

Investigating English for Science and Technology (EST) Postgraduate Student's Ability to Use Clause Conjuncts A Paper Submitted

Lecturer: Sanaa Sabeeh Othman

University of Mosul/ College of Arts

التحقق من قابلية طلبة الدراسات العليا الدارسين للغة الإنجليزية للأغراض العلمية والتكنولوجية في
إستخدام الروابط بين الجمل
سناء صبيح كلية الاداب/ جامعة الموصل

Abstract

The present study is a descriptive and analytical one which deals with the relationship between clauses in clause complexes in biological texts from the perspective of systemic functional grammar. It is hypothesized that communicative functions of clause conjuncts can be outlined via the assistance of clause conjuncts through the two systems: those of taxis and logical-semantic type which are effective tools to identify the feature behind a text. In order to test this hypothesis, (20) M.A. and Ph.D. students at the College of Science / Dept. of Biology were chosen.

The results revealed that the findings can help to understand some features of the scientific texts which contribute a lot to the teaching and learning of English in English for science and technology.

الملخص

يعتبر هذا البحث دراسة وصفية وتحليلية تتناول العلاقة بين الجمل في أنواع الجمل المعقدة في نصوص خاصة بعلم الأحياء ومن منظور Halliday أي من منظور النحو الوظيفي.

إذ تم إفتراض أن الوظائف التواصلية للجمل المعقدة يمكن معرفته عن طريق أو بمساعدة روابط الجمل خلال نظامين: الأول خاص بعلاقات الترابط ونوع العلاقة المنطقي والمعنوي بين الجمل المعقدة يعتبر هذان النظامان من الأدوات المهمة لتشخيص ملامح أي نص.

تم إختيار (20) طالب وطالبة دراسات عليا (ماجستير ودكتوراه) من كلية العلوم / قسم علوم الحياة بجامعة الموصل لإختبار الفرضية.

أظهرت النتائج أن ما تم التوصل إليه بإمكانه المساعدة في فهم بعض ملامح النصوص العلمية (وبخاصة علوم الحياة) وهذه النتائج ستساهم إلى حد كبير في تعلم وتدريس اللغة الإنكليزية لطلبة الدراسات العليا والذين هم متعلمين للإنكليزية لأغراض العلم والتكنولوجيا.

1. Introduction:

Grammar, among other branches of linguistics, can be seen as the most useful tool to satisfy the desire of man to understand the nature of language (Bloor and Bloor,1995:15). Compared with traditional grammar, functional grammar is considered as an effective tool of analysis as it deals with both spoken and written language and focuses on the functions of language.

Al-Jubori (1979:45) identifies that the main features of scientific writing constitute the major factors involved in the design and implementation of English for special purposes courses. The features are carried out in four broad divisions. The first division deals with features within the sentence level. The second is concerned with elements beyond the bounds of a single sentence (contextual beyond the bounds of a single sentence (contextual features), a third division deals with the notions frequently recurrent in scientific texts

(features of communicative activities). A fourth division will deal with tabulation and diagramming (non-verbal features).

The textual features manifest the relationship between an expression and content. They include referential values attached to cohesive devices and anaphoric language items or as Halliday called them deictic specific or nonspecific, and the relationship between clause complexes which are the main concern of this study.

It is well-known that it is very often in scientific writing that there is no explicit indication of the communicative function of clauses. Writers assume that readers realize how a particular clause is to be understood without the assistance of such indicators (clause conjuncts). It is hypothesized that the communicative functions of clauses in clause complexes in scientific texts can be achieved via the assistance of clause conjuncts through the two systems: those of taxis (parataxis and hypotaxis), and the other is the logical-semantic type which is divided into expansion which is done in one of three ways by elaboration, extension and enhancement. In addition to expansion, the relationship of projection, which is not the focus of this study, can be divided into locution and idea.

In order to test the hypothesis, (20) M.A. and Ph.D. students at the College of Science – Dept. of Biology were chosen for this purpose.

It aims at investigating the students abilities to understand the relationships between clauses in clause complexes (the logical meaning of clauses in clause complexes (CLC) in scientific texts collected from certain articles and books.

The results exemplify that understanding the logical meaning of clause complexes in scientific texts can help to understand some features of the texts, and offer some suggestions for teaching and learning English for EST (English for Science and Technology) students.

2. Systemic Functional Grammar and Functions:

Halliday (1994:15) states that language is seen as a "network of systems, or interrelated sets of options for making meaning" thus, language is systemic". The term "functional" is used to indicate that the approach is concerned with meaning. Therefore, the grammar is "the study of how meanings are built up through the use of words and other linguistic forms such as tone and emphasis". (Bloor and Bloor, 1995: 1, Martin et al. ,1997:3) mention that functional grammar enables to understand language in context. In systemic linguistics, there are three terms for particular types of functions: micro-function, macro-function and meta-function.

a. Micro-function:

In functional grammar, micro-function is defined as a functional constituent, e.g. subject, actor, theme, as in example (1):

(1) The book the librarian sent me

Theme subject actor

b. Macro-function:

Macro-function refers to the language use in early child-language, like functions of imagination, discovery, interaction and so on.

c. Meta-function:

Halliday (2004:5) identifies three meta-functions: the ideational, the interpersonal and the textual. Each is concerned with a different mode of meaning of clauses. According to Halliday (1994: 34), each forms part of a different functional configuration. Morely (2000: 16) agrees with Bloor and Meril's expression (1995: 19) considering the three meta-functions as semantically relevant. Halliday (2004: 5) clarifies that language has evolved under the human need to make meanings about the world around and inside us, it is the means for creating and maintaining our interpersonal relations. These motifs are two modes of

meaning in discourse, i.e. "ideational" and the "interpersonal" metafunctions. They are organized via a third mode of meaning, the textual metafunction which acts on the other two modes to create a coherent flow of discourse (see also Halliday, 2003: 17).

a. Ideational Metafunction:

Halliday (1994: 107) states that it is concerned with clauses as representation. It expresses speakers' experience including the elements of the external world and those of consciousness. The ideational function reflects the field parameter of register and can be classified into two subfunctions: the experiential and logical.

The experiential function is largely concerned with content or ideas. The logical function is concerned with the relationship between ideas. Experiential meanings are realized through the system of transitivity. Logical meanings are realized by relationship of co-ordination (or parataxis) or subordination (or hypotaxis) between one clausal unit and another. Experiential grammar of the clause produces the constituency structure whereas logical meanings are associated with the interdependency structures as in example (2) which is analyzed on the basis of experiential and logical meanings.

(2) His hands went to the fire and he pulled a burning stick from it.

| | | | | | | | | | | |
|--|-------|----------|----------|--------------|--|-------|----------|----------|--|--------------|
| | actor | | process: | circumstance | | actor | process: | goal | | circumstance |
| | | material | | | | | | material | | |

Logical Meaning [[[his hands went to the fire [[and he pulled a burning stick from it.]]]

1 + 2

b. Interpersonal Metafunction:

Halliday (1994:68) says that the interpersonal metafunction is about the social world, especially the relationship between speaker and hearer, and is concerned with clauses as exchanges.

(3) Microsoft have expanded in China recently

| | | | | | | | |
|--|---------|--|-------------------|--|---------|--|---------|
| | subject | | finite predicator | | adjunct | | adjunct |
| | mood | | | | residue | | |

c. Textual Metafunction:

The textual metafunction is about the verbal world. It is concerned with clauses as messages. Halliday (1994:97) describes it as the 'relevance' or the enabling function clause as a message structure. The clause consists of two parts: Theme and Rheme. In English a nominal group, an adverbial group or a prepositional phrase can realize the function of theme. See example (4).

(4) All the green plants can synthesize organic substances

| | | |
|-------|--|-------|
| theme | | rheme |
|-------|--|-------|

The analysis of the three metafunctions helps to form a comprehensive picture of language in all its levels: phonology, lexico-grammar, and semantics- and the social context in which language (communication) occurs.

3. Grammatical Rank Scale:

Halliday employs the notion of rank. Rank can be understood as the hierarchy of units and reflects the basic realization patterns. Thompson (1996:12) declares that the English grammatical rank scale consists of four ranks: clause, group, word, morpheme.

4. Clause and Clause Complexes:

The clause is the largest unit in the rank scale. Halliday (1994: 16, cited in Thanh, 2008: 9) identifies that the sentence is a unit of written expression not of grammar. Functional grammar tends to refer to clause as a constituent unit in the grammar. The clause is the basic unit of functional grammar; it expresses the meaning and at the rank of clause, it is usually to use language to interact with others. Functional grammar clause is the point of

origin of the system of Transitivity, Mood and Theme, realized by three simultaneous structural layers: (transitivity structure, modal structure and thematic structure) (see Bloor and Meril, 1995: 7).

4.1 Clause Simplex and Clause Complex:

Halliday (1994:216) states that "The notion of 'clause complex' enables to account for the functional organization of sentences". It is identified that the relationship between clauses in a clause complex is a very important aspect of this notion.

1.4.1 Relationship between Clauses in Clause Complexes:

The relationship between clauses in clause complexes expresses the logical meaning, which is one of the important components of Halliday's ideational metafunction in addition to the experiential meaning which is realized by transitivity. According to Halliday, Clauses in a clause complex are interrelated in terms of two systems: those of taxis and logical-semantic type.

1.4.1.1 Taxis

Taxis, or interdependency, indicates the logical interdependency between clauses in a clause complex, i.e. they show whether one clause is dependent on or dominates another, or whether they are of equal status.

Taxis are of two kinds: parataxis and hypothesis. Parataxis is the logical interdependency between clauses where the clause in the nexus are of equal status, "The relation between two like elements of equal status, one initiating and the other continuing" (Halliday, 1994: 218).

Paratactic is the logically symmetrical and transitive. Symmetrical means that the position of the two clauses can be changed without changing the meaning as in example (5) where it is represented by the order in which the speaker has chosen to say them. This is done by using the numbers 1, 2, 3,

1 + 2

(5) Genes control inherited traits and scientists call the complete set of genes within an organism's genome its genotype. B (1)

4.1.1.2 Logico-Semantic Type:

Clauses in clause complex linked together not only in terms of taxis, but also in terms of a particular logico-semantic relationship. This relationship is divided into expansion and projection. In a nexus related by expansion, the secondary clause expands the message of the primary clause. Expansion can be done in one of three ways: elaboration, extension or enhancing. Elaboration means saying the same thing over again, either by direct repetition, or by rewording it, or giving an example, as in example (6).

(6) In man, no two individuals are identical, for example each gamete contributes twenty-three chromosomes to the zygote.

B(1) Extending means adding something new, giving an exception to it, or offering an alternative as in example (7).

(7) In asexual organism, genes are inherited together, or linked, as they cannot mix with genes of other organisms during reproduction. A(1)

Enhancing means giving some further information that is related in a systematic way by a semantic feature of time, cause, condition or concession as in example (8).

(8) While molecular biology was established in 1930s, the term was first coined by Warren Weaver in 1938.

A(5) Thompson (1996: 27) explains that the relationship of projection is different from that of expansion. In clauses related by projection, the secondary clause is instated by the primary clause as what somebody said (locution) or thought (idea).

4.2 Types of Expansion:

According to Halliday (1994: 219), in expansion the secondary clause expands the meaning of the primary clause by: elaborating it or enhancing it. In other words, expansion can be classified into elaboration, extension and enhancement.

4.2.1 Elaboration:

Halliday (1994:225) exemplifies that the secondary clause elaborates on the meaning of another by restating, clarifying, refining, or adding a descriptive attribute or comment. The elaborated thing may be some part or more of the primary clause constituents. Elaboration may be paratactic (notation $1=2$) or hypotactic (notation $=\beta$) where the equal sign is used, 1, 2, 3, ...to refer to the number of paratactic clauses, the symbols α and β are used to indicate both the primary and the secondary clauses respectively.

4.2.1.1 Paratactic Elaboration:

Martin et al. (1997:171) states that Paratactic elaboration can be divided into three subtypes: exposition, exemplification and exemplification.

(i) Exposition (means in other words) in exposition, the secondary clause restates the thesis of the primary one in different words (Halliday, 1994: 226). It can be explicit or inexplicit. Explicit where the relationship may be made by conjunctive expressions like: "or/(rather)", "in other words" or "that is to say", in writing, "i.e." is used, as in the examples below.

(9) Some individuals have characteristics that have a survival value, in other words, they are better adopted to their environment than the others. A(3)

(ii) The second type of paratactic elaboration is exemplification, in which case the secondary clause develops the meaning of the primary clause by further specifying it, or giving an example, the conjunctions used in this type are 'for example', 'for instance', 'in particular' and in writing 'e.g.'. the relation can be explicit as in example (10), or inexplicit as in example (11).

(10) The size of each compartment varies according to the age, sex and health of the individual, for example, in a healthy young man the total body weight is divided in approximate way. B(1)

(11) The body compartments cannot be measured directly, this may be done by using methods of the dilution technique. B(1)

The conjuncts 'for example', 'in particular', or 'i.e.' can be used to indicate that the secondary clause often is more specific by citing an actual example expressing the connection between facts and ideas.

(iii) Clarification: Halliday (1994: 226) exemplifies that in this type, the secondary clause clarifies the thesis of the primary clause, gives an explanation or explanatory comment. "In fact", "indeed", "at least", "actually", "as a matter of fact", "to be precise" are common in this type. In writing, "i.e." again or sometimes "viz." are used. This relation can be inexplicit by juxtaposition, and in writing by a colon (:) or a semicolon (;) as in example (12) where the relation is explicit and example (13) where it is inexplicit and the (;) can be explained as: in particular, indeed, in fact or at least.

(12) The speciation process has been reported in the laboratory which allows the study of the genetic mechanisms involved in this study, indeed chromosome doubling within a species may be a common cause of reproductive isolation. A(4)

(13) Human activities are now the primary cause of the ongoing extinction event; global warming may further accelerate it in the future. A(5)

4.2.1.2 Hypotactic Elaboration ($\alpha = \beta$)

Hypotactic elaboration means that the combination of elaboration with hypotaxis gives the category of non-defining relative clause/non-restrictive which functions as a kind of

descriptive gloss or comment to the primary clause. They can be divided into finite and non-finite clauses.

(i) Finite

Halliday (1994: 227) identifies that the secondary clause in this type has the same form as a defining relative clause of the WH-type. However, it differs from a defining relative clause. The non-restrictive (non-defining) relative clauses provide additional information about the antecedents or give a comment on them. They are considered by Halliday as dependent clauses unlike the restrictive ones which are rankshifted or embedded clauses functioning as postmodifiers in a nominal group. Another way of the difference between the two types is that the domain of the dependent clause might refer to the whole primary clause, or to any of its constituents. Thus, non-defining relative clauses can be grouped into three-headings (Halliday, 1985: 204).

(a) Clauses with 'which' with the domain is the whole of the primary clause as in example (14), or some part of it as in example (15).

(14) Natural selection is the most scientist's interesting concern, which makes nature as the measure to individuals survival. B(1)

(15) Large-scale transfers are the eukaryotic bdelloid rotifers, which have received a range of genres from bacteria, fungi and plants. B(2)

(b) Clauses with "which", "(that)", "who" or "whose" the domain is a nominal group as in example (16):

(16) Spore formation involves the production and release of special cells (or spores), that eventually give rise to new individuals. A(1)

The nominal group may be non-finite in the primary clause, the second clause is often enclosed as in example (17), the clause structure is

$\alpha \ll = \beta \gg$. Halliday (1985: 205).

(17) Inflation, which was necessary for the system became also lethal.

(c) Clauses with 'when' or 'where' having as domain some expressions of time or place to indicate the points of time and place, as in examples (18) and (19).

(18) Epithelial tissue lines the body internally, where it lines both mucous and serous membrances. B(1)

(19) Mostly, the typical time for producing Pollen is at the end of February, when the Yew and Elm start producing Pollen. B(2)

According to Al-Jubori (1979: 132), restriction is one of the syntactic features at the sentence level. They tend to define or describe the shape, properties, structure, location, function or process of certain objects. Relative clauses can be divided according to their function and form (see Meehan, 1987: 7, and Halliday, 1985: 205).

(ii) Non-Finite:

The same semantic relationship with the finites are obtained. The domain again may be one nominal group (NG) as in example (20), or some up to whole clause as in example (21). It is noted that with the non-finite clauses, the meaning is less specific, both the domain and the semantic relationship are left inexplicit. There is no WH-form, as there is with the finites; nor is there any preposition acting conjunctively, as typically is with non-finite clauses of extension and enhancement. There may be an explicit subject in the dependent clause as in (22):

(20) In the epidemics there are different strata, having distinctive anatomical features. A(3)

(21) Values are found in most veins, to direct the blood flow proximally. B(1)

(22) Microevolution and Macroevolution might involve selection at different levels, with microevolution acting on genes and organisms. A(1)

4.2.2 Extension:

In this type of expansion, according to Halliday (1994: 230), two clauses in clause complex are connected by means of extension when one clause extends the meaning of another by adding, replacing or altering the meaning. There are two types of extension: Addition (one clause adds to the meaning of another), and Variation (one clause changes the meaning of another by contrast or by qualification). Extension can be paratactic or hypotactic which is less common realized than paratactic extension.

4.2.2.1 Paratactic Extension (1 + 2):

Thompson (1996: 203) notifies that with parataxis yields coordinated clauses. The typical expression used are 'and', 'nor', 'or' and 'but'. Paratactic extension includes addition, variation. The relationships can be explicit or inexplicit.

(i) Addition:

Addition can be achieved explicitly by using the conjunction "and" (positive addition), "nor" (negative addition) or "but" (adversative addition) as in the examples (23), (24) and (25). Paratactic addition can be accompanied by cohesive expressions like "too", "in addition", "also", "moreover" and "on the other hand".

(23) Microbiological procedures usually must be aseptic, and use a variety of tools such as light microscopes with a combination of stains and dyes. A(2)

(24) The Australian Cattle Dog is aggressive, but it forms a strong attachment with its owners. A(5)

(25) Cellulose is neither present in the cell walls, nor are chloroplasts found. B(2)

(ii) Variation:

Halliday (1994: 230) presented that one clause is presented as being in total, where the cohesive expressions are "instead", "on the other hand" or partial replacement of another as in clause (26). In alternation i.e. paratactic alternation, one clause is offered as alternative to another, the most typical conjunctive signals in this type are: 'or', 'conversely', 'alternatively', 'on the other hand', as in example (27).

(26) The number of cells in meiosis will not be two but four cells are produced.

B(2)

(27) Animals must feed hetrotrophically, on the other hand, they cannot synthesize sugars, starches and proteins. B(2)

4.2.2.2 Hypotactic Extension ($\alpha + \beta$):

Halliday (1985: 208) and (1994: 231) mention that in a hypotactic extending complex, the secondary clause extends the meaning of the primary clause by adding some new elements, giving an exception to it or offering an alternation. As in the case with hypotactic elaboration, the dependent clauses may be finite or non-finite.

(i) Finite:

Thompson (1996: 203) mentions that finite hypotactic clauses of addition are introduced by 'while' and 'whereas'. The meaning is addition with contrast as in examples (28) and (29).

(28) Whereas most species of Euglena process chlorophyll, some do not. B(2)

(29) While this simple correspondence between an allele and a trait works in some case, most traits are more complex and are controlled by multiple interacting genes. A(1)

The distinction between additional and adversative is not clear-cut. There is no finite form for replacement. The finite clause for subtraction is introduced by 'except that', 'but (for the fact) that'. Another type of hypotactic extension is expressed by conditional

structure 'if....not' which can be paraphrased by 'either....or'. In this structure, the dependent clause always comes first.

(30) The biologists either study molecules, or they use techniques of molecular biology techniques to infer historical attributes of populations. A(3)

(ii) Non-Finite:

Halliday (1994: 231) the non-finite extended clauses are imperfective clauses introduced by a preposition functioning conjunctively such as besides, apart from (additive), without (adversative), instead of (replative), other than (subtractive). The form is identical with an elaborating one. Non-finite extended clauses can be inexplicit.

4.2.3 Enhancement:

In enhancement one clause enhances the meaning of another by reference to time, place, manner, cause or condition. The symbol 'x' is used to signal enhancement. Enhancement might be either paratactic or hypotactic.

4.2.3.1 Paratactic Enhancement (Notation 1 × 2):

A combination of enhancement with parataxis yields a kind of co-ordination with a circumstantial feature incorporated into it. It is typically expressed by the conjunctions listed by Halliday 'then', 'so', 'for', 'but', 'yet', 'still', or a combination of 'and' and another conjunctive element e.g. 'and then', 'and afterwards', 'and at that time'. Halliday identifies four types of enhancements: temporal, special, manner and causal-conditional).

(i) Temporal:

Temporal relation can be signaled by a conjunction group such as "then", "and afterwards", "first...then" (later time); "and just then", "and at the same time", "and at this time", "now" (same time), as in:

(31) Plants are adapted by the possession of roots to obtain water, at the time the roots are often adapted to enable these plants to survive. B(2)

(ii) Spatial:

Spatial relation is introduced by 'and there' to denote the sameness, as in example (32).

(32) The environment may alter, and there the individual may move to different places. B(2)

(iii) Manner:

Manner consists of means and comparison. In order to express paratactic enhancing clause of means, the conjunction group 'and in that way', 'similarly' are used. 'Whereas' 'and thus', 'and hereby', 'and so', 'and neither' are used to introduce a clause of comparison, as in examples (33).

(33) Advantageous variations will be retained, whereas disadvantageous ones will disappear. A(5)

(iv) Causal-Condition:

Cause-effect relation can be introduced by conjunctions 'so', 'and 'therefore', whereas effect-cause is expressed by 'for', as in examples (34).

(34) Some Protozoans are sometimes classified as plants and sometimes as animals, for they show plant and animals characteristics. A(3)

(v) Condition:

Condition may be positive, negative or concessive. Positive condition is introduced by 'and then', 'and in that case', negative condition by 'otherwise', 'or else', and concessive condition by 'yet', 'still', 'though', 'nevertheless', as in:

(35) Even within a community as small as a fresh water spring, nevertheless we can recognize several quite distinct habitats. A(4)

4.2.2.2 Hypotactic Enhancement:

These clauses are traditionally adverbial subordinate clause. Thompson (1996: 204) pointed out that they correspond very closely in function to adjuncts, specifying aspects of the dominant process such as the time, reason, condition. A hypotactic enhancement clause may be finite or non-finite, as with elaboration and extension.

(i) Finite:

Hypotactic enhancing clauses embrace temporal, spatial, manner and causal-condition.

(a) Temporal Relations:

These relations can refer to same time, later time, or earlier time. The subordinators used as conjunctions are "after", "before", "since", "until", "when". Temporal clauses are common in initial position, though it can be found in the middle or at the end of the complex, as in the examples:

(36) After we describe the complex nutritional possibilities in the genus Euglena, we can summarize some facts. A(1)

Spatial clauses are introduced by "where", "wherever", "as far as" as in example (37).

(37) A cell called a zygote, whenever a gamete from one parent fuse with a gamete from the other parent. A(2)

Clauses of manner are introduced by "as", "as if", "as though", "like"...as in example (38).

(38) We can recognize many different environments, as there are different species. A(2)

(b) Causal-Conditional Relations:

Causal-conditional relation can be positive, negative, or concessive, which can be introduced by "if", "as long as", "provided that" (positive condition), "unless" (negative condition), "even if", "even though", "although" (concession) as in example (39).

(39) This similarity is difficult to explain unless we accept that all vertebrates have a common ancestor. A(3)

(ii) Non-Finite:

A non-finite enhancing clause does not have a subject, and in this case, the subject is also the subject in the primary clause. The meaning of the non-finite clause is the same as its finite counterpart. Thus, non-finite enhancing clause can belong to one of the following subtypes: time, manner, or cause, as in the example (40). This relation can be expressed explicitly or implicitly.

(40) Man affects the ecosystem, by replacing large areas that contain living communitier with towns and cities. A(3)

5. The Test and Data Analysis:

5.1 The Test:

The test was carried out in 2012. the participants were the postgraduate students at the College of Science / Dept. of Biology. The students were taught how to use clause conjuncts in connecting clauses. The data consisted only of clause complexes which belong to the category of expansion. Many other clause simplexes and complexes of projection are not included, as they are not the focus of this study. And then a test was done to investigate their ability to use conjuncts correctly. (15) sentences were chosen which include all types of expansion i.e. elaboration, extension and enhancement. The students were required to tick one choice among three ones. As the participants are not specialists in English language, some clues were introduced, for example, each category and its meaning was presented. That is to facilitate the task required from them. (10) clauses were chosen to represent the

three meaning of expansion with cases of overlapping among them. The clauses were collected from books and articles related to biology science. The clauses chosen were labeled by mentioning the letter and the number. The clauses chosen from books labeled B(1), B(2). The clauses chosen from articles were labeled A(1), A(2)...The chosen books and articles were:

Books:

- 1.B(1): English in Basic Medical Science/ 2. B(2): English in Biological Science/

1. Articles:

- 1.A(1): Evolution/ 2. A(2): Microbiology/3. A(3): Biology/4. A(4): Mycology/ 5. A(5): Molecular Biology.

The clauses were tabulated and the numbers and their percentages were mentioned. In addition, a histogram for each clause was presented to distinguish the right choice with red colour and the wrong ones with blue. The data was analyzed following Halliday's functional grammar by using:

- Boundary Markers

[[[: clause complex boundary, [[: clause boundary,

- Types of dependency

1, 2, 3,parataxis relation/ α , β , hypotaxis relation,- Logical semantic relations (expansion) = : elaboration, + : extension, \times : enhancement.

5.2 Data:

1. [[All organisms, both plants and animals, are similar in several important ways, [[each kind of organism has its own particular shape or morphology.]]] B(2)
1 = 2 elaboration (exemplification)
2. [[*Certhidea Olivacea*, [[which has a probing bill with a probing tip, feeds only on animal food.]]] $\alpha \wedge = \beta$ B(2)
3. [[Traits vary among individuals, [[leading to differential rates of survival and reproduction.]]] $\alpha = \beta$ (elaboration/clarification) B(1)
4. [[The two lateral compartments are cavities [[known as the pleural cavities.]]] $\alpha = \beta$ (elaboration / clarification) B(2)
5. [[A coronal section of the body is not a cross-section, [[but it is made from side to side.]]] 1 = 2 extension / variation / replacive B(2)
6. [[Plants tend to be fixed organisms, [[or they are on the other hand able to float freely in or on water.]]] 1 + 2 extension (variation / alternative) A(4)
7. [[Some researchers have attempted a unifying monistic definition of species, [[while others adopted a pluralistic approach and suggest other ways.]]] $\alpha + \beta$ (extension / addition / adversative) A(3)
8. [[If the cell body is uninjured, [[then a new axon growing out of cell body]]] $\alpha + \beta$ extension (variation / alternative) A(5)
9. [[Comparing the anatomies of both modern and extinct species, [[paleontologist can infer the lineage of those species.]]] $\beta \wedge$ enhancement (causal and condition) A(1)
10. [[The food chain starts with a photo-autotroph [[and then there follows a series of heterotrophs.]]] 1 \times 2 Enhancement (temporal: different time). A(2)

5.3 Data Analysis and Discussion:

As shown in table (1), clause no. (1) exemplifies that the conjunction relation between the primary and the secondary clauses is that of elaboration / exemplification which was inexplicit. The highest rates recorded were 40% (i.e. 8) to represent both elaboration / exposition and exemplification, the third rate recorded was 20% (i.e. 4).

In accordance with the results obtained, the students chose equally elaboration/exposition and exemplification which declare that the combination of elaboration with parataxis gives three types; exposition, exemplification and clarification. The previous two types could be regarded as apposition between clauses. The inexplicit relation or the absence of the abbreviation [e.g.] as a symbol for exemplification used in writing, made it difficult for the participants to identify the correct choice. See figure (1).

Clause No. (2):

Certhidea olivacea, which has a probing bill with a probing tip, feeds only on animal food.

In the clause no. (2), the non-defining relative clause is used as an alternative to joining together two clauses by means of 'and' as an extending conjunction (positive addition). The clause complex can be altered as:

Certhidea olivacea feeds only on animal food and has a probing bill with a probing tip.

In the primary clause, when the nominal group (NG) is non-final, the secondary clause is often enclosed so as to follow immediately after it. The rates recorded were: 50% (i.e. 10) as elaboration / exposition, 40% (i.e. 8) as extension / addition (positive), and 10% (i.e. 2) as enhancement / temporal. The students identify elaboration / exposition to be the best choice for they depend on the conjunction used which is considered to be a cohesive rather than a structural marker of the paratactic relationship regardless of the use of 'and' as a joining conjunction instead of non-defining relative clause (see figure 2).

Clause No. (3):

Traits vary among individuals, leading to differential rates of survival and reproduction.

In clause no. (3), the dependent clause in the clause complex is a non-finite non-defining relative clause functioning as an elaboration / exposition. The rates recorded were: 55% (i.e. 11) as extension / additive, 25% (i.e. 5) as enhancement / temporal and 20% (i.e. 4) as elaboration / clarification. As it is usual with non-finite clauses, the meaning is less specific, the domain and the 'semantic relationship' are left inexplicit.

As there is no WH-form and a preposition acting conjunctively like the non-finite clauses of extension and enhancement, there was an overlapping among the three choices (see figure 3).

Clause No. (4):

The two lateral compartments are cavities, known as the pleural cavities.

The reduced non-defining relative clauses are widely used to add extra information about the names of organisms or the classification of an organ. They are used when the non-defining relative clause contains a passive verb. The omission of the WH-form and the finite (the first element in the mood) in the reduced non-finite clause is problematic for most of the students. The rates recorded were: 40% (i.e. 8) as enhancement / temporal, 35% (i.e. 7) as extension / addition (positive) and 25% (i.e. 5) as elaboration / exposition. Most of the students understand the relation as (1+2) i.e. the secondary clause extended the proposal of the primary clause rather than elaborating it (see figure 4).

Clause No. (5):

A coronal section of the body is not a cross-section, but it is made from side to side.

The conjunct used in clause no. (5) is 'but'. The secondary clause introduced by 'but' expands the meaning of the primary clause by replacement. The meaning of 'but' is not adversative, 'but' can be replaced by 'instead' as a total replacive (not X but Y), or 'except for' as subtractive (X but not all Y), 'only' can also be used to represent the meaning of extension / variation / replacive. The majority of the students chose extension / addition / adversative to record 60% (i.e. 12), 25% (i.e. 5) as extension / addition / negative, and 15% (i.e. 3) as extension / variation / replacive. The results exemplified that it is not easy to decide the exact meaning between clauses though certain conjuncts are present (see figure 5).

Clause No. (6):

Plants tend to be fixed organisms, or they are on the other hand able to float freely in or on water.

In sentence no. (6), and in the category of extension, 'or' is the conjunct related to the category: variation / alternative (X or Y). in the alternative type one clause is offered as alternative to another. the rates recorded were: 65% (i.e. 13) as extension / variation / alternative, 25% (i.e. 5) as extension / addition / adversative, and 10% (i.e. 2) as elaboration / exposition. The majority of the students made the right choice. This could be related to the use of cohesive conjunction in the clause. According to the rates recorded, the cohesive conjunctions can, to some extent, play a role in distinguishing the kind of connection between clauses, the use of 'on the other hand' was an indication of its expanding function alternatively. 'On the other hand' as a cohesive conjunct, can elaborate the meaning of the secondary clause by exposition i.e. restating the thesis of the primary clause in different words, which was a case of overlapping between elaboration and extension (see figure 6).

Clause No. (7):

Some researches have attempted a unifying monistic definition of species, while others adopt a pluralistic approach and suggest that there may be other ways.

The rates recorded were: 50% (i.e. 10) as extension / positive addition, 45% (i.e. 9) as extension / addition / adversative and 5% (i.e. 1) as extension / variation / replacive. The first two recorded rates were approximately related. This explains that there is no clear line between addition and adversative. These clauses sometimes have an adversative component, sometimes there is no finite form for replacement, which is a satisfaction of that choice as the lowest one. The finite clauses extend with hypotaxis embraces addition, replacement and alternation, but the extending clause dependent. It is noted that finite clauses with 'whereas', 'while', and 'except that' have a paratactic flavour if they follow the primary clause. If it precedes, the clause has a hypotactic flavour. It is necessary to mention certain cases, the extending clause could not precede. It is clear that the line between parataxis and hypotaxis is not very sharp as a working rule (see figure 7).

Clause No. (8):

If the cell body is uninjured, then a new axon growing out of the cell body.

The rates recorded were: 45% (i.e. 9) as extension / variation / replacive, 40% (i.e. 8) as extension / variation / alternative and 15% (3) as extension / addition / negative. In clause no. (8), the conjunction 'if – not – then' was extension / variation / alternative. The relation can be presented as 'either – or else'. These can be recognized because it does not matter which of the alternatives is treated as negative condition. The students were unable to recognize which of the alternative was treated as negative condition. This made them chose extension / variation / replacive. The use of 'if – clauses' is common in scientific texts to state a real condition. Al-Jubori (1999: 138) identifies that conditionals are used to make general statement or to illustrate rather abstract propositions (see figure 8).

Clause No. (9):

Comparing the anatomies of both modern and extinct species, paleontologists can infer the lineages of these species.

The extending additive clause enhances the meaning of the primary extended clause by reference to cause and condition. There is an overlap between the non-finite extending and elaborating clauses. As the meaning is less specific, both the domain and the semantic relationships. There is no WH-form, no any preposition acting conjunctively, so the form is identical with an elaboration. This explains the identical rates recorded concerning the

meaning of extension and elaboration. Still, the meaning of extension could be established by adding a conjunctive preposition like on-temporal. The order of α and β is important in determining the exact meaning. The rates recorded were: 35% (i.e. 7) as both extension / positive addition and elaboration / exposition. The enhancement / causal - conditional / cause – reason recorded 30% (i.e. 6).

The imperative clauses are used in place of 'and' to represent a simple addition or to replace the consequence – effect of what has been stated, or an explanation of what has just been said (see figure 9).

Clause No. (10):

The foods chain starts with a photo-autotroph and then there follows a series of hetrotrophs.

The clause complex explains a sequence of paratactic clauses interpreted as being in some circumstantial relation to each other especially a temporal sequence. The secondary clause enhances the meaning of the primary one by time. The events described take place in a time sequence. The rates recorded were: 40% (i.e. 8) as both enhancement / temporal and extension / addition, and 20% (i.e. 4) as enhancement / conditional – clausal / cause – reason. The students' choices showed that they prefer to analyze the clause as extending treating 'and' as the unmarked form of the expansion type.

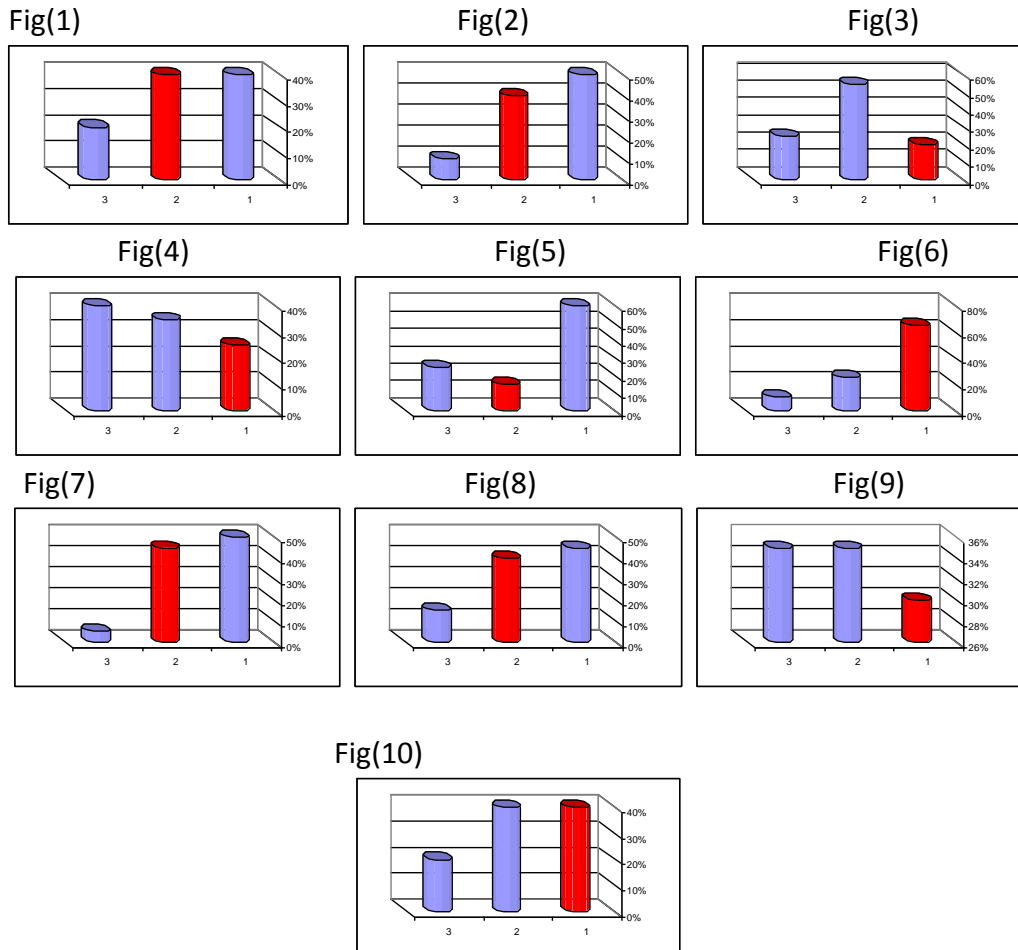
Al-Jubori (1979: 138) mentions that time statements with the use of expressions such as 'after', 'when', 'before', 'until', 'till' are used to describe several uses: sequence of actions, processes, cause and effect and generalization. The use of 'and' to join together two clauses with a sequence marker, with a 'same-time' marker 'and at the same time', with a cause – effect marker as 'and therefore' to express a fact and its consequence or to summarize most important points (Pearson, 1978: 54) (see figure 10).

Table (3) Numbers and Names of Percentages of Clauses Relationships in Clause Complex

| Category | | Meaning | No. | % | |
|----------|---|-------------------------------------|--------------------|----|----|
| 1 | 1 | Elaboration / Exposition | In other words | 8 | 40 |
| | 2 | Elaboration / Exemplification | For example | 8 | 40 |
| | 3 | Elaboration / Clarification | To be precise | 4 | 20 |
| 2 | 1 | Elaboration / Exposition | In other words | 10 | 50 |
| | 2 | Extension / Addition | X and Y | 8 | 40 |
| | 3 | Enhancement / Temporal | A meanwhile B | 2 | 10 |
| 3 | 1 | Elaboration / Clarification | To be precise | 4 | 20 |
| | 2 | Extension / Addition | X and Y | 11 | 55 |
| | 3 | Enhancement / Temporal | A meanwhile B | 5 | 25 |
| 4 | 1 | Elaboration / Exposition | In other words | 5 | 25 |
| | 2 | Extension / Addition | X and Y | 7 | 35 |
| | 3 | Enhancement / Temporal | A subsequently B | 8 | 40 |
| 5 | 1 | Extension / Addition / Adversative | X and conversely Y | 12 | 60 |
| | 2 | Extension / Variation / Replacive | Not X but Y | 3 | 15 |
| | 3 | Extension / Addition / Negative | Not X and not Y | 5 | 25 |
| 6 | 1 | Extension / Variation / Alternative | X or Y | 13 | 65 |
| | 2 | Extension / Addition / Adversative | X and conversely X | 5 | 25 |
| | 3 | Elaboration / Exposition | In other words | 2 | 10 |
| 7 | 1 | Extension / Addition / Positive | X and Y | 10 | 50 |
| | 2 | Extension / Addition / Adversative | X and conversely Y | 9 | 45 |
| | 3 | Extension / Variation / Replacive | Not X but Y | 1 | 15 |
| 8 | 1 | Extension / Variation / Replacive | Not X but Y | 9 | 45 |
| | 2 | Extension / Variation / Alternation | Instead | 8 | 40 |
| | 3 | Extension / Addition / Negative | Not X and not Y | 3 | 15 |

| | | | | | |
|----|---|--|-----------------------|---|----|
| 9 | 1 | Enhancement / causal – conditional Cause - reason | Because P so result Q | 6 | 30 |
| | 2 | Extension / Additive | A and B | 7 | 35 |
| | 3 | Elaboration / Exposition | In other words | 7 | 35 |
| 10 | 1 | Enhancement / Temporal | A subsequently B | 8 | 40 |
| | 2 | Extension / Addition | A and B | 8 | 40 |
| | 3 | Enhancement / Conditional – Causal Cause - Reason | Because P so result Q | 4 | 20 |

Fig: (1) Histograms of the Analyzed Clauses



5. 4 Conclusion:

The types of the relationships between clauses in clause complexes as one of the contextual features in biological texts were discussed. These relationships can be studied to represent the logical meaning to and to represent the relationship between ideas.

The study focused on different methods of combining clauses in clause complexes in general and in biological texts in particular. The relationship between clauses can be seen from two dimensions, taxis and logico-semantics. Taxis, which shows the interdependency between the clauses in clause complexes which are of two types: paratactic and hypotactic. The expansion relations as one type of logico-semantic relation was focused.

It is noted that the three types of expansion were presented in the analyzed texts. The results recorded exemplified that

- (1) The main features of English for science and technology (EST) were presented.
- (2) As for the use of clause conjunctions they were used to show contrast, similarity, explanation, consequence or result, summarizing clauses, to show the strength of a general statement, explaining the order of a series of events by using sequence markers.

- (3) The use of non-defining relative clauses was prominent in biological texts to extend the meaning of the primary clauses by adding information or naming statements. There is a considerable number of non-defining relative clauses with a preposition before which.
- (4) The short-form non-restrictive relative clauses are also common. They are constructed by omitting 'which' and changing the verb to its '-ing form'.
- (5) The relative clauses defining and non-defining with a passive verb are shortened by omitting "which" + verb "to be".
- (6) There is a heavy use of the final "-ing clauses" in place of "and", "since" to explain the meaning or to show result enhancing clauses which refer to temporal activity were common also.
- (7) The results showed that there is a must need for improving the postgraduate students to use clause conjuncts correctly, as they need to deal with different references during their study and according to their academic need.

REFERENCES

1. Al-Jubori, A. (1979). "General Features of English for Science and Technology". In IDELTI Journal. N. 13, pp: 123 – 159.
2. Bloor, T. and Meril (1995). The Functional Analysis of English. Oxford: Oxford University Press Inc.
3. Bloor, T. and Bloor M. (1995). The Functional Analysis of English. A Hallidayan Approach. London: Arnold.
4. Halliday, M. A. K. (1994). An Introduction to Functional Grammar. 2nd ed. London: Edward Arnold.
5. Halliday, M. A. K. and Hassan, R. (1997). Cohesion in English. London: Longman.
6. Martin, J. R. and Mathiensen, C. M. T. M. and Painter C. (1997). Working with Functional Grammar. London: Arnold.
7. Morley, C. D. (2000). Syntax in Functional Grammar. New York: Continuum Wellington House.
8. Thompson, G. (1996). Introducing Functional Grammar. Oxford: Oxford University Press Inc.
9. Halliday, M. A. K. (2004). Introduction: How Big is a Language? On the Power of Language. In the Language of Science: Volume 5 in the Collected Works of M. A. K. edited by J. J. Webster. London and New York: Continuum. p xi.
10. Halliday, M. A. K. (2003). Introduction: On the "Architecture of Human Language. In On the Language and Linguistics. Volume 3 in the Collected Works of M. A. K. Halliday. Edited by Jonathan Webster. London and New York: Continuum.
11. Than, L. (2008). Expansion and its Realization in the Short Story "The Law of Life by Jack London". Unpublished M.A. Thesis. Vietnam National University.

BIOLOGY REFERENCES

1. [http://en.wikipedia.org/w/index.php?title=mycology.mycology\(2011\)](http://en.wikipedia.org/w/index.php?title=mycology.mycology(2011))
2. Biology via net: www.wikipedia.org.
(<http://www.cattledog.com/misc/faq.html>).
3. Maclean, J. (1990). English in Basic Medical Science, Hong Kong: Oxford University Press.
4. Hall, B. K.; Hallgrimsson, B. (2008). Strickberger's Evolution.
(<http://www.jblearning.com.pp.762>)
5. Roberts, K., Raff, M., Alberts, B., and Walter, P. (2011). Molecular Biology of the Cell.
(<http://www.dmoz.org/science/Biology>) pp.1616.
6. Microbiology. (2011). [www.pubmedcentral.nih.gov/articlerender.Microbiol.Rev.59\(1\):143 – 169](http://www.pubmedcentral.nih.gov/articlerender.Microbiol.Rev.59(1):143-169).
7. Pearson, I. (1978). English in Biological Science. Oxford: Oxford University Press.

APPENDIX

Tick the correct meaning of the Underlined Clause Conjuncts in the following clauses:

Clause No. (1):

All organisms are similar in several important ways , each kind of organism has its own particular shape, or morphology.

Elaboration / Exposition (in other words)
Elaboration / Exemplification (for example)
Elaboration / Clarification (to be precise)

Clause No. (2):

Certhidea Olivacea, which has a probing bill with a probing tip , feeds only on animal food.

Elaboration / Exposition (in other words)
Extension / Addition (X and Y)
Enhancement / Temporal (different time / later)

Clause No. (3):

Traits vary among individuals, leading to differential rates of survivals and reproduction.

Elaboration / Clarification (to be precise)
Extension / Addition (X and Y)
Enhancement / Temporal (A meanwhile B)

Clause No. (4):

The two lateral compartments are cavities, known as the pleural cavities.

Elaboration / Exposition (in other words)
Extension / Addition (X and Y)
Enhancement / Temporal (A subsequently B)

Clause No. (5):

A coronal section of the body is not a cross-section, but it is made from side to side.

Extension / Addition / Adversative (X and conversely Y)

Clause No. (6):

Plants tend to be fixed organisms, or they are on the other hand able to float freely on water.

Extension / Variation / Replacive (not x but Y)
Extension / Addition / Negative (not X and not Y)

Clause No. (7):

Some researchers have attempted a unifying monistic definition of species, while others adopt a pluralistic approach and suggest other ways.

Extension / Variation / Alternative (X or Y)
Extension / Addition / Adversative (X and conversely Y)
Elaboration / Exposition (in other words)

Clause No. (8):

If the cell body is injured, then a new axon growing out of the cell body.

Extension / Addition / Positive (X and Y)
Extension / Addition / Adversative (X and conversely Y)

Clause No. (9):

Comparing the anatomies of both modern and extinct species, Paleontologists can infer the lineages of those species.

Clause No. (10):

The food chain starts with a photo-autotroph and then there follows a series of hetrotrophs.

Extension / Variation / Replacive (not X but Y)

Enhancement / Causal – Conditional / Cause - Reason

Extension / Addition / Positive (A and B) but Y

Elaboration / Exposition / (in other words) Extension / Variation / Alternation (instead)

Extension / Addition / Negative (not X and not Y) Enhancement / Temporal (A subsequently B)

Extension / Addition (A and B)

Enhancement / Conditional – Causal / (Cause – Reason)