acts which are typical to any scientific enquiry. The different sciences carry out these activities each using its own bulk of word categories such as technical abbreviations, symbols and formulae, highly technical (*diode, semi-conductor* etc.) and sub-technical vocabulary (*method, function, take place, occur* etc.). Thus, to ensure a successful performance of these acts, the foreign language learner is expected to have a specialized English vocabulary as well as general vocabulary peculiar to explaining scientific procedures (*integrate, isolate, differentiate* etc.) at his disposal.

An example of this might include some sentence connectives or 'sequence signals' to use Yee's term (1975). According to Yee (1975) these connectives play a crucial role in scientific and technical writing since they show how parts of a text are related. Strevens (1971) lists a number of the classroom activities of science in which language is crucially involved, e.g: classifying, measuring, inferring, observing, testing, predicting, quantifying, differentiating, etc. The different sciences carry out these activities each using its own characteristic. The language used might include some of the following connectives or others: 'unless', 'because', therefore', 'however', 'hence', 'thus', 'nevertheless', 'yet', 'similarly', 'consequently'. Yee (1975) claims that they "*make explicit the sort of relationship that exists between the parts of a text, and often, the degree of explicitness of the relationship. They also function as transition words, and as such, contribute to the smooth flow of thought in written discourse*". (p. 6) Yee's listing, based upon a study of eight EST texts, classifies the functions of these sentences connectives into 15 categories, 'semantic classes' in her terms, according to their meaning, such as signals indicating explanation, e.g.: 'that is' and 'namely', signals indicating additional information, e.g.: 'also', and 'and'.

Unfortunately, she provides little more information than is already available in standard grammars. These 'sequence signals', however, are important in that they are used to relate ideas to each other and to avoid repetition within a text. One shortcoming of with Yee's approach is that it suggests that members of each semantic class are freely substitutable for one another when they often are not. For instance, it is asserted (Yee (1975, p. 71) that the connective 'on the other hand' is similar in meaning and in function to 'conversely'. This assumption ahs raised much criticism among EST scholars and practitioners. Borkin (1977) finds this a most misleading assertion. He states that the two connectives 'on the other hand' and 'conversely' do not freely substitute for one another in written expository English. In addition, Borkin has found that this result holds for other connectives which have traditionally been assembled together in a set of semantic classes. Selinker (1979), who admits that sentence connectives is a major area of difficulty in the analysis of discourse, maintains: "*It is my working assumption… that as regards EST/EAP texts, the meaning and function of connectives that appear to be the same in non-technical English will be affected by the nature of the scientific concepts involved in the different EST/EAP disciplines*" (p. 210).

In an analysis of cause – effect relations in a technical English teaching context, Bartolic (1975) has affirmed the validity of Yee's investigation and findings. He has suggested that students need to be familiar with the manners in which these connectives are used to express cause – effect concept. He concludes: "*It is therefore of the utmost importance to make a good selection of teaching material and to present the students with these structures and expressions which are most commonly used by, in this instance, engineers*" (Bartolic (1975, p. 156). Widdowson (1979) shares the opinion of Bartolic when he states that foreign language learners need to recognize and understand the role and importance of connectives in texts as discourse. He explains: "*Within each section there are stages which introduce new coherence relationships and these can be labeled by the overt clues which are used to mark them: 'for example', making exemplification, 'that is to say', marking restatement, 'however', marking concession, 'on the other hand', contrast and so on*" (Widowson, 1979, p. 257)

All in all, Yee's concept of sequence signals is believed to be of paramount importance to EST practitioners and is built upon the assumption that it is not sentences which are related by these connectives, but most often larger discourse units. These larger EST discourse units (the paragraph and the text, the exchange and the dialogue) are characterized by five most frequently occurring rhetorical functions (Trimble et al, 1977). They are: the rhetoric of description, the rhetoric of definition, the rhetoric of classification, the rhetoric of instruction and the rhetoric of visual-verbal relationships. These can be exemplified from Trimble and Trimble (1977) relating to technical manuals: "*Thus we find commonly the rhetorical functions of description, definition and classification, and the rhetorical techniques of time order, space order and causality. In addition, manuals have two rhetorical features found less commonly in scientific and technical writing: the interpretation of illustrations and the rhetoric of instruction*". (Quoted by Robinson 1970, p. 20) Robinson (1980) commenting on the study that has been carried out by Trimble and Trimble (1977) states that they: "*engage in the identification of the rhetorical functions in any given text or group of texts, consider the sequencing of functions and analyze the forms of their linguistic realization, most particularly the verb forms. Their work on the relationship of tense and rhetorical function seems especially useful*". (p. 26)

Trimble (1985) further indicates that "*the rhetorical functions are the foundation of the rhetorical approach to the analysis of written EST discourse*". (p. 19) He assumes that "*Rhetoric is not a substitute for the term 'discourse', rather it is one part of the concept of discourse*" (p. 4). He further states "*we use the term 'rhetoric' to refer to one important part of the broad communicative mode called 'discourse'*" (p. 10), and then he offers the following definition of rhetoric: "*Rhetoric is the process a writer uses to produce a desired piece of text. This process is basically one of choosing and organizing information for a specific set of purposes and a specific set of readers*" (p. 10). This is immediately followed by his 'EST Rhetorical Process Chart' which illustrates the four levels at which rhetoric is deemed to operate and whereby choice at one level determines choices at the next level down. These are: (Level A); the purposes of the total discourse, for example presenting a whole technical article, (major subdivisions of this whole text, usually section headings,) detailing an experiment, presenting a repair, installation maintenance and operation information in a manual, etc., (Level B); rhetorical

functions such as description and operation, for example presenting information on apparatus, presenting information on data gathering in an illustration, etc., (Level C); rhetorical functions such as definition, description and classification, for example reference to known definitional information, reference to known classificational information, information transfer, etc., and (Level D); the level of the paragraph; the rhetorical techniques which 'provide relationships within the rhetorical units of level C'. These include time order, causality, comparison, contrast, exemplification etc. Interest in these functions led to the *Focus Series* (P. Alien and H. Widdowson (eds.), OUP) and to the *Nucleus Series* (M. Bates and T. Dudley-Evans (eds.), Longman)

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A second key question concerning the nature of EST is closely related to the first one. Scientific English is seen by many theorists and practitioners alike as an instrument to realize universal specialized communicative functions such as those associated with scientific and technical discourse. Widdowson (1975), who is an advocate of the universality of science, has made strong claims about the universality of scientific discourse when he states that most world languages use common universal sets of concepts, methods, and procedures which are an essential part of scientific and technical discourse. He (1978) firmly rejects the belief that Scientific English is a representation of a huge amount of linguistic information about scientific terminology, such as the use of the passive which happens to be one of the most frequently applied constructions in academic and scientific texts. (Hyland 1996; Ding 2002; Dorgeloh. H. 2004). The frequent use of the passive voice in scientific texts is explained by Strevens (1980) when he states that the choice is concerned: "… *with two facts about the rhetoric of English sentences and the nature of much scientific writing. The organization of clauses in English is such that initial position for the subject (such as occurs in passive construction) is normally the strongest*" (p. 128) Allen & Widdowson (1978) claim that "*People who talk about 'Scientific English' usually give the impression that it can be characterized in formal terms as revealing a high frequency of linguistic forms like the passive and the universal tense in association with a specialist vocabulary. But to characterize it in this way is to treat scientific discourse merely as exemplification of the language system, and does little or nothing to indicate what kind of communication it is*" (p. 59). It could be argued, thus, that discourse analysts should concern themselves with studying the communicative value of sentences rather than the way in which these are structured. Widdowson was quoted by Swales as saying that "*We should think of scientific discourse not as a kind of text, that is to say a variety of English defined in terms of its formal properties, but as a kind of discourse, that is to say a way of using English to realize universal notions with scientific enquiry*" (Swales, 1985, p. 70).

The learning of science entails the acquisition of knowledge of certain universal concepts which are peculiar to scientific and technological texts. Widdowson (1974) advocates the theory that the basic concepts of science are universal, irrespective of the native language of the scientists. That means to say that these scientific concepts make up cognitive deep structures which can be realized in various languages throughout the world as "*a textualization of a variety of*

discourse… which scientists and technologists acquire through education" (Widdowson, 1979, p. 52). The student should study the textualization, or simply the functional realization of language, that Widdowson refers to as 'illocutionary acts' or scientific discourse, such as descriptions, exemplifications, generalizations. Widdowson (1974) further assumes the communicative conventions are the same in a scientific context and that the language teacher should make use of the learner's knowledge of such conventions in his mother tongue to enable him to recognize coherence. These conventions of scientific discourse help the learner to combine the illocutionary acts and thus pave the way for the creation of a main body of discourse which has a specific purpose, such as making hypotheses, describing procedures, stating findings, drawing conclusions, etc,. In order to make his theory of universality clear and acceptable, Widdowson (1979) has postulated a deep study into the linguistic means (text), the functional realization of language (textualization), and the rhetorical acts (discourse). These three notions are related to each other in such a way as to promote better understanding of scientific discourse. Thus, in the light of this relation, scientific discourse is defined as "… *a universal mode of communicating, or universal rhetoric, which is realized by scientific text in different languages by the process of textualization*" (Widdowson, 1975, p. 52).

Widdowson's (1979) definition of language learning as acquiring the ability to handle discourse suggests that foreign language learners should feel that they are involved in a communicative activity and not just learning usage. He claims further that it is important that students are exposed with problem solving situations which should as far as possible make appeal to the kind of cognitive processes which is the purpose of science teaching to develop. Moreover, Widdowson (1974:52) asserts that "… *the student entering higher education will have already been initiated into these concepts and procedures as they are realized both through his own language and through non-verbal symbolization*".

This non-verbal symbolization, however, is of paramount importance to the field of English for science and technology. Mathematical formulae, charts, graphs, equations, tables, etc. which largely characterize scientific discourse can provide a link between concepts available in the student's mother tongue and the target language. Robinson (1980) understands Widdowson's and as equating non-verbal and verbal symbolization with the surface structure. She (1980) points out that "*The surface realization of scientific discourse in any language. e.g. English, will be a combination of verbal forms unique to the language and non-verbal devices, such as formulae and graphs etc. which are universal or 'neutral' with respect to different languages*" (p. 24). From this is developed Widdowson's most useful practical suggestion, that of the translation approach which is a three cornered operation.

WIDDOWSON'S THREE WAY TRANSLATION PROCEDURE

Widdowson (1979) suggests that knowledge of EST can derive from what the students know of science and other specialist subjects and the functions of their own language in association with what they have learned of English usage. EST students entering university education should have acquired both an adequate knowledge of usage (e.g. sentence patterns) and the knowledge of

some science in their native language. Regarding this type of student widdowson states: "…*he will have learnt some science and in consequence he will have some knowledge of how his own language is put to communicative use in scientific discourse of an instructional sort. This learning of science will, of course, have drawn upon the student's more general awareness of how his own language functions as communication. The situation, then, is that the student has some knowledge of how his own language is put to use in scientific discourse*" (p. 44). However, "*what students need to know is how English is used to realize the discourse of that level of scientific instruction that they arrived at*" (Widdowson, 1979, p. 43). In other words students need English as a means to extract scientific information from scientific books and journals in order to strengthen their existing knowledge of science and technology. Hence, the EST teacher is required to provide his students with an appropriate and effective way of realizing the scientific knowledge they have already acquired in their mother tongue through the English language. According to Mackay and Mountford, Widdowson's most practical Three Way Translation procedure "… *provides an opportunity for students to relate their own knowledge of science to the acquisition of English as a foreign or second language*" (p. 14).

It is well established that EST can be taught effectively when the communicative value of discourse is taken into consideration. It is in this sense that the Three-way Translation procedure shows the students how English works in the same way as their own language. The procedure also increases the students' awareness as to how it is used in the performance of certain specific communicative acts relating to the communicative system of science. Widdowson (1979) further explains this by saying that: "*The use of non-verbal devices enables us to relate three ways of expressing the same basic concepts and procedures. In this way, the student can be shown in general how English is used in the same way as his own and in particular how it is used in the performance of specific acts of communication relating to the communicative system of science*" (p. 45). So we have the following state of affairs: When the non-verbal device is provided with the instance of English use, the provision of the translation is basically a comprehension exercise. When the non-verbal device is given with the instance of L1 use, the provision of the translation is basically a composition exercise.

Widdowson (1979) provides an exercise as an example in which he explains how to train the student's to transfer information from one mode into another. The example is illustrated thus: A description of a machine or an instrument is given in a short passage. The EST student's task is to complete or label a diagram by reference to the data provided. This procedure is used in replacement of the traditional comprehension questions. The student might also be required to express a set of facts in the form of a graph or a table. Widdowson (1979) describes the advantages of such types of exercises as follows: "*Transferring information from a verbal to a non-verbal mode is an exercise in comprehension. Transferring from a non-verbal to a verbal is an exercise in competition*" (p. 73).

Generally, it is well established that when entering higher education in different areas of science and technology, non-native speakers of English had already acquired some knowledge of science in their own language and through verbal and non-verbal symbolization of the communicative

system of science and other specialist subjects in their academic fields (Widdowson, 1974, 1979). This means that the students are not acquiring new knowledge as such but they are rather learning how to express the knowledge of science they had already acquired through the English language while they are studying for their academic subjects in an English medium institution. As Mackay & Mountford (1978) put it: "*Students or professionals in the various branches of science and technology are already familiar with the procedures of their field and the manner in which communication in their specialisms are organized. The task of the English programme is, therefore, by taking advantage of this knowledge, to demonstrate to them how these procedures and principles of communicative organization are realized in English*" (p. 13).

According to Widdowson (1979) this kind of information transfer exercise can be graded for difficulty by increasing the complexity of the verbal and non-verbal accounts, by withdrawing prompts and so on. The exercises the student will be faced with should use the cognitive processes which are the ultimate goal of the science teaching. Widdowson (1979) further recommends that this activity should involve an exploration into the teaching of science since English for Science and Technology must be considered as 'extension from science education'.

PEDAGOGICAL RECOMMENDATIONS

Any attempt at study or research into the nature of scientific English is not worthwhile unless the task of the EST teacher and the interests of the learners are taken into account. In the early days of EST rise and development, Brooks et al (1967) state: "*It seems to be that little can be done to make the teaching of English more effective for scientists until school teachers of English and literary critics begin to face a warmer interest in the characteristics which differentiate scientific from literary writing and to study the problems of communication which are peculiar to scientists*" (p. 29). Widdowson (1974a) addresses the problems faced by general English trained teachers who are frustrated by their "*lack of knowledge of how language functions in scientific and technical communication*" (p. 282). He suggests that the teaching of language in these two areas be considered aspects of the same activity: "*namely the teaching or learning of English as communication*" (p. 283). Widdowson (1984) further asserts that academic authors need to consider their audience and carefully anticipate that audience's background knowledge in the subject matter including both teachers and learners. According to Gopen & Swan (1990) "*The fundamental purpose of scientific discourse is not the mere presentation of information and thought but rather its actual communication. It does not matter how pleased an author might be to have converted all the right data into sentences and paragraphs; it matters only whether a large majority of the reading audience accurately perceives what the author had in mind*" (p. 550). Hence, teachers need to center their students' interests on acquiring the skills that will enable them to use language to achieve real world communicative tasks.

In his article "*Technical, Technological and Scientific English*", Strevens (1973) draws a distinction between the terms science, technology, and technical services and gives some indications for teaching in these areas. He (1973) has defined the three fields of discourse subsumed by EST as follows:

i. Science: The understanding describing and explaining the nature of the universe,
ii. Technology: The design and control of machines,
iii. Technical Service: The construction and manipulation of devices invented by technology according to the principles established in science.
He (1973) states that these are three distinctive tasks and each of which has a separate function and uses language differently. Nevertheless, they share a number of features together, namely: Phonological, orthographical, grammatical, and rhetorical. Strevens (1980) further states that scientific English "… *uses the full range of general and scientific concepts, philosophical as well as methodological, it uses the stock of international scientific terminology based on Greek and Latin roots, the terms of particular branches of science, and other coining*" (p. 128).

Consequently, the general English trained teacher is recommended to learn a set of specialized terms or to use Strevens' (1980) words, a 'specialized vocabulary'. This specialized vocabulary is of three types: (i) the vocabulary of scientific concepts; (ii) a stock of words composed of Greek and Latin roots and affixes and (iii) a number of other words or special scientific and technological origins. Such vocabulary knowledge enables EST teachers to render students' understanding of their specialist field an easy task. It also helps those teachers embarking in EST to grasp science content, understand the language of science and guide students to the fulfillment of their academic needs and requirements. (Calderhead & Shorrock, 1997; MacCarter & Jakes, 2009; Williams & Burden, 1997). Nation (2001) is confident enough to state that "*the English teacher may be able to make a useful contribution to helping the learners with technical vocabulary*" (p. 203)

EST merits its present status and form because it offers teachers and learners alike, various ways of dealing with science in terms of communication purposes. EST can be best considered as a further development of the knowledge that actually exists at the disposal of the learner. Nation (2001) assumes that generally learners entering university possess a repertoire of 2000-3000 words of General English; their main aim at this stage is to learn the specialized vocabulary related to their field of study. In this case as Widdowson (1979) remarks: "… *It is not difficult to convince the student of the communicative reality of the language*" (pp. 44-5).

Following on from this it is advisable for EST teachers as well as their science and technology students to follow the process that enables them to link the existing knowledge of science for the creation of discourse. In other words, they will have to convert usage into use. Coulthard (1977) states: "*Learners need to become analysts of discourse themselves, and in confronting a foreign language we should help them by encouraging a use of existing discourse awareness in their mother tongue while providing them with a workable model of analysis for the organizing of the data*". (Preface xiii)

Hence, the main aim in EST is to develop the learners' communicative competence by focusing their attention on the relationship between usage, science, and use. Widdowson (1979) suggests that teachers should move on to a new linguistic level and teach the production of paragraphs (i.e. a 'unit' above the linguistic level of the sentence). Widdowson (1979) further points out that

the task of the EST teacher is to teach learners the functions of each paragraph, namely, definitions, classifications, descriptions, stating relationships, presenting hypotheses or drawing conclusions. This should help the learners group as much information as possible from text reading. Learners should be taught how to cut up a scientific paragraph and also to understand through text reading how language functions for the production of information. Widdowson cautions us that the EST syllabus should not be the presentation of structures and notions in isolation but should be concerned with the sequence of coherence relationships which build up into a paragraph and then into a series of paragraphs. The learner's task is to perceive the text as connected discourse rather than as sentences in isolation selected at random. Allen & Widdowson (1974) argue that an English syllabus at this level should aim at developing two kinds of ability among learners, that of understanding the rhetorical functioning of language in use and the ability to identify and to manipulate cohesive devices to produce passages of prose.(pp. 43-4)

CONCLUDING REMARKS

In this paper, I have tried to draw a picture of the main features characterizing EST from Henry Widdowson's perspective as well as its position within the field of ESP. The paper has also addressed the role a teacher of English as a foreign language acting as an EST instructor should adopt. The first idea discussed in this overview is concerned with the position of EST within the field of ESP. The differences in where practitioners and theorists situated the field of EST as well as the first attempts to describe it have been elucidated. The second idea discussed in this paper is Widdowson's claim of the universality of scientific discourse i.e. discourse structures are specific to scientific and technical communication and apply to all scientific disciplines. Thus, the concepts of science are universal and the specialized uses of language in scientific materials ought to be associated with certain universal modes of communication which cut across the different languages and not with varieties of languages. The paper has equally addressed the place that has to be devoted to Widdowson's Three Way Translation Procedure by a teacher of foreign language acting as an EST instructor. Finally, the EST teacher's task is to help his learners develop the essential skills in approaching the various types of the rhetorical functions in a scientific text, the ability to interpret scientific terminology, and to evaluate and understand how the English language functions for the production of information.

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