

CHAPTER 1: INTRODUCTION

Anyone who enjoys tree diagram drawing will agree with Gertrude Stein: "I really do not know that anything has ever been more exciting than diagramming sentences" (cited in Fromkin, Rodman & Hyams, 2011: 83). 'Syntactic tree diagram' has been referred to with different names; it is called 'syntax tree' in generative syntax (Smet & Vries, 2008); 'parse tree' or 'concrete syntax tree' (Derrick & Archambault, 2010); 'phrase structure tree' or 'constituent structure tree' (Fromkin, Rodman, & Hyams, 2011); "it is a two-dimensional diagram used in generative grammar as a convenient means of displaying the internal hierarchical structure of sentences as generated by a set of rules" (Crystal, 2008: 494). Drawing tree diagrams is the fundamental skill in the study of syntax; it is a common practice to provide visual representation of the internal structure of a phrase or clause. However, many beginning students of syntax often find syntactic tree diagram drawing a daunting task. They wonder how the X-bar theory works; they also keep thinking how phrases and clauses are structured when seeing more and more complicated phrases and clauses; they experience frustration when they are unable to generate appropriate tree diagrams. This happens because they fail to understand the properties of the X-bar theory.

"Syntax is the study of the principles and processes by which sentences are constructed in particular languages" (Chomsky, 1957: 11). One cannot claim himself or herself to have learned syntax if they do know who Noam Chomsky is and what X-bar theory is. Any students of syntax will be familiar with the X-bar schema; familiarity with the schema is obtained when students are exposed to it as X-bar theory and are requested to tree the internal structure of phrases or clauses throughout the whole learning process.

Apart from the schema, students of syntax will also be exposed to and familiar with the following phrase structure rules and structural relations:

Phrase structure rules:

- (1) specifier rule : $XP \rightarrow (YP) X'$ or $XP \rightarrow X' (YP)$
- (2) adjunct rule : $X' \rightarrow X' (ZP)$ or $X' \rightarrow (ZP) X'$
- (3) complement rule : $X' \rightarrow X (WP)$ or $X' \rightarrow (WP) X$

Structural relations:

- (4) specifier (YP) = daughter of XP; sister of X'
- (5) adjunct (ZP) = daughter of X'; sister of X'
- (6) complement (WP) = daughter of X'; sister of X

Students who have mastered the X-bar theory should be clear with the four notions: specifier, head, complement, adjunct; thus, they are expected to also be able to draw accurate syntactic tree diagrams using the X-bar theory to show the head-complement and modifier-head relations. Armed with X-bar schema, phrase structure rules, and structural relations, students would be able to generate diagrammatic representation of any syntactic structures. However, errors are very common in tree diagram drawing. Among some of the problems found in students' tree diagram drawing are: ternary branching, inaccurate marking and labeling of grammatical categories, and projection from a wrong head (Qiang, 2010). The interpretation of a clause is determined by the interpretations of the words in the clause and the structure of the clause. When a clause can be interpreted in more than one way, the clause is said to have more than one internal structure. Students' frustration doubles when they are required to diagram these structures and convey the different interpretations of these ambiguous clauses. Drawing trees look simple and interesting when it is demonstrated; however, when they have to perform the task themselves, they find that

it is not an enjoyable process at all. Drawing trees are thus a fundamental skill to be learned and mastered in the study of syntax. Students will have exposure to demonstration and construction of syntactic tree diagrams; then, they must practice the skill as “drawing trees is a learned skill that needs lots of practice” (Carnie, 2006: 79); without enough practices, one would fail to master the art of tree diagram drawing and enjoy the drawing process. Thus, apart from understanding the theory, tree diagram drawing is also a skill to be learned and mastered; when students become more practiced and experienced, they will enjoy treeing phrases and clauses.

1.1 Background of the study

Syntactic tree diagram is a good tool to represent the internal structures of phrases and clauses; however, before one is able to produce a well-formed syntax tree, one must have understood the X-bar theory and mastered the skills in drawing the correct trees. Based on the my observation, beginning students of syntax have learned about X-bar theory in lectures; thus, they should have conscious knowledge of X-bar theory and should be able to produce tree diagrams accurately. However, it is found that even though they have been explicitly taught about X-bar theory and it is complemented by the step-of step demonstrations on the how to generate a tree diagram; students still fail to produce a well-formed X-bar structure. Errors are identified if the participants are requested to draw the tree diagrams showing all the minimal, intermediate and maximal projections in an NP, VP, AP, PP, DP, TP, or CP.

When there is lack of understanding of how the X-bar system works, beginning students often find treeing diagram is difficult and complicated. However, what about students who have some specific background knowledge in X-bar theory and tree diagram

drawing experience? The topic is worth studying because it has yet to be examined. Qiang's (2010) study is the only one found in the literature where it examines students' problem in tree diagram drawing among beginning students of syntax. Another study should be conducted to examine more advanced students' tree diagram drawing; these students are available in the postgraduate level and they are the perfect target to be studied. The research is exploratory; it is a focused and narrowly construed study. It can be carried out by examining their tree diagrams and find out whether they know the differences between a complement and an adjunct and know how to disambiguate structural ambiguous clauses; if they know, then they are expected to be able to produce viable tree diagrams.

1.2 Statement of the problems

A student of syntax who has learned the X-bar theory should have a certain competence in phrase structure rules and the structural relations within the X-bar schema; with the conscious knowledge learned, the student should be able to enjoy tree diagram drawing. However, there are three major problems observed when students produce their tree diagrams: (1) unable to differentiate a complement from an adjunct; as a result, they treat an adjunct as a complement; (2) unable to adjoin an adjunct to more than one possible node (X') in order to disambiguate structural ambiguous clauses; (3) unable to produce two tree diagrams to show the different interpretations when there are adjuncts on both sides of a head.

Problem 1:

Based on my learning experience, students of syntax are exposed to the X-bar theory by the introduction of the X-bar schema shown below:

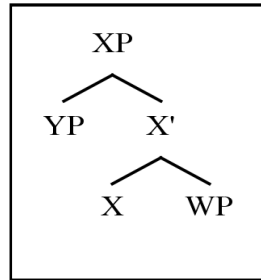


Figure 1.1: X-bar schema

YP is introduced as the specifier of X while WP is the complement of X. Obviously, adjunct¹ is not included in the tree diagram. When students of syntax use the schema as the reference to produce their tree diagrams, one problem is always observed: they are unable to differentiate a complement from an adjunct; as a result, adjuncts are always treated as the complement.

A complement is a daughter of an X' and a sister of X; thus the complement must be merged to an X; an adjunct is a daughter of X' and a sister of an X'; thus it must be adjoined to an X'. Students who are unable to capture the difference between the two would be unable to show the difference using different tree diagrams. For examples (Carnie, 2006: 163)²:

(7) [N book] [PP of poems]

(8) [N book] [PP with a red cover]

Both (7) and (8) have the same surface structure where an N precedes a PP. However, they have different internal structures and should be each represented by a different tree diagram as shown below:

¹ Hasselgard (2010) and Ernst (2004) discuss different types of adverbial adjuncts.

² More detailed discussion can be found in Radford (1998).

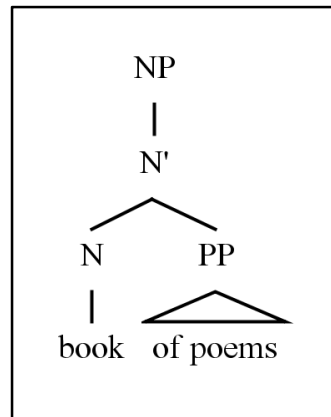


Figure 1.2: [N book] [PP of poems]

As shown by Figure 1.2, the PP ‘of poem’ is the daughter of N’ and the sister of N; thus, the diagram correctly shows that the PP is the complement of the head N ‘book’ within the NP.

As for (8), its structure can be shown by the following diagram:

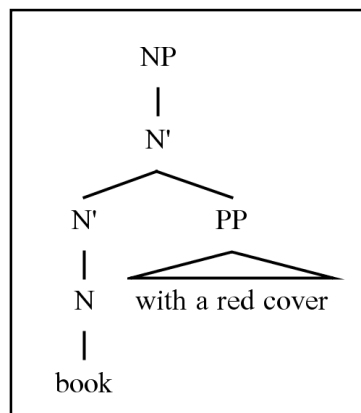


Figure 1.3: [N book] [PP with a red cover]

As shown by Figure 1.3, the PP ‘with a red cover’ is the daughter of N’ and the sister of N’; thus, the diagram also correctly shows that the PP is the adjunct thus must be adjoined to the N’ in the NP.

The difference between the two tree diagrams is the extra N’ in Figure 1.3; the extra N’ causes a different interpretation to the same PP, namely, either it is a complement or an adjunct. At the same time, the interpretation has implication to the meaning of the NP where the PP in (7) “tells us what kind of book is being referred to” while the PP in (8)

“seems more optional and more loosely related to the NP” (Carnie, 2006: 164). Thus, based on the examples shown, students who are unaware of the difference between complement and adjunct will not be able to produce the accurate tree diagrams when given phrases with the structures: **head + complement** and **head + adjunct**.

Problem 2:

Students of syntax are also found to have difficulty when treeing structural ambiguity clauses. In a phrase level, an adjunct is adjoined to the X' of an XP; however, in a clause level, an adjunct can be adjoined to a different X' from different syntactic categories depending on the different interpretations given to the clause. The options of adjunction to different X' of different syntactic categories can thus result in structural ambiguity of the same clause, meaning the clause will have more than one interpretation. Tree diagram is a useful tool to explain structural ambiguity; if students are not sensitive to the options of adjunction, they are expected to not being able to produce the tree diagrams to show the different internal structures for the different interpretations. This can be exemplified by the following example used as our cartography exercise:

(9) Mary saw a university [PP in the village].

The PP ‘in the village’ is an adjunct in the clause. In a phrase level (‘university in the village’), it is adjoined to the N'. However, in a clause level, there are two options for adjunction (PP is adjoined to a V' or PP is adjoined to an N'); thus, two different syntactic tree diagrams can be produced to show the internal structures of the same clause using the following two diagrams:

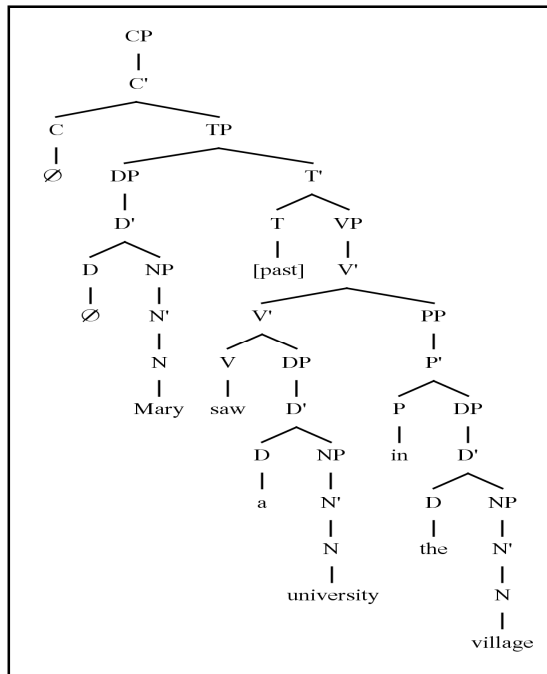


Figure 1.4: PP is adjoined to V'

In Figure 1.4, the PP 'in the village' is adjoined to the V'; it modifies the V 'saw'.

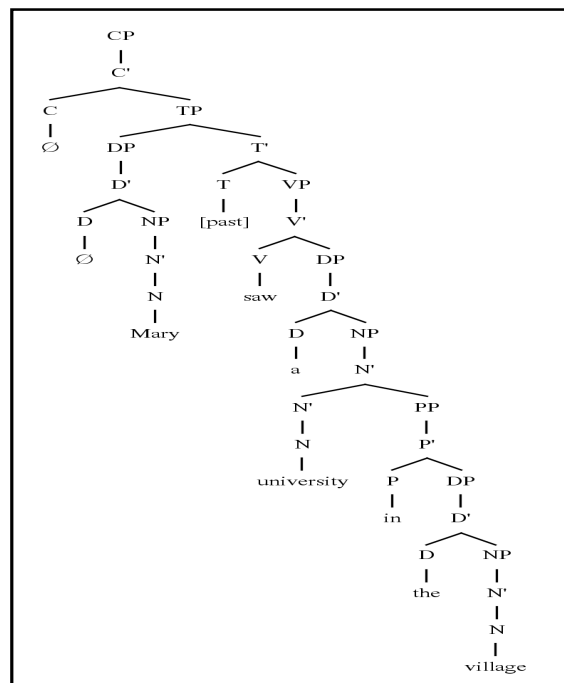


Figure 1.5: PP is adjoined to N'

In Figure 1.5, the PP 'in the village' is adjoined to the N'; it modifies the N 'university'.

Problem 3: adjuncts on both side of a head

Students are not aware that when there are adjuncts on both sides of the head, either one can be adjoined first depending on the intended meaning; different sequence of adjunctions enables two possible tree diagrams to be generated. For example, for the NP:

(10) dangerous dog in the park

can be represented by the two diagrams below:

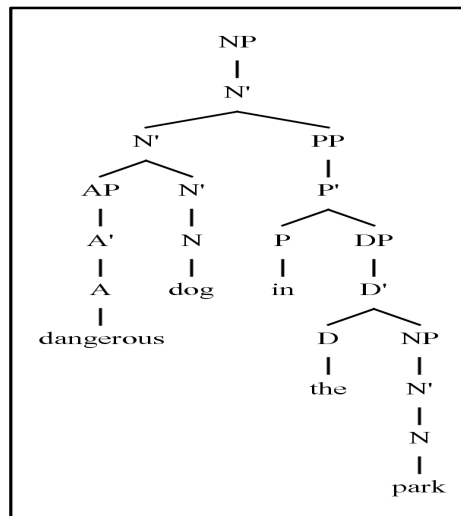


Figure 1.6: [N' dangerous dog] [PP in the park]

In Figure 1.6, the AP 'dangerous' is adjoined to the N' which immediately dominates 'dog' to form another N'; 'dangerous' thus modifies only 'dog'.

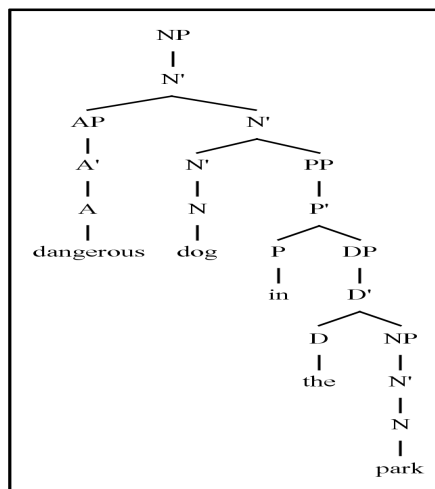


Figure 1.7: [AP dangerous] [N' dog in the park]

In Figure 1.7, the AP ‘dangerous’ is adjoined with the N’ ‘dog in the park’; thus, it modifies the whole N’ ‘dog in the park’.

1.3 Objectives of the study

The research will investigate students’ understanding of X-bar theory by examining their production of cartographies. This is done by finding out whether they are sensitive to the difference between a complement and an adjunct. They will be required to generate tree diagrams using the X-bar theory and show the minimal, intermediate and maximal projections. Thus, the objectives of the study are to find out whether students are able to show the internal structures of (1) phrases from different syntactic categories; (2) ambiguous clauses, and (3) phrases with adjuncts on both side of a head.

If the students are able to produce possible tree diagrams with correct internal structures, it shows that they have understood X-bar theory and mastered the skills to draw syntactic tree diagrams; if not, ill-formed trees are expected and will be described in the report. Ultimately, the study will try to show that tree diagram drawing is not difficult or complicated; understanding the X-bar theory is the key to mastering tree diagram drawing.

1.4 Research questions

The research will be guided by the three research questions below:

1.4.1 How do students adjoin a head and an adjunct within a phrase? If they know the difference between a complement and an adjunct, they should be able to adjoin an adjunct to its head correctly to form an intermediate projection when given a phrase with the following structure:

- (i) N + adjunct₁ + adjunct₂
- (ii) V + adjunct₁ + adjunct₂

(iii) $A + \text{adjunct}_1 + \text{adjunct}_2$

1.4.2 How do students draw the tree diagrams when given ambiguous clauses? This question will examine whether the participants are sensitive to two options of adjunction in an ambiguous clause. If they have the sensitivity, they should be able to disambiguate ambiguous clauses by showing the different internal structures of the same clause using different tree diagrams.

1.4.3 How do students draw the tree diagrams when there are two adjuncts on both sides of a head? This question will examine whether the students are sensitive to two possible sequences of adjunction and thus two possible ways to represent the internal structure of a clause.

1.5 Limitation of the study

Only declarative clauses will be tested upon the participants. Apart from this, only two-place predicates are tested in the instrument. Three-place predicates are avoided as more technicality will be expected from the participants where they will be expected to be very familiar with both lexical verb (VP) and light verb (vP) concepts and thus required to draw more complicated tree diagrams.

1.6 Significance of the study

The intended study will have pedagogical implication; the results of the study are worthy of note to lecturers. The output of the study will provide useful feedback to

lecturers with regard to students' comprehension of X-bar theory and production of syntactic tree diagrams based on the theory. This is because, without proper understanding and enough practices, students will not be able to generate viable syntactic tree diagrams. Furthermore, the study will identify and discuss the errors/problems facing students' of syntax. For introductory level teaching of syntax, lecturers may point out the errors to beginning students and remind them to avoid generating them.

The output of the report will also motivate lecturers to plan more systematic and fruitful teaching and learning of syntax, especially during the earlier stages of tree diagram drawing teaching. This can be done by introducing introductory syntax references that cover detailed demonstration or discussion on X-bar theory and tree diagram drawing, or providing detailed explanation in class and giving more practices. As a result, students will have more comprehensive understanding of X-bar theory and be more aware of the important consideration when generating tree diagrams

Apart from that, the intended study will also provide some valuable resources to learners. Most of the tree diagrams inserted in the report will be drawn with full X-bar structure where all the details (all the projections of the head X and thus non-branching structures) are shown (even though when there is no complement or an adjunct). This is because one seldom finds detailed illustration of syntactic tree diagrams (especially the X') as they will often be simplified or certain parts of the diagram are abbreviated with a triangle due to space limitation, didactic reasons or the authors try to adopt the economy condition and avoid unnecessary details; as a result, much details are omitted and students may not pay attention to these details. The research report is hoped to be able to provide some useful references to students who look for detailed illustration. Students are encouraged to compare the tree diagrams inserted in the report. Observant students will

find that phrases and clauses share the same essential structural properties and have the same internal construction; this internal construction is actually the application of the one single X-bar schema. They will realize that tree diagram drawing is in fact very easy and straightforward.

Next, the study will help to create students of syntax's sensitivity with regards to (1) the difference between complement and adjunct and how they should be merged or adjoined; (2) different options of adjunction; and (3) possible ways of adjoining adjuncts on both sides of the head. The study will definitely help students to be more observant and careful when they tree phrases or clauses. At the same time, the output of the study will inform the students some of the errors produced by other students of syntax in tree diagram drawing; they will be more informed and recognize the errors and hopefully avoid generating them. Ultimately, they will have better understanding of the X-bar theory and be able to master the skills in drawing tree diagrams. Hopefully, this will help them to enjoy the drawing process and have more confident when producing tree diagrams.

Apart from lecturers and students, the research report may also be useful to an author or a publisher. Potential author or publisher may be interested with the findings of the research report. Many references only provide general ideas and steps in tree diagram drawing; this is definitely not very informative and useful especially to beginning students when they are dealing with more complicated phrases and clauses. Thus, the research report may motivate the publication of a book that deals with step-by-step demonstration and detailed elaboration of tree diagram drawing.

CHAPTER 2: LITERATURE REVIEW

2.1 Fundamental notions

This section will provide some fundamental notions and structural relations for tree diagrams: root, terminal node, nonterminal node, precedence, dominance, mother, daughter, sisterhood.

In earlier technical work, tree diagrams were referred to as “phrase-markers” or “P-markers” because words are combined to form phrases of various types” (Radford, 2009: 58). The X-bar schema requires that phrases and sentences are formed by a series of binary merger operation, and the resulting structures can be represented graphically using a tree diagram; for example:

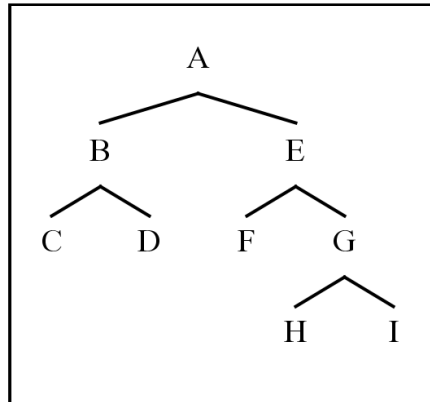


Figure 2.1: Binary merger operation

On the right of the tree diagram, H and I are merged to form G; the resulting structure G is then merged with F to form E; while on the left, C and D are merged to form B, then the resulting structure B is merged with the other resulting structure E to form A.

Each of the label A, B, C, D, E, F, G, H, I is called a **node**; the nodes represent the syntactic categories (such as like N, V, A, P, etc). The topmost node A is the **root**. The

nodes at the very bottom C, D, H, I are **terminal nodes**; each of the terminal nodes carries a lexical item or a constituent. B, E, F, G are **nonterminal nodes**.

For nodes that appear horizontally, they have **precedence** relation. A node that appears before another one is said to precede the node; thus, C precedes D, F precedes G, H precedes I. The two lines connecting the two nodes vertically in the diagram are called **branches**. These branches show the **dominance**/containment relation between the nodes: what immediately contains is what immediately dominates; thus, A immediately dominates B and E; B immediately dominates C and D; E immediately dominates F and G; G immediately dominates H and I. In contrast, what is immediately contained is what is immediately dominated; thus, B and E are immediately dominated by A. C and D are immediately dominated by B; F and G are immediately dominated by E; H and I are immediately dominated by G. As for the nodes which are not immediately dominated but are in a lower position in the tree, they are said to be dominated; thus, A dominates C, D, F, G, H and I; E also dominates H and I.

Applying the kinship terminology in the dominance relations, A is the **mother** of B and E; B and E are **daughters** of A and at the same time, B and E are **sisters** to each other. Two nodes that have the same mother are thus in the **sisterhood** relation. The same relation applies to B where B is the mother of C and D; C and D are daughters of B and they are both sisters to each other; E is the mother of F and G; F and G are daughters of E and they are both sisters to each other; G is the mother of H and I; H and I are daughters of G and they are both sisters to each other.

2.2 X-bar schema

According to Trask (1993), Zellig Harris (1951) was the first person to suggest the X-bar system; Chomsky (1970) revived it while Jackendoff (1977) further developed it. In the 1980s, the theory was incorporated into Government and Binding Theory (Matthews, 2007). A very comprehensive discussion of the theory was given by Radford (1988). The X-bar system provides a unified analytical framework for phrasal projections (Tomalin, 2006); however, it is not without criticism; a critical review of the system was given in Kornai and Pullum (1990). Chomsky (1994) proposes to eliminate the X-bar theory under Minimalist Program (1991, 1993) and replaces it with Bare Phrase Theory.

In Chomsky's (1970) paper *Remarks on Nominalization*, he discussed three types of nominalization in English: (i) the gerundive nominal, (ii) the derived nominal, and (iii) the combination of gerundive nominal and derived nominal. Example for each of the nominalization is shown below:

- (11) John's refusing the offer
- (12) John's refusal of the offer
- (13) John's refusing of the offer

It was proposed in the paper that for each of the lexical category N, V, A, there is a rule of categorical complement where:

- (14) $NP \rightarrow N \text{ Comp}$
- (15) $VP \rightarrow V \text{ Comp}$
- (16) $AP \rightarrow A \text{ Comp}$

Each of the N, V, A can be followed by an optional complement to form a phrase. A single schema was suggested to replace the three rules above:

$$(17) \quad \bar{x} \rightarrow X \dots$$

In the schema, X is a variable representing the lexical category N, V, A. The $\bar{x}$ represents a phrase, it contains an X as its head; the three dots (...) are to be filled by a range of optional complements of X.

A phrase that immediately dominating an $\bar{x}$ is represented by an $\bar{\bar{x}}$. A phrase associated with the $\bar{x}$ is referred as the “specifier”³ and it is represented by [spec, $\bar{x}$]. The schema representing the whole phrase is:

$$(18) \quad \bar{\bar{x}} \rightarrow [\text{spec}, \bar{x}] \bar{x}$$

Thus, each of the phrases NP, VP and AP can be represented by a different schema:

$$(19) \quad \bar{\bar{N}} \rightarrow [\text{spec}, \bar{N}] \bar{N}$$

$$(20) \quad \bar{\bar{V}} \rightarrow [\text{spec}, \bar{V}] \bar{V}$$

$$(21) \quad \bar{\bar{A}} \rightarrow [\text{spec}, \bar{A}] \bar{A}$$

Where [spec, $\bar{N}$] is a determiner⁴, [spec, $\bar{V}$] is an auxiliary, and [spec, $\bar{A}$] is a system of qualifying elements.

Using the schema in (19), the NP “several of John’s proofs of the theorem” has the following structure:

³ In modern higher level Syntax, specifier is the position for subjects.

⁴ Chomsky treated D as the specifier of N. It was proposed by Abney (1987) that D headed its own phrasal projection; NP was the complement of D. All the tree diagrams in this research report are drawn based on Abney’s proposal.

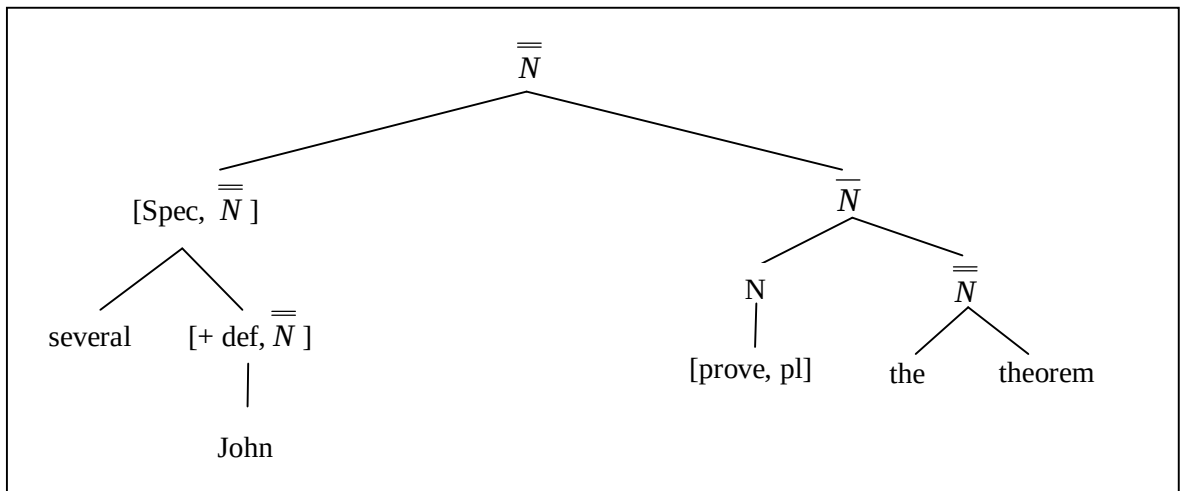


Figure 2.2: “several of John’s proofs of the theorem”

A rule for the base grammar is then proposed as:

$$(22) \quad S \rightarrow \bar{\bar{N}} \bar{\bar{V}}$$

where other optional complements are possible. For the clause “John proved the theorem”, it has the following structure:

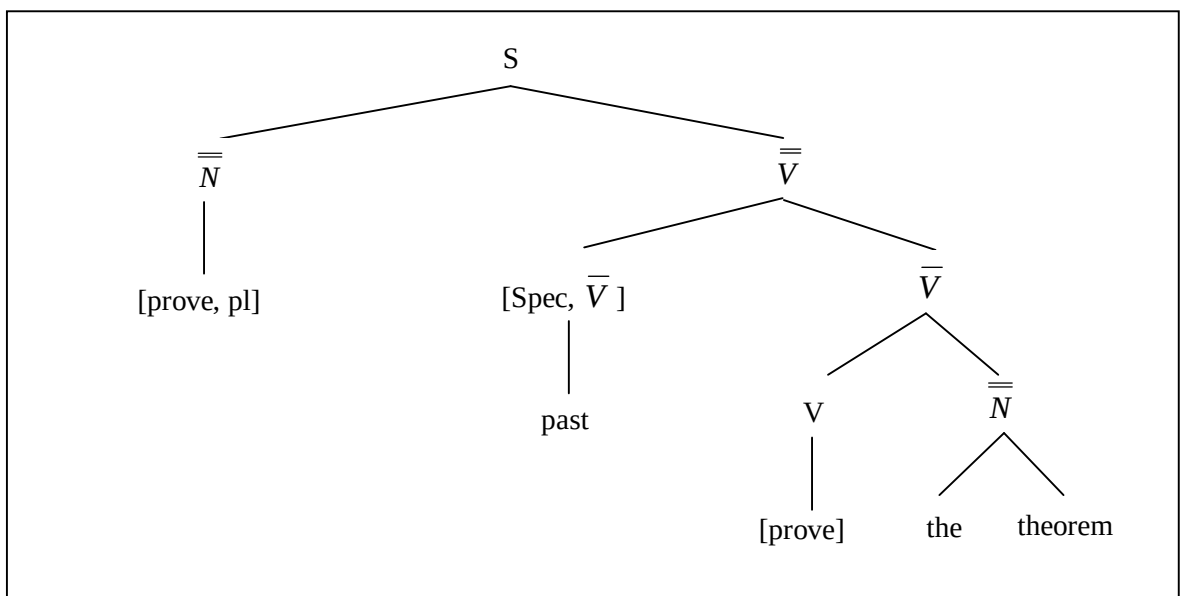


Figure 2.3: “John proved the theorem”

Chomsky's proposal can be represented visually using the schema below:

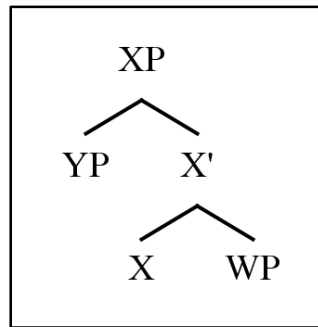


Figure 2.4: X-bar schema based on Chomsky's (1970) proposal

Figure 2.4 is the canonic schema used in references of syntax. It is to be noted that this there-level X-bar schema only shows three structural relations: specifier, head, and complement. Adjunct is clearly not included within the schema.

For better explanation purpose, discussion in this research report will be based on the following four-level X-bar schema:

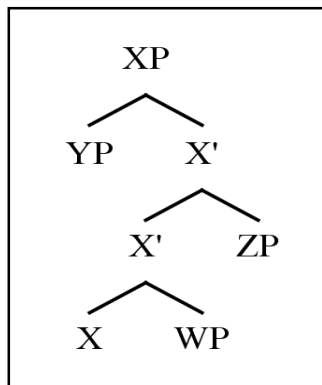


Figure 2.5: X-bar schema

The difference between Figure 2.4 and Figure 2.5 is the extra X' ZP in Figure 2.5.

Figure 2.5 shows the graphical representation of the phrase structure rules:

- (23) specifier rule : $XP \rightarrow (YP) X'$
- (24) adjunct rule : $X' \rightarrow X' (ZP)$
- (25) complement rule : $X' \rightarrow X (WP)$

According to Radford (1988: 184), the adjunct rule is optional and “we can choose to apply the rule, or not apply it, as we wish”. Applying the family metaphor introduced in section 2.1, the following three relations are captured:

(26) specifier (YP) = daughter of XP; sister of X'

(27) adjunct (ZP) = daughter of X'; sister of X'

(28) complement (WP) = daughter of X'; sister of X

X is regarded as the head of the schema; the specifier, complement and adjunct⁵ are the three important properties in the schema; they function as the modifier of the head X. Each of them must be a phrase itself; these phrases are optional and it is indicated by the brackets in the phrase structure rules. From the schema, it is obvious that the specifier occupies the topmost position; comparing the adjunct and complement, the former occupies a higher position in the schema while the latter is in a lower position; it also shows that the complement is adjacent to X while adjunct is farther away.

While the specifier, complement and adjuncts are optional, X is obligatory. It is the most prominent syntactic object in the schema and it is the head of the XP; it is treated as a variable where it can be any of the syntactic categories; for example, N, V, A, or P; thus, X' can be N', V', A' or P'; while XP is the umbrella term for the phrases: NP, VP, AP, or PP. X' and XP are the projection of the head X; X itself is a minimal projection, X' is an intermediate projection of X, while XP is a maximal projection of X.

All the information mentioned can be summarized in the following table:

⁵ Adger (2002) treats adjuncts as sisters of XP; thus, he uses a different X-bar schema in his book (page 88).

Table 2.1: Summary of discussion 1

Variable	Terminology	Phrase structure rule	Structural relation	Schema
YP	specifier	$XP \rightarrow (YP) X'$	daughter of XP; sister of X'	$\begin{array}{c} XP \\ \swarrow \quad \searrow \\ YP \quad X' \end{array}$
ZP	adjunct	$X' \rightarrow X' (ZP)$	daughter of X'; sister of X'	$\begin{array}{c} X' \\ \swarrow \quad \searrow \\ X' \quad ZP \end{array}$
WP	complement	$X' \rightarrow X (WP)$	daughter of X'; sister of X	$\begin{array}{c} X' \\ \swarrow \quad \searrow \\ X \quad WP \end{array}$

In fact, depending on the languages and the head parameter (Chomsky, 1981) of these languages, (whether the languages are head-initial or head-final), the specifier, adjunct and complement will appear on different sides of the head. For English, a head-initial language, the specifier is on the left of the head, the complement on the right; while for adjunct, it can appear on either left or right of the head; and it can also appear on both sides of the head at the same time (exemplified by Figure 1.6 and Figure 1.7).

As for head-final languages (for example, Japanese, Korean), their specifier, complement and adjunct will have the opposite positions from that of English; thus, the information in Table 2.1 fails to capture the correct position of the syntactic elements in these languages. These head-final languages share the same phrase structure rules below:

(29) specifier rule : $XP \rightarrow X' (YP)$

(30) adjunct rule : $X' \rightarrow (ZP) X'$

(31) complement rule : $X' \rightarrow (WP) X$

However, they still have the same structural relations with that of head-initial languages:

(32) specifier (YP) = daughter of XP; sister of X'

(33) adjunct (ZP) = daughter of X'; sister of X'

(34) complement (WP) = daughter of X', sister of X

Thus, for head-final languages, they have the following properties:

Table 2.2: Summary of discussion 2

Variable	Terminology	Phrase structure rule	Structural relation	Schema
YP	specifier	$XP \rightarrow X' (YP)$	daughter of XP; sister of X'	$\begin{array}{c} XP \\ \swarrow \quad \searrow \\ X' \quad YP \end{array}$
ZP	adjunct	$X' \rightarrow (ZP) X'$	daughter of X'; sister of X'	$\begin{array}{c} X' \\ \swarrow \quad \searrow \\ ZP \quad X' \end{array}$
WP	complement	$X' \rightarrow (WP) X$	daughter of X', sister of X	$\begin{array}{c} X' \\ \swarrow \quad \searrow \\ WP \quad X \end{array}$

In fact, the two different versions of phrase structure rules for head-initial and head-final languages can be generalized as follow:

(35) specifier rule : $XP \rightarrow (YP) X'$ or $XP \rightarrow X' (YP)$

(36) adjunct rule : $X' \rightarrow X' (ZP)$ or $X' \rightarrow (ZP) X'$

(37) complement rule : $X' \rightarrow X (WP)$ or $X' \rightarrow (WP) X$

The new set of phrase structure rules can now be used to capture the different syntactic structures of both head-initial and head-final languages.

2.2.1 Properties of X-bar theory

Based on the X-bar schema in Figure 2.5, it is possible to generate four different tree diagrams according to their syntactic category:

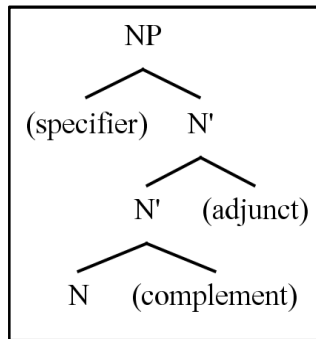


Figure 2.6: NP

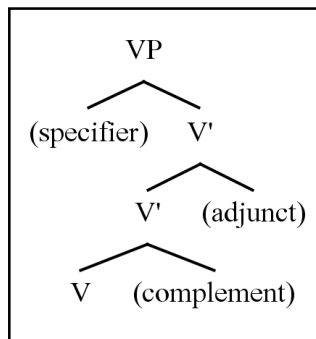


Figure 2.7: VP

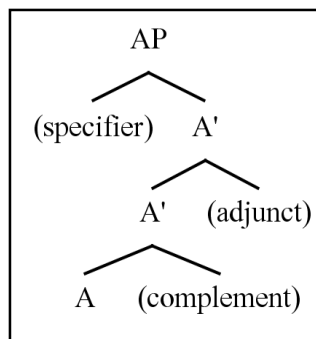


Figure 2.8: AP

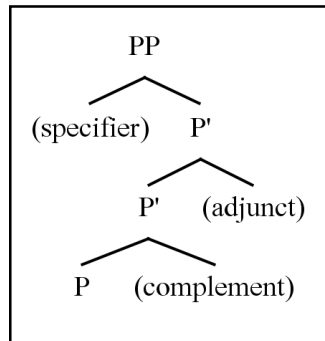


Figure 2.9: PP

If a closer examination is given to the relations for complement and adjunct, one will find that: there will be only one complement in a tree but it is possible to generate more than one adjunct in a diagram, for example:

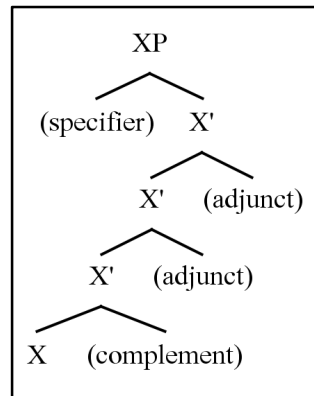


Figure 2.10: Adjuncts in XP

Figure 2.10 shows that as long as an adjunct is a daughter of X' and a sister of X', an unlimited number of adjuncts can be adjoined within the XP; this shows that adjunction is recursive; for example, the NP below:

- (38) [_N book] [_{PP} of linguistics] [_{PP} with good comments] [_{PP} from the lecturers]
 [_{PP} in University of Malaya]

has the following internal structure:

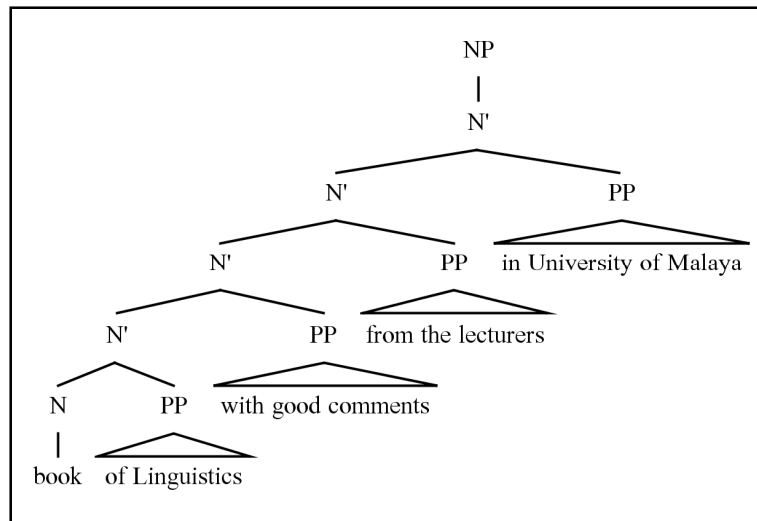


Figure 2.11: Adjuncts in NP

Figure 2.11 shows the adjunction on the right of the head N ‘book’. In English, adjuncts can also be adjoined to the left of a head; for example, the APs below:

(39) [AP small] [AP fuzzy] [AP white] [N rabbit]

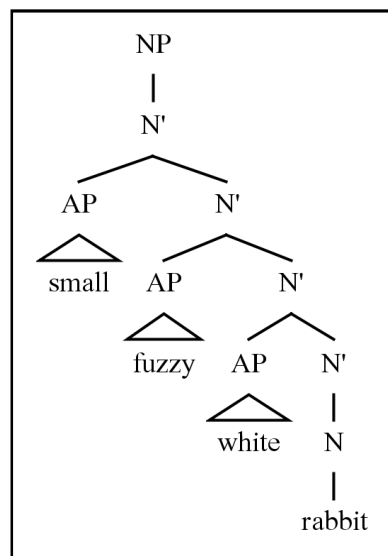


Figure 2.12: Adjuncts in NP

Apart from that, the adjuncts can be reordered as long as they are a daughter of X' and a sister of X'; however, a complement cannot be reordered at

all as it must always be a daughter of X' and a sister of X. An example for the reordering of adjuncts is shown below:

(40) [_N book] [_{PP} of linguistics] [_{PP} in University of Malaya] [_{PP} with good comments] [_{PP} from the lecturers]

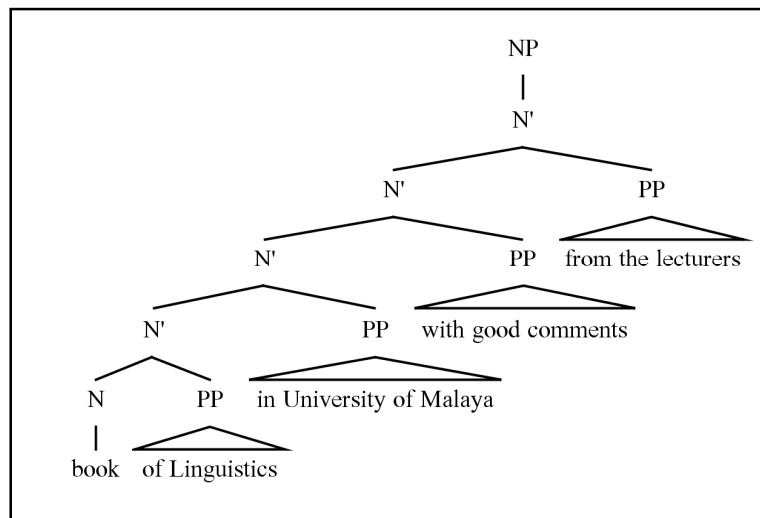


Figure 2.13: Reordering of adjuncts

Figure 2.13 above shows that all the adjuncts are on the right of the head. However, based on the same relation as long as an adjunct is a daughter to an X' and a sister to X', the same adjunct can also appear on the left of a head; for example, for the VP [_V kick] [_{DP} the ball], it can have the adjunct 'quickly' on either left or right of the head V 'kick' as shown by (41) and (42) below and their internal structures in the Figure 2.14 and Figure 2.15 below respectively:

(41) [_{AdvP} quickly] [_V kick] [_{DP} the ball]

(42) [_V kick] [_{DP} the ball] [_{AdvP} quickly]

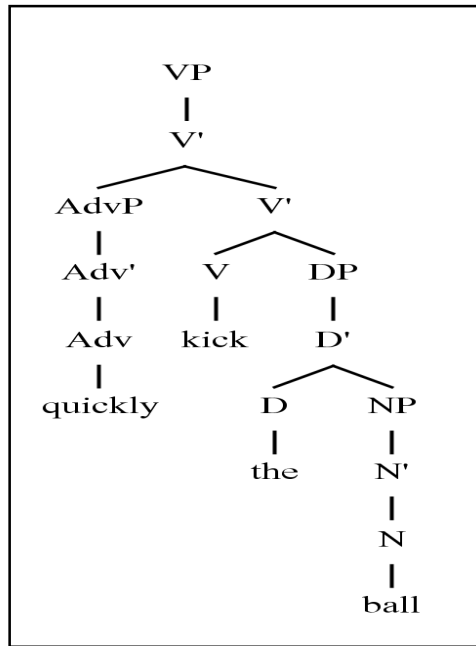


Figure 2.14: [AdvP quickly] [V' kick the ball]

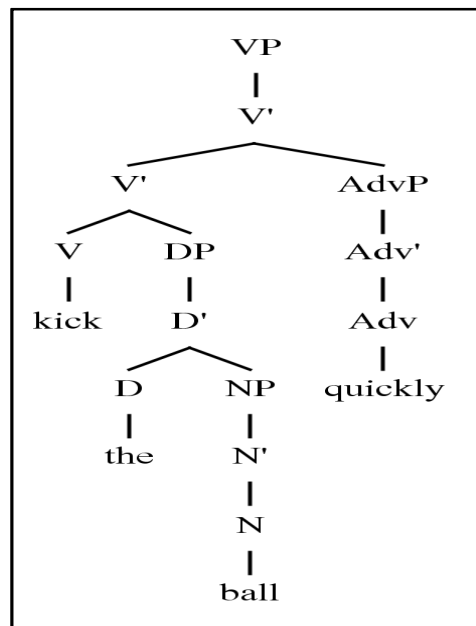


Figure 2.15: [V' kick the ball] [AdvP quickly]

And, it is also possible to have adjuncts on both sides of the head; for example, the NP:

(43) [AP dangerous] [N dog] [PP in the park]:

In the phrase, the head N “dog” has two adjuncts, the AP ‘dangerous’ and PP ‘in the park’. The former is on the left of the head N ‘dog’ while the latter is on the right. When there are two adjuncts, either one can be adjoined first. The following tree diagram shows the internal structure of the NP when the PP is adjoined first (Figure 1.5 is repeated for convenience as Figure 2.16 below):

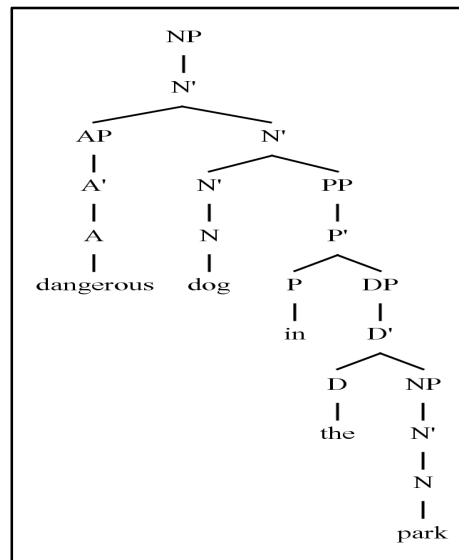


Figure 2.16: [AP dangerous] [N' dog in the park]

In Figure 2.16, the NP is treed in such a way to give the meaning: there is a dog in the park and the dog is dangerous (not the cute dog in the park or the dirty dog in the park).

When it is the AP that is adjoined first, it can be represented by the following tree diagram (Figure 1.6 is repeated for convenience as Figure 2.17 below):

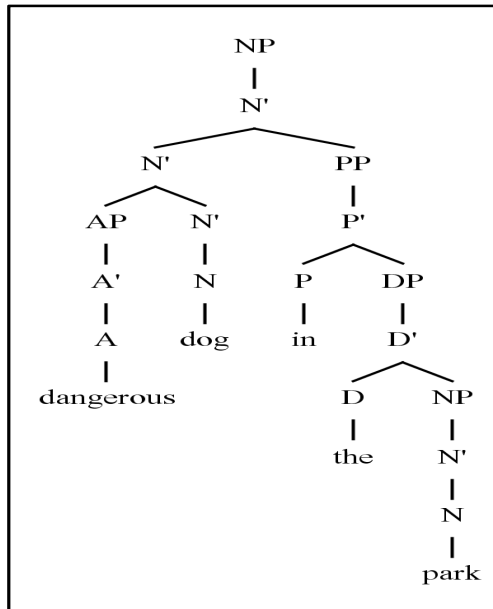


Figure 2.17: $[_{N'} \text{ dangerous dog}] [_{PP} \text{ in the park}]$

The NP is treed in such a way to give the meaning: there is a dangerous dog and the dog is in the park (not the dangerous dog in the garden or the dangerous dog in the street).

Thus, based on Figure 2.16 and Figure 2.17, it can be concluded that either one of the adjuncts can be adjoined first depending on the intended meaning.

2.2.2 Complement and adjunct in an XP

The following section will discuss the complement and adjunct within the four lexical categories (N, V, A, P) by showing their surface and internal structures.

2.2.2.1 NP: complement and adjuncts

Given the following three NPs:

(44) $[_{N} \text{ book}] [_{PP} \text{ of poems}]$

(45) [_N book] [_{PP} with his signature]

(46) [_N book] [_{PP} of poems] [_{PP} with his signature]

For (44) and (45), the head N ‘book’ is followed by a PP. Both have the same surface structure; however, both PPs have different relation with the head N ‘book’. The relations can be shown by showing the internal structure of each of the phrases below:

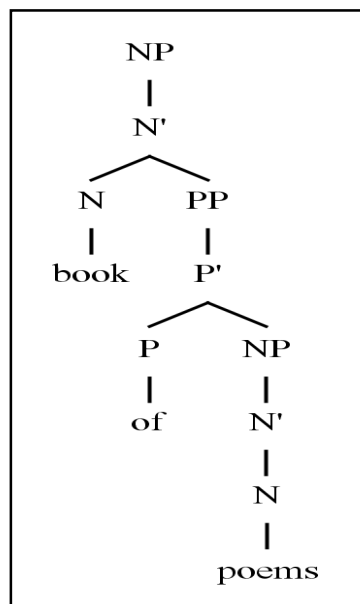


Figure 2.18: [_N book] [_{PP} of poems]

In Figure 2.18, the PP ‘of poems’ is the daughter of N' and sister of N; thus, it is the complement of the head N ‘book’; it is used to complement the meaning of ‘book’.

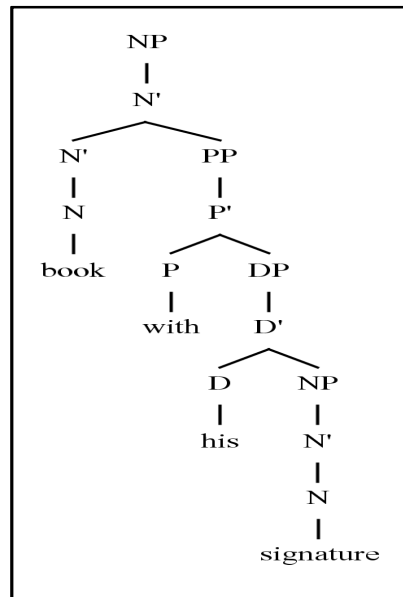


Figure 2.19: [N book] [PP with his signature]

As for Figure 2.19, the PP ‘with his signature’ is the daughter of N’ and sister of N’; thus, it is the adjunct of ‘book’ (N’ which immediately dominates N); it is used to modify the head N ‘book’.

Observant readers will find that there is one difference between the two diagrams. The extra N’ in Figure 2.19 has an important effect where it results in the different interpretation given to the PP ‘with his signature’, where the PP is regarded as an adjunct.

Since that the two PPs in Figure 2.18 and Figure 2.19 have different interpretations based on their adjunction to different nodes, they can be each merged and adjoined with the head N ‘book’ as shown below:

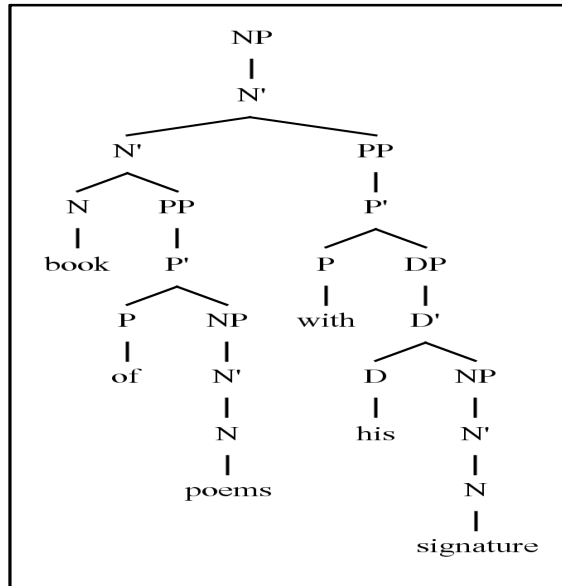


Figure 2.20: [N book] [PP of poems] [PP with his signature]

For this NP, both the PPs ‘of poems’ and ‘with his signature’ are used to modify the head N ‘book’; however, the first PP is obligatory to complete the meaning of ‘book’ while the second PP is optional.

The same merging and adjunction process can be applied within a VP.

2.2.2.2 VP: complement and adjuncts

Given the following three VPs:

(47) [V read] [DP the book]

(48) [V sleep] [PP in the library]

(49) [V read] [DP the book] [PP in the library]

(47) has the following internal structure:

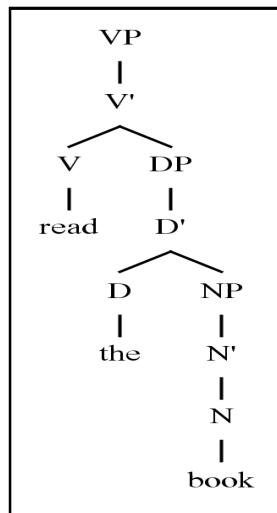


Figure 2.21: [_V read] [_{DP} the book]

In Figure 2.21, the DP ‘the book’ is the daughter of V’ and sister of V; thus, it is the complement of the head V read.

As for (48), it has the following internal structure:

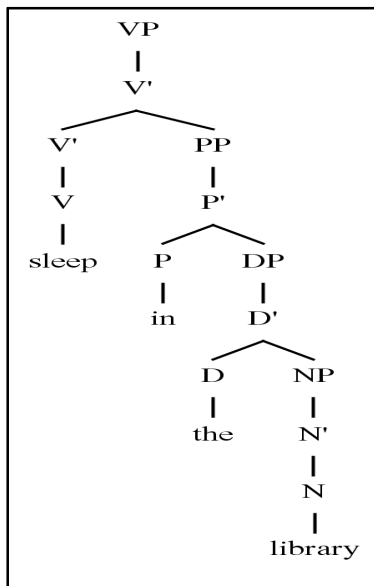


Figure 2.22: [_{V'} sleep] [_{PP} in the library]

In Figure 2.22, the PP ‘in the library’ is the daughter of V’ and sister of V’; thus, it is the adjunct of the head V ‘sleep’.

For (49), it has the following internal structure:

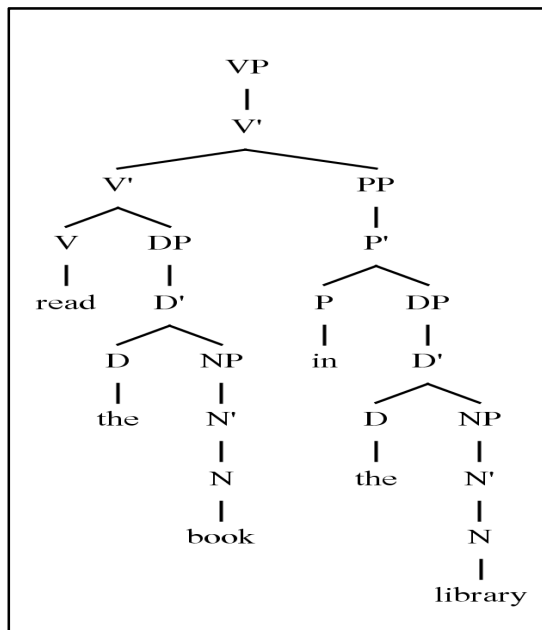


Figure 2.23: [v read] [DP the book] [PP in the library]

Figure 2.23 shows that, the head V ‘read’ has a complement DP ‘the book’ which is the daughter of V’ and the sister of V. The head V also has an adjunct PP ‘in the library’ which is the daughter of V’ and the sister of V’. Both DP and PP are used to modify the head V ‘read’.

However, apart from modifying the V ‘read’, the PP can also be used to modify the N ‘book’; this can be done by adjoining the PP to the intermediate projection of the N ‘book’. The maximal projection of the N ‘book’ is the complement of the D ‘the’. The adjunction produces the following internal structure:

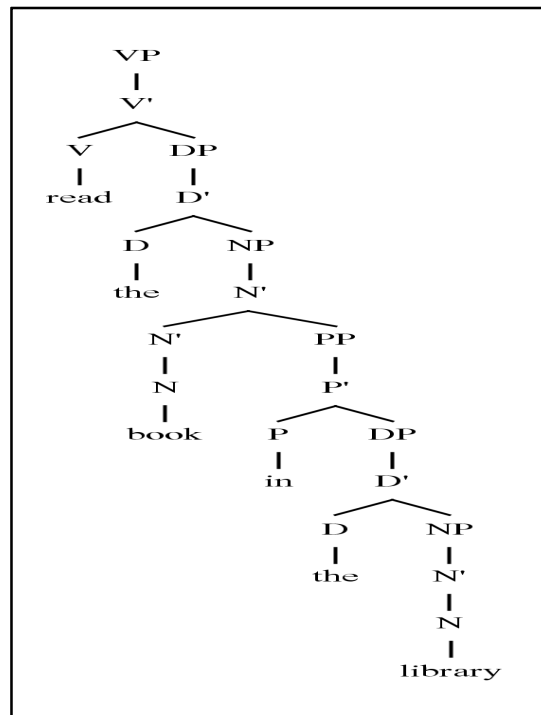


Figure 2.24: [_V read] [_D the] [_{N'} book in the library]

The two options of adjunction enable two internal structures of the same clause. For example, for the clause:

(50) He is [_V reading] the [_{NP} book] [_{PP} in the library].

When the PP ‘in the library’ is used to modify the V ‘reading’, it has the interpretation ‘the reading of book is happening in the library’; when the PP is used to modify the N ‘book’, the interpretation is ‘it is the book in the library that he is reading, not the one somewhere else’. The flexibility of adjoining a PP to an N’ or a V’ makes PP extraordinarily useful in structural ambiguity especially for comedians (Oaks, 2010).

An ambiguous clause has more than one interpretation or reading. Ambiguity happens when lexical items in the clause are merged or adjoined together in different ways and because of this, it enables the formation of different structures with different interpretations. In English,

prepositional phrase is a very productive source of syntactic ambiguity (Wasow, Perfors & Beaver, 2005). A syntactic tree diagram is a useful tool to disambiguate the ambiguity; this is done by representing the different internal structures of the clause and showing the merging or adjunction of lexical items into different constituents. Adjunct is adjoined to an X'; those who are aware of this concept will be able to disambiguate structural ambiguity clauses with different tree diagrams; for example, the following time-worn ambiguous clause:

(51) He saw the man with a telescope.

It has two interpretations; we can get the interpretations by paraphrasing the clause to:

(52) He used a telescope to see the man.

(53) He saw a man who had a telescope with him.

The different interpretations of (51) can be captured by showing the internal structures of the clause using two syntactic tree diagrams.

For interpretation (52), the PP 'with a telescope' is an adjunct; it is used to modify the V 'saw', thus describing how he saw the man. In order to get this interpretation, a tree diagram should show that the PP is adjoined to the V'; thus, the tree diagram will look like the following:

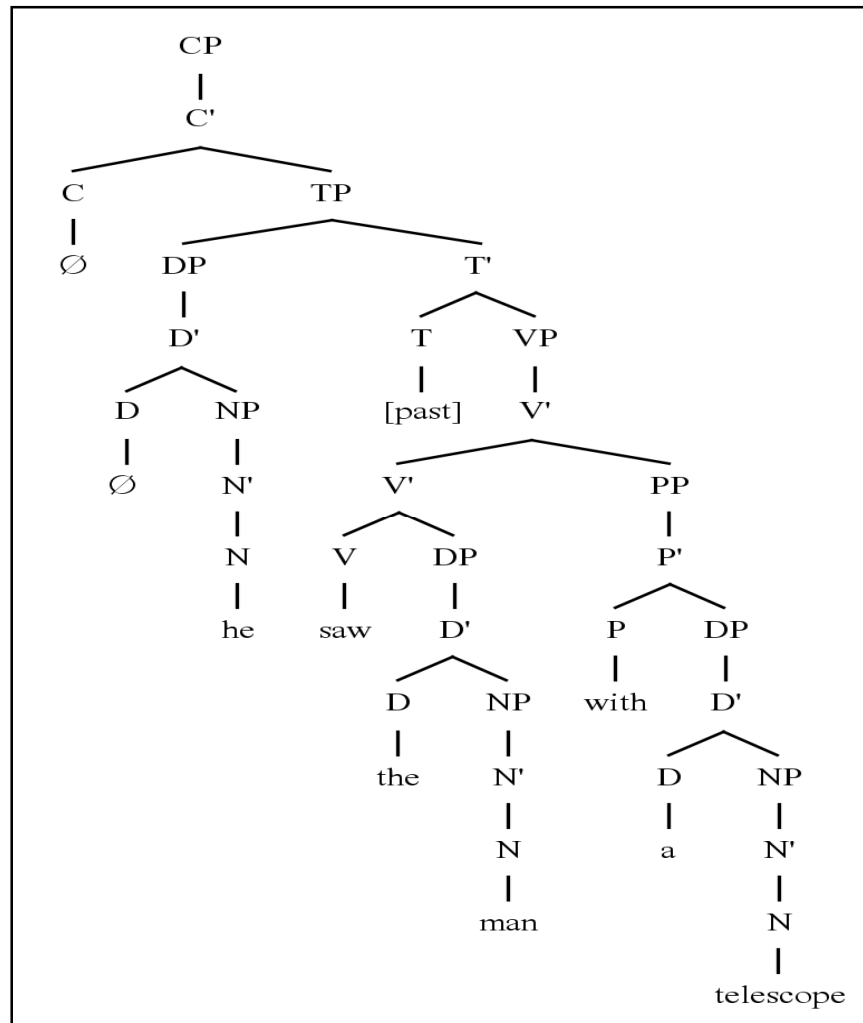


Figure 2.25: "He used a telescope to see the man"

For interpretation (53), the PP 'with a telescope' is the adjunct to the N 'man', it is used to specify which man he saw. In order to get this interpretation, a tree diagram should show that the PP is adjoined as the adjunct of N; thus, the tree diagram will look like the following:

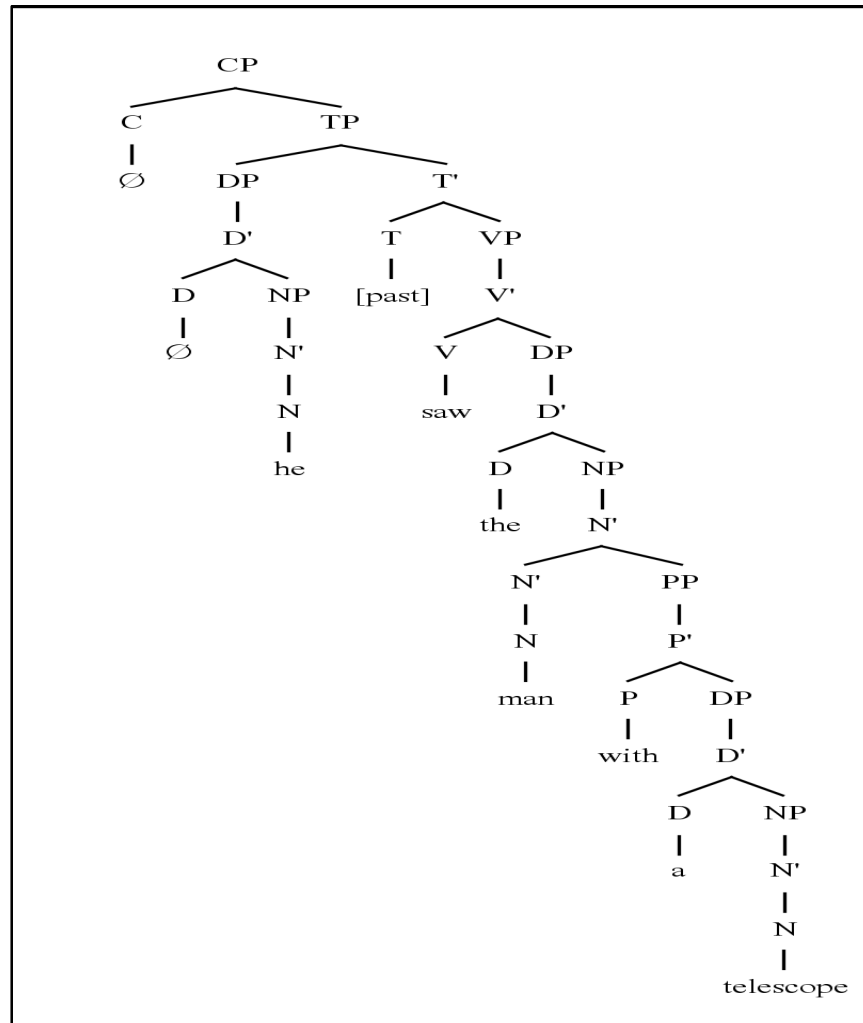


Figure 2.26: "He saw a man who had a telescope with him"

2.2.2.3 AP: complement and adjuncts

Just like the NP and VP shown in the previous section, an AP can also be followed by a complement or a complement and adjunct, or just an adjunct; for examples:

(54) [_A afraid] [_{PP} of spiders]

(55) [_A happy] [_{PP} with the service]

(56) [_A afraid] [_{PP} of spiders] [_{PP} without exception]

For (54), it has the following internal structure:

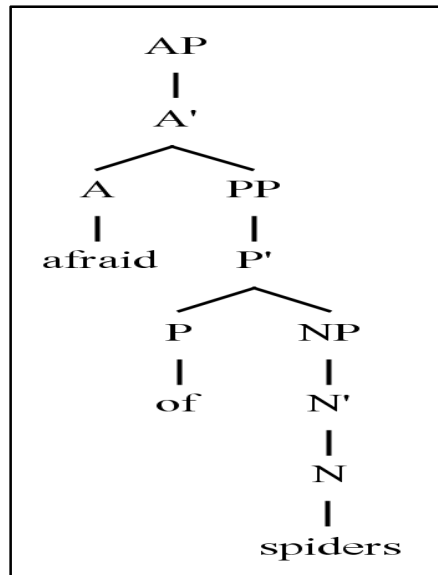


Figure 2.27: [A afraid] [PP of spiders]

Figure 2.27 shows that the PP 'of spiders' is the daughter of A' and the sister of A; thus, it is the complement of A 'afraid'.

For (55), it has the following internal structure:

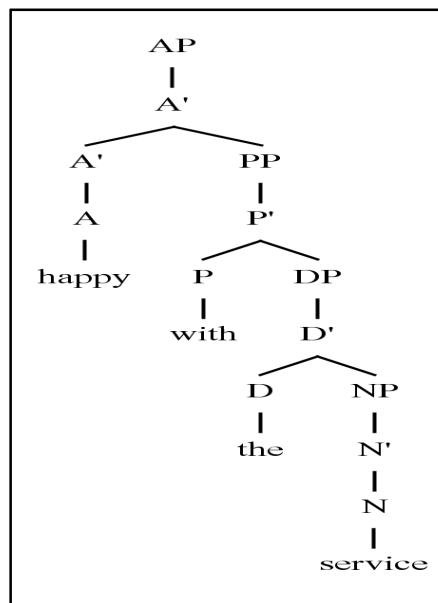


Figure 2.28: [A happy] [PP with the service]

Figure 2.28 shows that the PP ‘with the service’ is the daughter of A’ and the sister of A’; thus, it is the adjunct of A ‘happy’.

As for (56), the head A ‘afraid’ is followed by two PPs; its internal structure is shown with the following tree diagram:

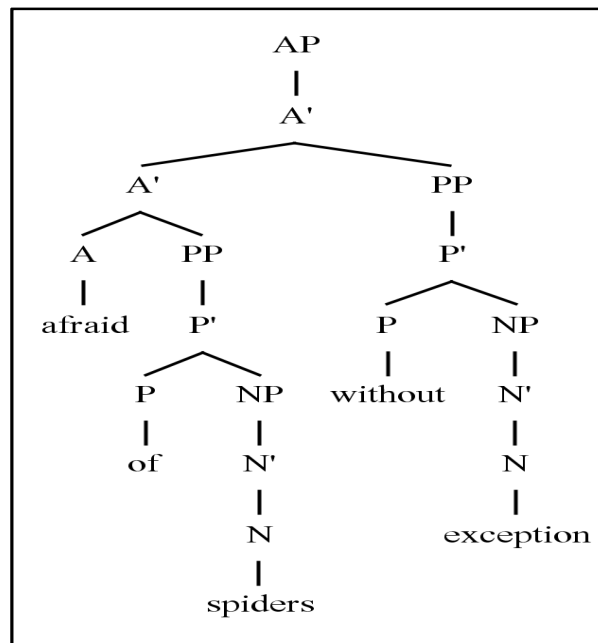


Figure 2.29: [A afraid] [PP of spiders] [PP without exception]

Figure 2.29 shows that the PP ‘without exception’ is the daughter of A’ and the sister of A’; thus, it is an adjunct.

2.2.2.4 PP: complement and adjuncts

PP has the same process of merging and adjunction. Given the following two PPs:

(57) [P in] [NP love]

(58) [P in] [NP love] [PP with the woman]

The NP ‘love’ in (57) is merged with the head P ‘in’; the internal structure is shown in the following tree diagram:

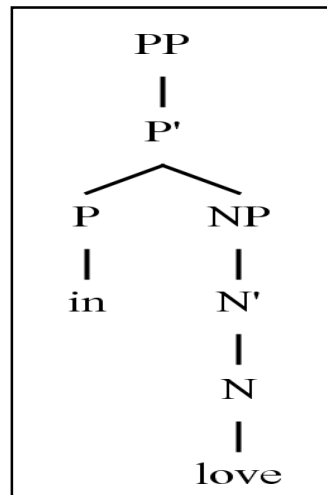


Figure 2.30: [P in] [NP love]

In Figure 2.30, the NP ‘love’ is the daughter of P’ and sister of P; it is the complement of the P ‘in’.

As for (58), the merging of the NP ‘love’ and the adjunction of the PP ‘with the woman’ are shown in the following tree diagram:

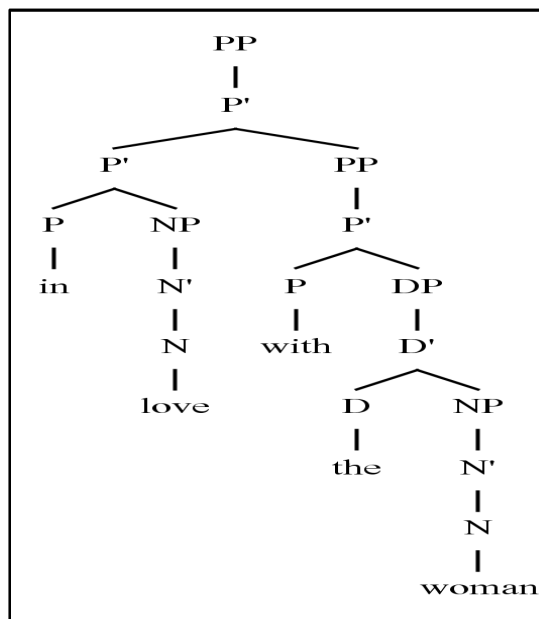


Figure 2.31: [PP in love] [PP with the woman]

In Figure 2.31, the PP ‘with the woman’ is the daughter of P’ and sister of P’; it is the adjunct of P ‘in’.

After looking at the complement and adjunct for each different XPs in English, a summary of the difference between the two can be captured in the following table:

Table 2.3: Differences between complement and adjunct in English

Difference	complement	adjuncts
Structural relation	Sister of X	Sister of X’
Position	On the right of the head; lower in the tree diagram; adjacent to the head	Either left or right of the head, or both; higher in the tree diagram; a distance away from the head
Recursion allowed?	No. There can be only one complement as there is only one X	Yes. There can be more than one adjunct as long as an adjunct is the daughter of X’ and sister of X’.
Reordering	Can’t be reordered with an adjunct	Can be reordered with another adjunct(s)
Option of merging / adjunction	Always merged to the head first	Adjunction can be completed only after the merging of a head and its complement

2.3 Major references

The two major references used by the students of syntax are reviewed here. Two main things will be examined: (i) X-bar theory, (ii) tree diagram drawing.

The first reference is *An Introduction to Language* by Fromkin, Rodman, & Hyams (2011). Syntax is covered in *Chapter 2: The sentence patterns of language*. The chapter is claimed to have the “introductory spirit”. It has been “heavily rewritten for increased clarity”; therefore, readers are provided with “a minimum of formalisms and a maximum of insightful examples and explanations” (xiv).

X-bar theory is introduced by mentioning that all XPs have three levels of structure; it is then followed by the presentation of the canonic X-bar schema; the notions ‘specifier’, ‘head’ and ‘complement’ are briefly introduced. However, no phrase structure rules and structural relations associated with the X-bar theory are given. There is also no mention about ‘minimal projection’, ‘intermediate projection’ and ‘maximal projection’. It is noted however that ‘N-bar’ is used when explaining the sisterhood relation within an NP. Apart from these, there is also no mention about ‘adjunct’. Thus, readers are not clearly and explicitly exposed to the notion ‘adjunct’ and the difference between a complement and an adjunct; the function of an adjunct and the knowledge that an adjunct is always adjoined to an X’ to form a larger X’ is thus not obtained.

As for tree diagrams, readers are presented with a few tree diagrams in this chapter. However, the details within the diagrams are not shown as the authors adopt “the convention of using a triangle under a node when the content of a category is not crucial to the point under discussion” (105); it is further mentioned that the “X-bar conventions are not used in description of syntax except on the few occasions where the notation provides an insight into the syntax of the language” (107). Therefore, it can be concluded that readers are not provided with clarity and insightful examples about X-bar theory and detailed illustration of tree diagram drawing in this chapter.

However, there are three main points that readers have learned to assist their understanding about X-bar theory and tree diagram drawing. Firstly, there are three elements shown by the X-bar scheme: specifier, head, complement; secondly, a sentence has hierarchical organization; the internal structure of a sentence can be graphically presented using a tree diagram; an internal structure with a flat structure is therefore ill-formed; lastly, every word within a sentence has a label and the words are categorized

according to their grammatical categories. They learn about the notion ‘syntactic categories’ where N, V, A, P, Adv are categorized under the ‘lexical categories’ while D, T, C are ‘functional categories’. XP is a variable for NP, VP, AP, PP, DP, TP, CP.

The second reference is *An Introduction to English Sentence Structure* by Radford (2009). Readers are assumed to have some background knowledge about the X-bar theory. Radford does not mention the phrase ‘X-bar theory’ explicitly; he uses the phrase ‘bar notation’ which is associated with it. The book is written based on the Minimalism Program developed by Chomsky (1993, 1995, 1998). Under the Minimalist Program, the information about grammatical categories and the three levels of projections in a tree diagram are regarded as redundant; the theory of bare phrase structure (Chomsky, 1994) is thus proposed where a tree diagram should be unlabelled. However, Radford chooses the traditional diagramming approach with the reason it is still a widely used approach in contemporary work in the field while the “bare phrase structure is more of a leading idea than a fully developed theory and that it has not been widely adopted in descriptive work” (Radford, 2009: 66).

The grammatical categories are explained with examples in the book. When discussing tree diagrams, the notions ‘specifier’, ‘complement’, and ‘adjunct’ are introduced. ‘Adjunct’ is stated as “an expression which serves to provide (optional) additional information about the time or place (or manner, or purpose etc.) of an activity or event” (8). The notion ‘adjunction’ is associated with ‘adjunct’; in the index of the book, the notion is defined as “a process by which one constituent is adjoined to another to form a larger constituent of the same type” (371). There are only two tree diagrams in the book where the adjunction operation is shown. The author exemplifies that the adverb ‘gently’ can be adjoined to either a light verb or a lexical verb depending on its position in a

sentence. The first tree diagram is used to exemplify how the adverb ‘gently’ is adjoined to a v’ (projection of the light verb ‘roll’) to project a larger v’; the diagram is:

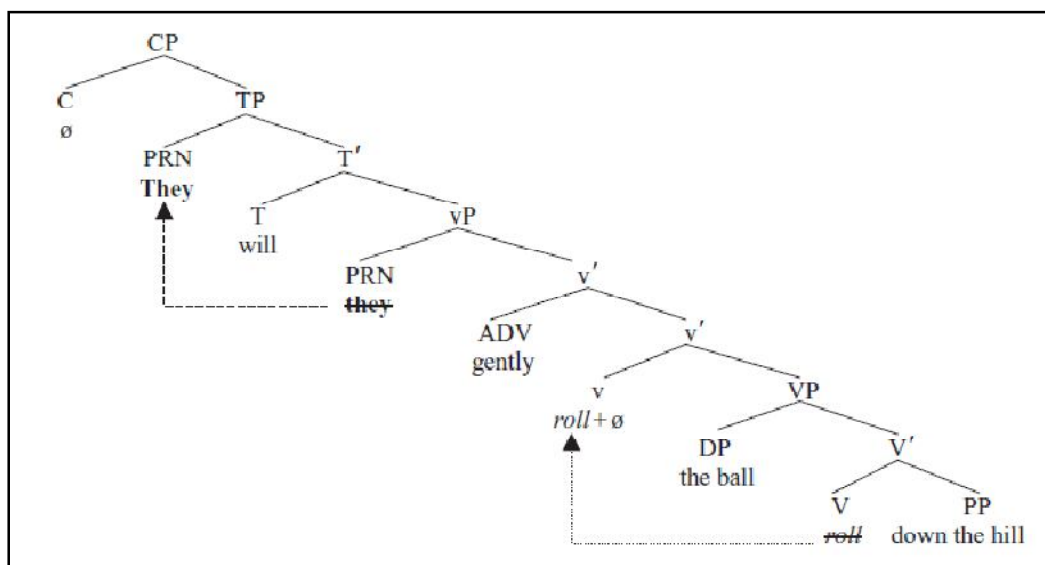


Figure 2.32: ‘gently’ is adjoined to a v’ to form a larger v’

The second diagram shows that the same adverb is adjoined to a V’ (projection of the lexical verb ‘roll’) to project a larger V’; the diagram is:

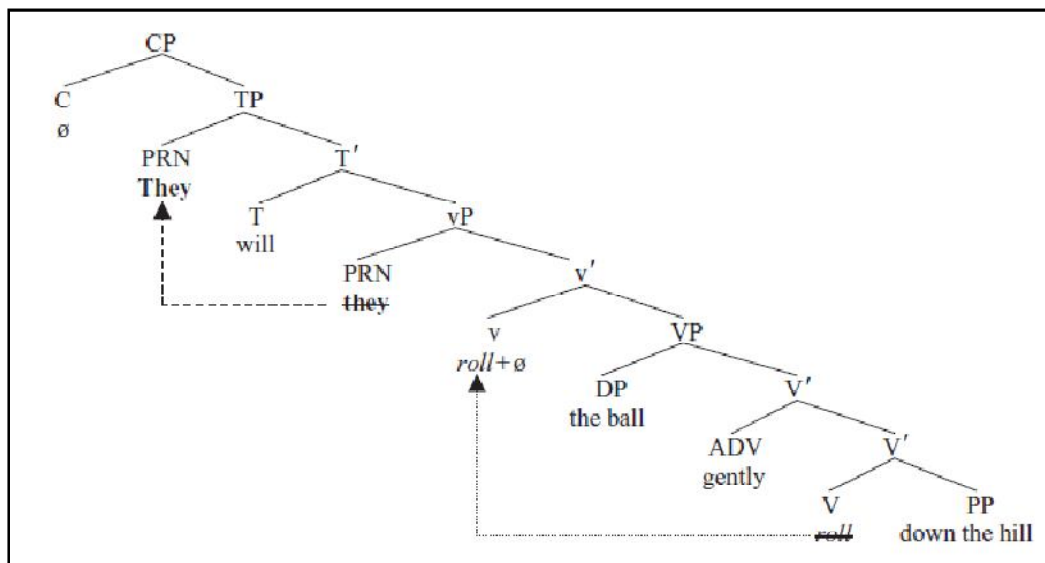


Figure 2.33: ‘gently’ is adjoined to a V’ to form a larger V’

These two tree diagrams are the only two that deal specifically with an adjunct; the book does not provide a section that discusses the differences between a complement and an adjunct.

There are a few important inputs from the book. Firstly, it is the information that by adjoining an adjunct, it extends a projection into a larger projection of the same type. Apart from that, the notions ‘minimal projection’, ‘intermediate projection’ and ‘maximal projections’ are introduced. There are also a multitude of tree diagrams presented in the book. There is explanation that a phrase and a sentence are derived using the binary merger operation in a bottom-up fashion. The operation is used consistently throughout the whole book when he explains how each sentence is derived. This is very beneficial to the readers as tree diagram drawing is explicitly taught in a step-by-step fashion starting from the very bottom of the hierarchy to the top with binary merger operation.

Therefore, reading the two major references students are exposed to the canonic X-bar schema; the phrase structure rules and structural relations associated with the X-bar theory; the labeling of lexical items which is syntactically-categorized according to either lexical category or functional category; the three important projections and the many examples of tree diagrams but only two tree diagrams that deal specifically with adjunction, and how they are constructed based on binary merger operation. The knowledge about X-bar theory and tree diagram drawing is complemented by the explicit teaching and learning during lectures.

2.4 Previous study

The research conducted by Qiang (2010) is the only one in the literature that discusses problems in tree diagram drawing. The researcher examines ten common errors in English major students' tree diagrams drawing. Data were collected from the researcher's own teaching experience and exam papers review. The problems identified and analyzed were from assertive, relative, interrogatives, and negatives clauses. The errors are:

(1) Ternary branching

Ternary branching fails to show the internal structure of a phrase or clause in terms of the semantic intimacy between the lexical items and their merging sequence. The researcher implies that students' errors are due to the lack of comment (on advantages and disadvantages) on binary and ternary branching in textbooks of syntax, and the influence of the use of ternary branching in earlier research in syntactic theory.

(2) Improper marking and representing of categories

It is pointed out that grammatical categories in syntax and pedagogical grammar are different. Students who are familiar with pedagogical grammar mark the grammatical categories differently (for example: mark a clause with 'S' instead of 'I') and incorrectly. Students are also found to have mislabelled the grammatical categories.

(3) Ill-formed structural hierarchy

Students are found to be unable to show the correct sisterhood relation between two nodes. This happens where two sisters are not merged in the same hierarchical level.

(4) Confused relationship between an X' and XP

Students do not understand the above-below relation between a maximal projection and intermediate projection; thus, they fail to label them correctly.

(5) Projection from incorrect heads

Students fail to identify the correct head and it causes the projection of the wrong head to a maximal projection.

(6) No separation of inflectional morpheme from verb and/or prepositioning of Infl

Students are found to not separate inflectional morphemes from verbs; however, if they do so, the verb and the morpheme are presented in the wrong order where the morpheme follows the verb.

(7) Wrong sequence of merge in embedded phrases

Influence from pedagogical grammar again has its effect, this time on embedded phrases. For example, for the VP “vote against government plans”, “vote against” are merged first and it is then merged with the NP “government plans”.

(8) Misinterpretation of different clauses

Students are unable to differentiate a complement clause from a relative clause; as a result, they merge the two incorrectly to the wrong sister.

(9) Mistreatment of adverbials

Students adjoin adverbials with either an N or P when they should have adjoined them with a V (which has a head-modifier relation with adverbials).

(10) Misrepresentation of wh-questions with constituent movement

For interrogative clauses, students are unable to show how a wh-expression moves from its base position to [spec, CP].

The collection of the ill-formed tree diagrams among the beginning students of syntax show that attention should be given to tree diagram drawing. Understanding is the key to producing well-formed tree diagrams.

It is found that there are some problems in the article. It is stated that “tree diagram and labelled bracketing are widely employed to characterize *hierarchical* structures of phrases or sentences” (926). The sentence implies that both structure representations have the same look. “The tree diagram is a notational device which is entirely equivalent to labeled bracketing; although it looks differently, it provides the same information about the syntactic structure of a sentence” (Wekker & Haegeman, 1995: 6). In fact, both follow the same principles for tree drawing; however, the output is different. Only the tree diagram is used to show *hierarchical* structure; it graphically communicates the internal structure with the top-bottom fashion. It is incorrect to mention that labelled bracketing shows ‘*hierarchical* structure’; this is because labelled bracketing is used to show constituent structure in a linear format (Culicover, 1976), with left-right fashion.

Students are said to have difficulty in tree diagram drawing and there are no satisfactory references which have detailed elaboration on the matter. Three books about heads in grammatical theory are recommended: Zwicky (1985), Hudson (1987), Corbett et

al. (1993). Examining the publication years, these books are outdated; more recent publications should be recommended because of the development in syntactic theory. For example, DP hypothesis is proposed by Abney (1987) where D is the head of DP; in the contemporary work in syntax, the phrase ‘the ball’ is treated as a DP where ‘the’ is the head while ‘ball’ is its complement; the complement NP is headed by ‘ball’, the head in this NP. There are in fact many recent publications that could be suggested to the students. The more recent references of linguistics like *Syntax: A generative Introduction* (Carnie, 2006), *An Introduction to Language* (Fromkin, Rodman, & Hyams, 2011), and *An Introduction to English Sentence Analysis* by Radford (2009) are very useful for beginning students.

The researcher is also found to not have provided enough information in the article. “It is also possible that, not strictly speaking, there is no constituent movement in syntax of WH-questions. For example, in “Who taught you?”, the WH-word “who” is located at the beginning of both deep structure and surface structure, without any overt movement.” (932). The intended audience of the article may be beginning students of syntax but the author should have pointed out that in advanced syntax, the wh-word ‘who’ moves from its based position [spec, vP] to [spec, TP] and then to its final landing site on [spec, CP]. The extra information is useful for students who are interested with the topic and would like to pursue a higher level syntax and explore it further.

Apart from that, Qiang is also found to use an inaccurate term to refer to the bar notation. It is found on page 928 that the intermediate and maximal projections “are usually written like N’, N”, V’, V” with *quotation marks*”. The accurate term should be ‘prime’. It should also be pointed out that the so called X-bar was originally typeset as $\bar{X}$, where there is an X with an overbar; however, due to the typeset difficulty it is now an established convention to present it as X’, where there is an X with a prime.

From the students' diagrams (diagram 7; diagram 9) inserted in the article, it is discovered that students treat the adjunct 'next week' as if it is a complement. This is because the NP 'next week' is merged with the VP 'vote against plans'. While the researcher correctly points out that for diagram 9, the students are confused by the relation between an intermediate projection and maximal projection. He fails to explain the structural relation between the two nodes: the NP 'next week' is an adjunct and should be adjoined to the V' 'vote against plans'. Therefore, a closer examination is then given to the terms used by the researcher in the article and it is discovered that a term is not mentioned in the article: 'adjunct'. This shows that he is unaware of the difference between a complement and an adjunct as he uses the word "merge" to refer to both the merger and adjunction operations; this can be shown by the usage in the following sentences:

Table 2.4: Incorrect use of the term 'merge'

Page	Sentences with the incorrect use of 'merge'
928	The right practice is exchanging the positions of V' and VP in (9), with V; <i>merging with NP</i> , projecting into VP, a phrasal category.
931	(21) is wrong in that the NP "government plans" is directly <i>merged</i> with the adverbial "next week", which means that "next week" modifies "government plans".
933	... we merge "vote against government plans", then <i>merge</i> with the adverbial "next week" into VP, ...

Therefore, when the lecturer himself is not aware of the difference between complement and an adjunct and the different terms used to explain the merger and adjunction operations, the same phenomenon is thus predicted from the students and it shows in their tree diagrams.

Based on the reviews of the two major references and Qiang's (2010) study, it shows that adjunct is not given emphasis in discussion. An adjunct is always adjoined to an X', and it is the daughter of X' and sister of X'. It is a topic that should be explored because

the results will be practical and useful to both lecturers and students, especially those that have completed syntax courses. Due to limited exposure to adjunct, it is worth a study whether they are aware of the differences between a complement and an adjunct, and whether they have problems in tree diagram drawing when there is enough exposure to examples of tree diagrams. Adequate sensitivity to X-bar theory can help increase the effectiveness of students' learning experience. The theory must be sensitized to students of syntax if the results of the study show that the participants have no such sensitivity.

CHAPTER 3: METHODOLOGY

3.1 Research design

Qualitative methodology is employed in the study where a case study was conducted to examine the participants' cartographies. Detailed description is used to describe how the students actually drew tree diagrams based on X-bar theory, and whether they drew the diagrams correctly. Incorrect tree diagrams were categorized according to errors; the errors were analyzed and attached in the appendix for the readers' perusal.

3.2 Sampling

Purposive sampling is used for the study as a specific group of participants were examined. A total number of 19 students participated in the intended study. The participants are the postgraduate students in the Faculty of Languages and Linguistics, University of Malaya. The participants are enrolling in either the program Master of English as a Second Language (MESL) or Master of Linguistics. They are those who studied the course *TXGB 6303 Structure of English*; some of the students also studied *TXGA 6103 General Linguistics*.

TXGA 6103 General Linguistics is one of the core courses in the faculty where it provides general introduction to the sub-fields in linguistics. The reference used in the course was *An Introduction to Language* by Fromkin, Rodman & Hyams (2011). According to the authors, "except on the few occasions where notation provides an insight into the system of the language, X-bar conventions are not used in description" (2011: 107); thus, students are not always exposed to the X-bar conventions using the reference. *TXGB 6303 Structure of English* is an elective course and it deals specifically with the English

syntax. The reference used was *An Introduction to English Sentence Structure* by Radford (2009). Students had more exposure to X-bar theory when taking the course. These two courses ensure that the participants have been exposed to both the lexical categories (N, V, A, P) and functional categories (D, T, C) in English, X-bar theory, and specific instructions on tree diagram drawing in their lectures. This ensures that the participants have specific background knowledge on the theory and at the same time, practices in tree diagram drawing as they will be requested to participate in task performance with syntactic tree diagram drawing.

3.3 Instrument

An instrument was designed for data collection (see Appendix A). The instrument consists of phrases and clauses where the participants were required to tree their internal structures. A description of the content of the instrument is given below:

To answer research question 1.4.1, the participants were requested to diagram six phrases which have the same **X + adjunct₁ + adjunct₂** structure:

- i) N + adjunct₁ + adjunct₂
- ii) V + adjunct₁ + adjunct₂
- iii) A + adjunct₁ + adjunct₂

The six phrases are:

- i) [_N girl] [_{PP} in the room] [_{PP} with a broken heart] (Appendix A: Q1)
- ii) [_N donation] [_{PP} from the company] [_{PP} to the school] (Appendix A: Q3)
- iii) [_V walking] [_{PP} in the street] [_{PP} without his company] (Appendix A: Q4)
- iv) [_V dreaming] [_{PP} with a broken heart] [_{PP} about your future] (Appendix A: Q6)

- v) [A important] [PP for your health] [PP in the future] (Appendix A: Q7)
- vi) [A comfortable] [PP with the arrangement] [PP in the morning] (Appendix A: Q9)

Each head is followed by two adjuncts. If the participants do not know the difference between a complement and an adjunct, they will treat adjunct₁ as a complement and thus incorrectly merge it as the complement of the head.

In order to avoid the participants' guessing of the purpose of this question, three filler phrases were included. These fillers have the same **V + complement + adjunct** structure:

- i) [V wash] [DP the car] [PP with two men] (Appendix A: Q2)
- ii) [V drawing] [DP the trees] [PP without hesitation] (Appendix A: Q5)
- iii) [V go] [PP to the library] [PP at night] (Appendix A: Q8)

Ill-formed tree diagrams will be presented and described in the report later.

To answer research question 1.4.2, the participants were requested to diagram the following four ambiguous clauses:

- i) They are recording a discussion on gambling in the class. (Appendix A: Q10)
- ii) The linguistics students frequently buy books from Richard. (Appendix A: Q11)
- iii) Ladies will buy the expensive bag in the shop with all their money. (Appendix A: Q13)
- iv) The naughty boy was poking the spider in the class with a pencil. (Appendix A: Q14)

If the participants have the sensitivity of the difference between a complement and an adjunct, they should be able to identify the ambiguity and disambiguate it by adjoining an adjunct to an (i) V' and a (ii) N':

- i) They are [_{V'} recording a discussion on gambling] [_{PP} in the class].
- ii) They are recording a discussion on [_{N'} gambling] [_{PP} in the class].
- i) The linguistics students frequently [_{V'} buy books] [_{PP} from Richard].
- ii) The linguistics students frequently buy [_{N'} books] [_{PP} from Richard].
- i) Ladies will [_{V'} buy the expensive bag] [_{PP} in the shop] with all their money.
- ii) Ladies will buy the expensive [_{N'} bag] [_{PP} in the shop] with all their money.
- i) The naughty boy was [_{V'} poking the spider] [_{PP} in the classroom] with a pencil.
- ii) The naughty boy was poking the [_{N'} spider] [in the classroom] with a pencil.

To answer research question 1.4.3, the participants were required to diagram the following two clauses:

- i) The old man likes the small house in the village. (Appendix A: Q12)
- ii) The dangerous dog in the park is chasing the dirty cat. (Appendix A: Q15)

The head in each of the clauses are preceded and followed by an adjunct. Either one of the adjuncts could be adjoined first to give different interpretations of the clause:

- i) The old man likes the [_{N'} small house] [_{PP} in the village]
- ii) The old man likes the [_{AP} small] [_{N'} house in the village]
- i) The [_{N'} dangerous dog] in the park is chasing the dirty cat
- ii) The [_{AP} dangerous] [_{N'} dog in the park] is chasing the dirty cat

The four ambiguous clauses and the two clauses (a head is preceded and followed by an adjunct) discussed above are combined under Section B in the instrument. Ill-formed tree diagrams are described. The possible tree diagrams for the phrases and clauses in the instrument are attached as Appendix B.

3.4 Procedure

Firstly, the instrument was constructed. Secondly, it was then presented to and checked by Dr Rodney C. Jubilado, a lecturer who teaches the courses *TXGA 6103 General Linguistics* and *TXGB 6303 Structure of English*. Thirdly, the instrument was pilot tested on some students so that improvement could be made. These students are the six students who are currently studying the course *TXGB 6303 Structure of English*. No problems were detected with the phrases and clauses used in the instrument. Finally, I obtained the list of students who studied *TXGB 6303 Structure of English* and started contacting the participants so that I could make an appointment and collect data from them.

3.5 Data collection

An appointment was made with the participants so that they were gathered and their tree diagrams could be collected from the task performance designed. During data collection session, the instrument was distributed to the participants and they were required to draw their trees on A4 papers. It was explicitly mentioned to the participants that they must not use triangle to simplify the internal structure of the phrases or clauses. The source of data for the research is a corpus of tree diagrams produced.

3.6 Data analysis

3.6.1 Section A

There were nine tree diagrams to be examined (see Appendix A: Section A). This is to find out whether the participants managed to differentiate a complement from an adjunct. If they did, they should have performed the three steps below:

(i) project an X to an X'

(ii) treat adjunct₁ as the adjunct of X and adjoin it to the X' to project a first X'

(iii) adjoin adjunct₂ to project a second X'

Otherwise, the participants who did not manage to differentiate a complement from an adjunct, they would have performed the three steps below:

(i) treat an X as the head

(ii) treat adjunct₁ as the complement of X and merge it to project a first X'

(iii) adjoin adjunct₂ to project a second X'

For each of the answers given by the participants, '√' was marked if they managed to adjoin adjunct₁ as an adjunct instead of a complement; otherwise, 'X' was marked. The answers collected are presented using Table 3.1 below:

Table 3.1: Participants' answers for Section A (complement and adjunct)

Participants	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
1									
2									
:									
19									

For participants who labelled adjunct₁ as a complement and an adjunct, the total number and its frequency are shown using Table 3.2 below:

Table 3.2: Summary of Table 3.1

Complement		Adjunct	
Number of participants	Frequency (%)	Number of participants	Frequency (%)

Research question 1.4.1 is answered based on Table 3.1, Table 3.2 and the tree diagrams produced.

3.6.2 Section B

There were four ambiguous clauses to be disambiguated by the participants (see Appendix A: Q10, Q11, Q13, Q14 in Section B). If participants are not aware of the ambiguity, they will only be able to produce four tree diagrams where they either adjoin an adjunct to a V' or an N'. However, if they are sensitive to the ambiguity, they will be able to generate two tree diagrams for each of the clauses where they manage to adjoin an adjunct to both the V' and an N', thus altogether they will be expected to produce eight tree diagrams.

For each of the tree diagrams produced, '✓' was marked depending on which X' was adjoined. The answers collected are presented using Table 3.3 below:

Table 3.3: Participants' answers for Section B (adjunctions to V' and N')

Participants	Q10		Q11		Q13		Q14	
	V'	N'	V'	N'	V'	N'	V'	N'
1								
2								
:								
19								

Research question 1.4.2 was answered based on Table 3.3 and the tree diagrams produced.

For research question 1.4.3, tree diagrams produced for Q12 and Q15 are examined. Depending on the sequence, ‘√’ was marked on the appropriate column in Table 4.4 below:

Table 3.4: Participants’ answers for Section B (adjuncts on both sides of a head)

	Q12		Q15	
Participants	Adjunct₁ + head	Head + adjunct₂	Adjunct₁ + head	Head + adjunct₂
1				
2				
:				
19				

Ill-formed tree diagrams produced by the participants thus helped me to make conclusion regarding the students’ understanding of X-bar theory and tree diagram drawing ability. Errors in the participants’ cartographies were determined simultaneous to the tree diagram analysis for Q1 to Q15.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Research question 1.4.1

How do students adjoin a head and an adjunct within a phrase? If they know the difference between a complement and an adjunct, they should be able to adjoin an adjunct to its head correctly to form an intermediate projection when given a phrase with the structure:

- (i) N + adjunct₁ + adjunct₂
- (ii) V + adjunct₁ + adjunct₂
- (iii) A + adjunct₁ + adjunct₂

Based on the data collected for Q1 – Q9, it is found that not even one of the participants is able to differentiate a complement from an adjunct. This is supported by the data collected and summarized by the Table 4.1 below:

Table 4.1: Participants' answers for Section A (complement and adjunct)

Participants	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
1	X	-	X	X	-	X	X	-	X
2	X	-	X	X	-	X	X	-	X
3	X	-	X	X	-	X	X	-	X
4	X	-	X	X	-	X	X	-	X
5	X	-	X	X	-	X	X	-	X
6	X	-	X	X	-	X	X	-	X
7	X	-	X	X	-	X	X	-	X
8	X	-	X	X	-	X	X	-	X
9	X	-	X	X	-	X	X	-	X
10	X	-	X	X	-	X	X	-	X
11	X	-	X	X	-	X	X	-	X
12	X	-	X	X	-	X	X	-	X
13	X	-	X	X	-	X	X	-	X
14	X	-	X	X	-	X	X	-	X
15	X	-	X	X	-	X	X	-	X
16	X	-	X	X	-	X	X	-	X
17	X	-	X	X	-	X	X	-	X
18	X	-	X	X	-	X	X	-	X
19	X	-	X	X	-	X	X	-	X

All the adjuncts in Q1, Q3, Q4, Q6, Q7, Q9 are treated as the complement where the adjuncts are merged with the head X in the phrases. Their tree diagrams are no difference from the ones produced for the fillers Q2, Q5 and Q8 (fillers) where they have the structure **V + complement + adjunct**. Table 4.1 can be further summarized by Table 4.2 below:

Table 4.2: Summary of Table 4.1

Complement		Adjunct	
Number of participants	Frequency (%)	Number of participants	Frequency (%)
19	100%	19	0%

The percentage clearly shows that the participants are not able to differentiate an adjunct from a complement. This is supported by the 100% treatment of the adjuncts as the complements. This is a very serious problem among the postgraduate students.

For Section A, the phrases for Q2, Q5, Q8 should have the following internal structure:

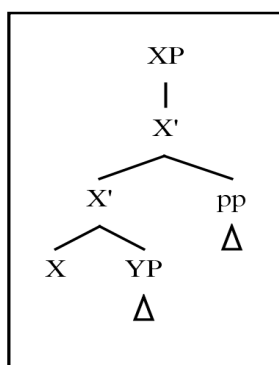


Figure 4.1: Internal structure for Q2, Q5, Q8

The tree diagram clearly shows that the head X is followed by a complement as the complement YP is the sister of X; daughter of X'.

As for Q1, Q3, Q4, Q6, Q7, Q9, their internal structure should have a significant difference as shown below (see Appendix B for the detailed tree diagrams):

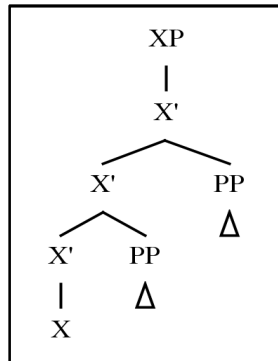


Figure 4.2: Internal structure for Q1, Q3, Q4, Q6, Q7, Q9

The two PPs in the schema are adjunct₁ (lower PP) and adjunct₂ (higher PP). The essential requirement to producing the correct tree is the lowest X' in the schema; this X' gives the lower PP the adjunct status based on the fact that the PP is the sister of X'; daughter of X'. The concept of adjunction is well applied here where adjunctions of both PPs help to extend the X' into another larger X'.

Based on the data collected, it is found that the participants produced five different varieties of internal structures. The first variety is shown by Figure 4.3 below:

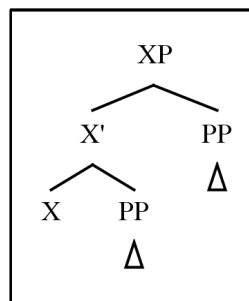


Figure 4.3: Variety 1

For this variety, this is how the internal structure is produced:

- (i) treat an X as the head
- (ii) treat adjunct₁ (lower PP) as the complement of X and merge it to project the X'
- (iii) adjoin adjunct₂ (higher PP) with the X' to form XP.

Based on the schema and procedures given above, the participants do not project the head X to become the X' first; thus the adjunct₁ will always be treated as the complement. Next, based on the phrase structure rule for an adjunct, an adjunct is always the sister of X'; daughter of X'; however, the participants treat the adjunct₂ as the sister of X' and daughter of XP, thus the phrase structure rule is not strictly followed when producing the internal structure for the relevant phrases.

For the rest of the varieties, the two adjuncts are dominated by a PP. This PP is then merged as the complement of the head X. The four varieties produced are shown below:

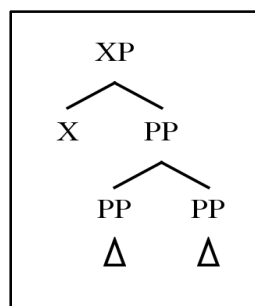


Figure 4.4: Variety 2

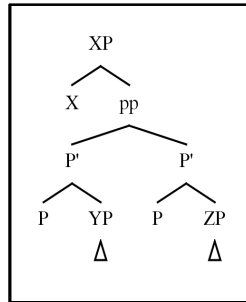


Figure 4.5: Variety 3

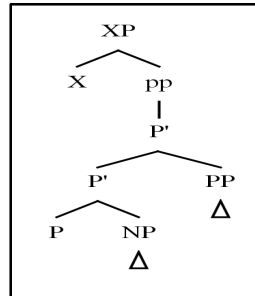


Figure 4.6: Variety 4

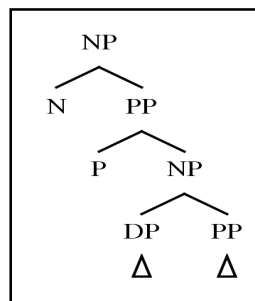


Figure 4.7: Variety 5

Figure 4.4 shows that the two lower PPs are merged and projected into another higher PP (for example, see Appendix C_Participant 7_Q6). However, while one knows that each PP is headed by a head P, it is not clear which of the two PPs is the head of the lower PP before the projection of the higher PP. The status for each of the two PPs is also not clear; for example, is the lower PP on the left intended to be treated as the specifier of the PP on its right? Or, is the lower PP on the right intended to be treated as the complement of the lower PP on its left?

Figure 4.5 shows that the higher PP immediately dominates the two P's (for example, see Appendix C_Participant 13_Q4). Thus, cartographically, the internal structure of Figure 4.5 shows that the higher PP is the projection of two head Ps. This clearly violates the Headedness Principle where “every nonterminal constituent in a syntactic structure is a projection of a head word” (Radford, 2009: 68).

Figure 4.6 can be given the interpretation that the P is projected into P' and it has a PP adjunct (for example, see Appendix C_Participant 1_Q3).

As for Figure 4.7, the internal structure was produced for Q1 ‘girl in the room with a broken heart’ (see Appendix C: Participant 16_Q1). The higher PP is treated as the complement of N because PP is the sister of N and daughter of NP; the lower PP ‘with a broken heart’ is treated as the complement of the DP ‘the room’ thus semantically it is anomalous unless ‘the room with heart a broken heart’ is read in a special context.

Examining the internal structures above, the tree diagrams are produced with the following procedures:

- (i) treat an X as the head
- (ii) treat adjunct₁ and adjunct₂ as one constituent and merge them as the complement of the head X to project the XP.

Thus, for Section A, the PP in each of the phrases for Q1, Q3, Q4, Q6, Q7, Q9 should be adjoined using the structure **X' + PP**; however, the corpus of cartographies collected shows that the participants consistently produce the structure **X + PP**. The second structure **X + PP** should only be used when the PP is given the complement status. The participants evidently do not understand the difference between the two structures and thus are unable to treat the PP as an adjunct. In fact, the same phenomenon is observed among the cartographies produced by all the six students whom the instrument was pilot tested.

Evidently, unable to differentiate an adjunct from a complement is a problem among the students of syntax.

4.2 Research question 1.4.2

How do students draw the tree diagrams when given ambiguous clauses? This question will examine whether the participants are sensitive to two options of adjunction in an ambiguous clause. If they have the sensitivity, they should be able to disambiguate ambiguous clauses by showing the different internal structures of the same clause using different tree diagrams.

For each of the Q10, Q11, Q13 and Q14 ambiguous clauses in Section B, the PP can be licensed in two different positions depending on the interpretations given to the clause, namely, whether the PP is adjoined to V' and used to modify the head V ; or, it is adjoined to the N' and used to modify the head N (see Appendix B for the detailed tree diagrams). The data collected are summarized with Table 4.3:

Table 4.3: Participants' answers for Section B (adjunctions to V' and N')

	Q10		Q11		Q13		Q14	
Participants	V'	N'	V'	N'	V'	N'	V'	N'
1	√		√		√		√	
2								
3								
4	√		√			√		
5		√		√		√		√
6								
7	√							
8								
9	√				√		√	
10	√		√		√		√	
11								
12					√			
13								
14	√		√		√		√	
15								
16						√		
17								
18								
19								
Total	6	1	4	1	5	3	4	1

For Q10, the PP 'in the class' can be adjoined to the V' to give the interpretation 'the recording was conducted in the class'; it can also be adjoined to N' to give the interpretation 'the act of gambling happened in the class'. Only six participants managed to produce the first adjunction with the first interpretation while only one participant produced the tree diagram for the second interpretation.

For Q11, the PP 'from Richard' can be adjoined to the V' to give the interpretation 'the act of buying books happens between the students and Richard who is the seller'; it can also be adjoined to N' to give the interpretation 'the books are written by Richard'. Only four students managed to produce the first adjunction with the first interpretation while only one is aware of the second possible adjunction. For this clause, the pilot tested

students outperform the participants in the study where all of them managed to adjoin the adjunct to the V' in the clause.

For Q13, there are three possible interpretations given. First, the PP 'in the shop' can be adjoined with the V' for the reading 'the act of buying will happen in the shop'; second, it can be adjoined to the N' 'expensive bag' for the reading 'there are expensive bag in the shop'; third, it can also be adjoined to the N' which immediately dominates the N 'bag' for the reading 'bag in the shop'. Table 4.3 shows that only five participants managed to produce the first adjunction while only three for the second adjunction.

For Q14, when the PP 'in the classroom' is adjoined to the V' 'poking in the spider', it gives the interpretation 'the act of poking the spider happened in the classroom'; however, when it is adjoined to the N' which immediately dominates the N 'spider' it gives the interpretation 'the spider is in the classroom'. Only four participants managed to identify the first interpretation and produce the adjunction to V' while only one participant managed to provide the second interpretation with the adjunction to N'.

Table 4.3 shows that only Participant 1, Participant 10 and Participant 14 managed to consistently adjoin the PP in each of the clause to the V'; however, the three of them failed to adjoin it to the N' and as a result, they only managed to produce altogether four tree diagram for the four clauses instead of eight. In contrast, Participant 5 managed to consistently adjoin the PP in each of the clause to the N' but failed to adjoin it to the V'; thus, only four tree diagrams are produced.

Comparing all the participants' performance between the adjunction of V' and N', they are obviously more sensitive to adjunction to V' than to N'. This is because there are altogether 19 adjunctions to V' while there are only altogether 6 adjunctions to N'. It seems

that adjunction to V' is the more natural interpretation. This indicates that adjunction to N' must be explicitly taught and emphasized when students of syntax are first exposed to the adjunction concept otherwise students may not be sensitive to the relations of the relevant constituents in the clause. For example, Participant 7 produced two tree diagrams for Q14 (see Appendix C: Participant 7_Q14). For these two tree diagrams, the PP 'in the class' was treated as the complement of the N 'spider'; the participant only managed to establish the relation between the spider and the class but was not sensitive enough to consider the relation between the boy and the class. The only difference between the two tree diagrams is how the two PPs 'in the class' and 'with a pencil' are merged by Participant 7.

To sum, Table 4.3 indicates that no participant is able to disambiguate the four ambiguous clauses with two different tree diagrams; this shows that the participants have extremely low sensitivity that all the clauses are ambiguous. This is supported by the data in Table 3.4 that they fail to notice the two possible adjunctions of the PP and thus are unable to produce possible tree diagrams for the two possible adjunctions to V' and N'.

However, examining the tree diagrams produced by all the participants again, it is found that even though the participants did not adjoin the PP to both V' and N' correctly to give the two possible interpretations to the clauses, there is one participant who did manage to identify the ambiguity but adjoin the relevant PP to the wrong node. Participant 14 managed to identify the ambiguity in Q11 and produce two tree diagrams for the clause (see Appendix C: Participant 14_Q11). For the second interpretation where the PP 'from Richard' should be adjoined to the N', this participant did not project the head N into N' and thus treated the PP as the complement of the N 'books'. Based on the tree diagram produced, it is clear that the participant indeed knows the ambiguity in the clause. The same situation happens to Q13 where the PP is again treated as the complement; however,

this PP is treated as the complement of the DP due to the wrong sequence of merge and adjunction within the NP. Among all the participants, Participant 14 is the only one who is sensitive enough to identify and attempt to show the two possible interpretations although only the ambiguities in Q11 and Q13 were identified.

Apart from that, there is one significant phenomenon detected among the tree diagrams produced for Q10, Q11, Q13 and Q14: the participants did not project the head N into N'; instead they treat the adjacent PP that follows the N as the complement of N; thus, another structure **N + PP** is adopted by the participants. This phenomenon can be shown with the Table 4.4:

Table 4.4: N + PP (where PP = complement of N)

Participants	Q10			Q11			Q13			Q14		
	V'	N'	N+PP	V'	N'	N+PP	V'	N'	N+PP	V'	N'	N+PP
1	√			√			√			√		
2			√			√			√			√
3			√			√			√			√
4	√			√				√				√
5		√			√			√			√	
6						√						
7	√					√			√			√
8												
9	√						√			√		
10	√			√			√			√		
11						√						
12							√					
13						√						
14	√			√		√	√			√		
15									√			√
16						√		√				
17												
18			√			√						
19			√			√			√			√
Total	6	1	4	4	1	10	5	3	5	4	1	6

The total number of participants who adopted the **N + PP** structure is considered high. This posts the question: Why did the participants fail to adjoin the PP to V' and N' but

majority of them tend to merge the PP as the complement of the head N? There are two answers: First, it shows that the participants did not treat the PP as the adjunct and as a result fail to project the head N into N' and adjoin the PP. Second, they tend to right associate the constituent with a preceding one where the constituent which is adjacent to the head is better associated with it, meaning since that the V in each of the clause is a distance away from the PP, the participants failed to establish the relation between the verb with the PP; the N is adjacent to the PP and it is thus much easier to establish the relation between them. This is similar to the Right Association proposed by Kimball (1973).

According to Oaks (2010: 294):

“Prepositions are a class of words whose contribution to structural ambiguity could easily be undervalued. Despite our heavy reliance on them to signal the relationships that exist among the different sentence elements, we hardly give their versatility any conscious attention”.

It seems that the PP in the clauses is not given enough attention by the participants; they are thus undervalued and not considered for another possible adjunction operation.

To sum, an important property of a tree diagram is it can be used to disambiguate ambiguous clauses; the participants' trees do not show that they are sensitive to the ambiguity; thus the result obtained from this section shows that there is a serious problem among the participants. Among the 19 participants, there is only one who is sensitive to ambiguity and managed to identify two ambiguous clauses among the four tested in the instrument. As a student of syntax who has been exposed to the theory and practice in X-bar theory and tree diagram drawing, one should have the sensitivity to the possible interpretations given to a clause; however, the data collected clearly show that they performed poorly in identifying the ambiguity in the clauses.

4.3 Research question 1.4.3

How do students draw the tree diagrams when there are two adjuncts on both sides of a head? This question will examine whether the students are sensitive to two possible sequences of adjunction and thus two possible ways to represent the internal structure of a clause.

For each of the Q12 and Q15 clauses in Section B, the head N has one adjunct on its left and right and this allows two options of adjunction depending on the interpretations given to the clause, namely, whether the adjunct on the left is adjoined to the head first or the adjunct on the right is adjoined first (see Appendix B for the detailed tree diagrams).

The data collected are summarized with Table 4.5:

Table 4.5: Participants' answers for Section B (adjuncts on both sides of a head)

Participants	Q12		Q15	
	Adjunct ₁ + head	Head + adjunct ₂	Adjunct ₁ + head	Head + adjunct ₂
1				
2				
3				
4				
5	√			
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				

Table 4.5 shows that only Participant 5 adjoined the adjunct with the head in Q12. It is interesting why the rest of the participants did not manage to produce the internal structure as would have been expected for both Q12 and Q15.

Examining the tree diagrams produced by all the participants, it is found that the structure **Adjunct₁ + head** and **Head + adjunct₂** are treated differently by the participants. The different interpretation given can be summarized using Table 4.6:

Table 4.6: Participants' treatment of the structure Adjunct₁+head & Head+adjunct₂

Participants	Q12		Q15	
	small + house	house + in the village	dangerous + dog	dog + in the park
1	Specifier + head		Specifier + head	
2		Head + complement	Head + complement	
3		Head + complement		Head + complement
4	Specifier + head		Specifier + head	
5		Head + complement		Head + complement
6	Specifier + head		Specifier + head	
7		Head + complement		Head + complement
8	Head + complement		Head + complement	
9	Head + complement			
10	Head + complement		Head + complement	
11	Head + complement		Head + complement	
12	Head + complement		Head + complement	
13	Head + complement		Head + complement	
14	Head + complement		Head + complement	
15		Head + complement		Head + complement
16	Head + complement			Head + complement
17				
18		Head + complement		Head + complement
19		Head + complement		Head + complement

The participants' selection of different constituents as the heads of the phrases allows them to give two different statuses to both 'small house' and 'dangerous dog' – they are either an AP or NP. Examining the structures in Table 4.6, it is obvious that the structure **Adjunct₁ + head** is missing in the participants' tree diagrams because some participants did not treat adjunct₁ as an adjunct but as the specifier of the head; thus it is the structure **Specifier + head** used by the participants when diagramming the internal structures for Q12 ('small' = specifier; 'house' = head; for example, see Appendix C_Participant 4_Q12) and Q15 ('dangerous' = specifier; 'dog' = head; for example, see Appendix C_Participant 1_Q15)

Apart from that, some participants treated 'small' in Q12 and 'dangerous' in Q15 as the head while 'house' in Q12 and 'dog' in Q15 as the complement; thus, the structure **Head + complement** is found in their tree diagrams (for examples, see Appendix C_Participant 8_Q12; Appendix C_Participant 10_Q15).

As for the structure **Head + adjunct₂**, it is also missing from all the participants' tree diagrams for Q12 and Q15 because they apparently used a completely different structure: **Head + complement**. 'House' in Q12 and 'dog' in Q15 are treated as the head while 'in the village' in Q12 and 'in the park' in Q15 are treated as the complement (for examples, see Appendix C_Participant 15_Q12; Appendix C_Participant 16_Q15). These findings strengthen the analysis for the result found for research question 1.4.1 where the participants are not sensitive to the difference between complement and an adjunct; an adjunct is treated as the complement; as a result, both complement and adjunct are diagrammed with the same internal structure.

At this point, observant readers will find that the internal structures for the two phrases below are different:

(59) 'the linguistics students' (in Q11)

(60) 'the old man' (in Q12)

Each of the phrases has the internal structure as shown in Figure 4.8 and Figure 4.9:

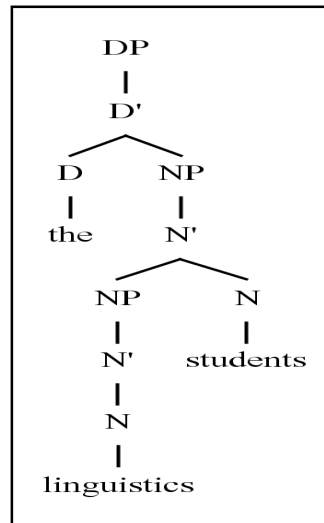


Figure 4.8: 'the linguistics students'

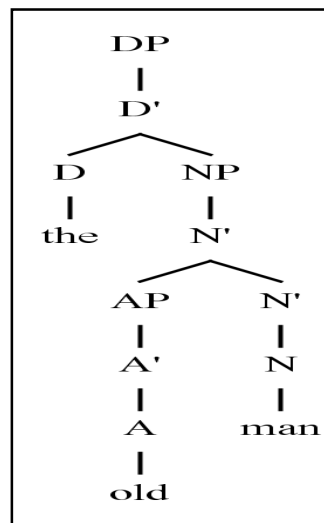


Figure 4.9: 'the old man'

The lexical items 'linguistics' and 'old' are different in terms of their grammatical categories and both are used to modify the following N in the phrases. However, the major difference between the two is, in Figure 4.8, 'students' has the status of N while in Figure 4.9, 'man' has the status of N'. Radford (1988: 204) states that "an N which lacks a

complement has the status of an N-bar dominating an N, whereas an N which has an overt complement has the status of N". This sets the stage for the NP 'linguistics' and the AP 'old' to have different status in the tree diagrams, namely, 'linguistics' is a complement while 'old' is an adjunct. The argument in support of the analysis that 'linguistics' is a complement while 'old' is an adjunct will be presented in the next paragraph.

First, 'linguistics' is the complement in 'the linguistics students' because it helps to complete the meaning of 'students'; it specifies a specific group of students. It can be paraphrased to become 'the students of linguistics' where 'the PP 'of linguistics' is the complement of 'students'. Second, the AP 'old' has an attributive function in 'the old man'; its function is to give additional information about the man; the phrase can always be expanded by adding more adjectives; for example, 'the dark old man', 'the tall dark old man'; thus it is the adjunct in the phrase. According to Radford (1988: 196-197), complements and adjuncts have different structural properties where:

(61) Adjuncts recursively expand N-bar into N-bar

(62) Complements expand N into N-bar

This sets another stage that the NP 'linguistics' is a complement as it is merged with the N 'students' to project into N'; while the AP 'old' is an adjunct as it is adjoined to the N' to project into another larger N'.

To sum, both 'linguistics' and 'old' are nominal premodifier; however, the difference between them is that 'linguistics' is a prenominal complement NP while 'old' is a prenominal adjunct NP. This results in the different internal structures in the two phrases.

After answering the three research questions above, this section will examine the problems in the participants' tree diagram drawing. Before drawing a cartographically viable tree, one should be able to first identify the constituents within a phrase or clause; then, break them down into its relevant constituents. Next, label each of the constituent according to its grammatical category and merge or adjoin the constituent adopting the binary merger operation and form larger constituents with the bottom up fashion (or top down fashion once they have enough training in tree diagram drawing and become experienced with the drawing skills) which shows the hierarchical structure of the phrase or clause. Examining the corpus of tree diagrams produced by the participants from Q1 to Q15, it is found that they have a few problems:

(1) Unable to distinguish both the merge and adjunction operations

The participants do not understand that the merge operation is used to form a phrase of a different type while the adjunction operation is used to extend the same phrase to a larger one. Both operations are treated by the participants as one to form a large constituent whether they are of the same type or not (for examples, compare Appendix C_Participant 3_Q5 & Appendix C_Participant 3_Q9).

(2) Improper marking and representing of categories

The word 'two' is commonly treated as the quantifier in tree diagram drawing. However, it is found that it is treated by some participants as A, N, or even T by certain participants (for examples, see Appendix C_Participant 9_Q2; Appendix C_Participant 8_Q2; Appendix C_Participant 6_Q2). Attention must be given to the correct label of 'two'.

There are also examples where the verb ‘likes’ is improperly marked as an adjective (for example, see Appendix C_Participant 16_Q12), the adjective ‘broken’ is labeled as a verb (for example, see Appendix C_Participant 17_Q1) and ‘are’ is marked as ‘V’ instead of ‘T’ (for example, see Appendix C_Participant 19_Q10).

There are also participants who did not label the grammatical categories of the constituent in a phrase or clause. There is a possibility that they do not know how to do so and thus chose to ignore the labeling (for examples, see Participant 2_Q15; Participant 17_Q2).

(3) Ill-formed structural hierarchy

Altogether there are 15 participants whose tree diagrams are drawn showing the flat structure where the sisterhoods are not shown hierarchically in different levels within their tree diagrams; “these flat structures are incorrect” (Fromkin, Rodman & Hyams, 2011: 84). They consistently wrote the linear string of words first before labelling each of the constituent according to their grammatical categories. The style is commonly used by beginning students of syntax who are just starting out. In postgraduate level, the participants should be able to draw viable tree diagrams which clearly show their internal structure hierarchically. According to Haegeman (1994), when the constituents are written flat on the same level, they are treated as being on equal footing. It is to be reminded that the participants were exposed to the multitude examples of cartographies exemplified in Radford (2009); thus the participants’ outputs are not the best representation of the phrases and clauses. They are expected to be able to produce cartographies that are hierarchically organized where all the different levels within an XP are shown. The flat tree diagrams can be found in some of the examples provided in Appendix C.

(4) Confused relationship between an X' and XP

It is found that there are participants who project an X' to an XP even though both of them do not have any relationship; the X's are thus seem to be projected arbitrarily in the tree diagrams (for examples, see Appendix C_Participant 6_Q10; Appendix C_Participant 8_Q8; Appendix C_Participant 14_Q12).

(5) Wrong sequence of merge/adjunction

Words that are closely related to each other in a phrase should be merged or adjoined first in tree diagram drawing. Participant 12 seems to have no knowledge at all with regards to the concept of constituent; as a result, the words which obviously do not have any relationship and can never be merged as a constituent are treated as one and projected (for examples, see Appendix C_Participant 12_Q1, Q6, Q7).

(6) Unable to show all the details within an XP

All the participants are unable to show all the details within an XP even though explicit instruction was given to do so. This shows that they have not acquired the competency with regards to how tree notation works. The three-level schema in X-bar schema with the three projections (X, X', XP) are available in all phrases even when there is no overt material to be merged or adjoined to each relevant level; however, many of the participants only managed to show the details when there is an adjunction to a V'.

In general, these problems show that the participants are not pedantic with the internal organization of phrases and clauses. They should be sensitized and be more meticulous with the necessary details in their cartographies.

CHAPTER 5: CONCLUSION

This research attempts to investigate and answer three research questions.

The first research question examines the participants' understanding of the difference between a complement and an adjunct. The results show that the participants do not know the difference between a complement and an adjunct. All the adjuncts in Section A are treated as the complement. Based on the cartographies collected, the participants are found to produce the following five varieties for the structure **X + adjunct₁ + adjunct₂** tested in the instrument:

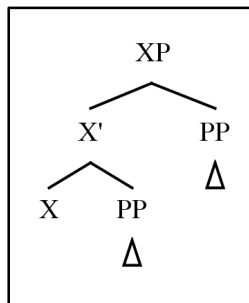


Figure 5.1: Variety 1

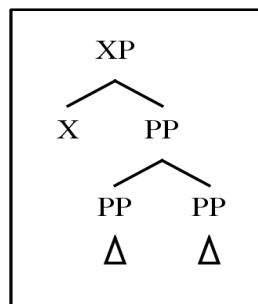


Figure 5.2: Variety 2

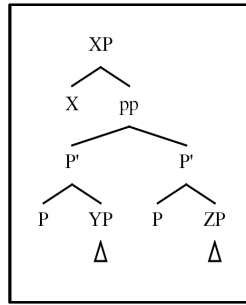


Figure 5.3: Variety 3

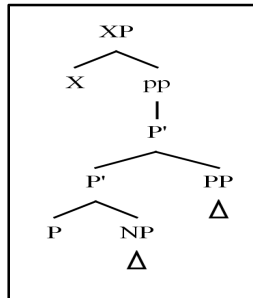


Figure 5.4: Variety 4

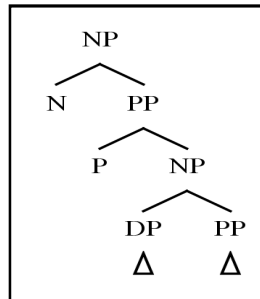


Figure 5.5: Variety 5

The second research question tries to explore the participants' sensitivity to the ambiguous status of the four clauses in Section B of the instrument. The results show that the participants have low sensitivity to the ambiguity of the clauses tested on them. The participants are found to be unable to disambiguate the ambiguities adopting two possible adjunction operations. The results found strengthen the finding for the first research question that the participants are unaware of the difference between a complement and an adjunct; as a result, they are unable to adjoin an adjunct to both a V' and an N' to give

different interpretations to the same ambiguous clause. However, the participants have better performance in adjoining an adjunct to the V' compared to the N'.

As for the third research question, it is intended to be used to investigate whether the participants are able to adjoin the adjuncts that appear before and after a head X as either one can be adjoined first depending on their readings. However, the results show that for the **adjunct₁ + head** structure, adjunct₁ is treated as either the specifier or the head; thus, almost all the participants do not produce the first adjunction as expected. As for the **head + adjunct₂** structure, the participants have the tendency to interpret it as the **head + complement** structure; thus, no participants do produce the second adjunction as expected.

Based on the cartographies collected, the participants are unable to produce viable cartographies as there are some problems identified:

- (1) Unable to distinguish both the merge and adjunction operations
- (2) Improper marking and representing of categories
- (3) Ill-formed structural hierarchy
- (4) Confused relationship between an X' and XP
- (5) Wrong sequence of merge/adjunction
- (6) Unable to show all details within an XP

Overall, this research report shows that the participants' understanding of the X-bar theory is poor and this prevents them to produce viable tree diagrams. Tree diagram drawing is a skill that students gradually acquire through practice and study. The participants' performance on the task designed shows that they have poor understanding of the adjunct rule and as a result it affects their tree diagram outputs.

Based on the unsatisfactory performance of the participants in adjunct cartographies, it is suggested that apart from introducing the three-level X-bar schema when students of syntax are exposed to the X-bar theory, lecturers of syntax could also consider introducing the four-level X-bar schema; the latter is the complement to the former. This is because the extra X' level in the schema explicitly shows the existence of the adjunct.

Furthermore, by using just the four-level schema, it helps to enhance and sensitize the three phrase structure rules learned:

- (1) specifier rule : sister of X'; daughter of XP
- (2) complement rule : sister of X; daughter of X'
- (3) adjunct rule : sister of X'; daughter of X'

At the same time, it also helps the students to remember and recall better as graphic representation of the phrase structure rules are easy to the eyes and the brain as well. With just a four-level schema and enough practices; students of syntax should have no problems in tree diagram drawing when required to produce any kind of phrases and clauses.

It is also suggested that students are given more training in tree diagram drawing; one very important aspect should be considered where students are required to show all the details within an XP even when there are no overt branching materials (specifier, complement, adjunct). The advantage of doing so is to create awareness among the students with regard to the existence of the X'.

It is hoped that this research report will sensitize and help students of syntax to clarify their cartographical issues and build firmer foundation with regard to adjuncts and its cartographies.