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An IP-related Syntactic Developmental Sequence (ISDS)

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The purpose of this study is to explore the question on how we can establish an IP-related syntactic developmental sequence. For a possible answer to this question, this study proposes an *IP-related Syntactic Developmental Sequence* (ISDS) derived from the Syntactic Developmental Sequence (Kim, 2006; Vainikka & Young-Scholten, 1998). The ISDS constitutes an implicational developmental sequence of the Single IP—the Double IP—the Multiple IP Stage in terms of the number of the auxiliary verbs in a sentence. The Single IP Stages follow an implicational sequence of Underspecified IP→TP→AgrP stage in terms of the LC in accordance with the Split-IP hypothesis. The Double IP Stages also follow an implicational sequence of Underspecified IP→ModP→AuxP*→TP→AgrP→ ForP stage in terms of the LC in accordance with the Split-AuxP hypothesis. The Multiple Stages are involved in the operations of mod- and aux-matching mechanisms which govern the matching of the aux-features and the mod-features, and the agreeing of modality, aspect, and passive features. Then, this study demonstrates that each stage of the ISDS can be examined on the IL data from sequence-based SLA research. In conclusion, the ISDS can determine the syntactic IL developmental sequence for the Double or the Multiple IP Stages as well as the Single Stages, and hence provide a theoretical framework for UG-based SLA research.

[IP/locality condition/Split-IP hypothesis/syntactic developmental sequence]

I. INTRODUCTION

Vainikka and Young-Scholten (1996, 1998) broached the *Minimal Tree Approach* as an answer to what Flex (1984) called the *developmental problem*: How and why does the IL development change from stage *x* to *x*+*n* stage? As opposed to the Full CP Approach[1], the

[1] The Full CP Approach postulates that clauses are treated as full CPs, and hence functional categories and their projections are present from the initial state of L2 acquisition, including functional categories such as IP and CP (Eubank, 1994; Haznedar, 2001, 2003; Lakshmanan, 1994; Lardiere, 2000; Schwartz & Sprouse, 1996).

Minimal Tree Approach assumes that a clause consists of a set of sub-trees of a full CP and that interlanguage (IL) data can be analyzed as consisting of the smallest possible sub-trees according to the Minimalist Program (Chomsky, 1992). Based on a series of research on German as a Second Language (GSL), Vainikka and Young-Scholten proposed a syntactic developmental sequence in terms of the Minimal Tree Approach. They argued that the sequence follows an *implicational scale* of VP—IP—CP where VP is acquired prior to IP and IP prior to CP, and that this development is driven by interaction between universal grammar (UG) and L2 input. In this respect, Vainikka and Young-Scholten's Sequence can be regarded as the first syntactic IL developmental sequence on syntactic mechanisms. Thus, it can be argued that the sequence allows for the possibility of interfacing the *logical problem* with the *developmental problem*, as proposed by Gregg (1996, p. 74). However, as Kim (2006) argued, despite such implications for SLA, the sequence is too *narrow* to explain the developmental processes of double or multiple CP structures (i.e., embedded clauses).

As a possible solution to this problem, Kim (2006) proposed a revised *Syntactic Developmental Sequence* (SDS) of the implicational stages of the single and the double or multiple CP structures according to the Minimal Tree Approach. The Single CP Stages of the SDS are ordered into a number of discrete stages in terms of the locality condition (LC)[2] of the Minimalist program (Chomsky, 1992); the V, the VP, the IP, and the FocP Stage, on each stage of which each relevant syntactic mechanism operates; the lexical-inserting, the theta-assigning, the case-marking, and the force-realizing mechanisms. Also, he devised the *Markedness on Operations* which quantifies the degrees of syntactic complexity in double or multiple CP structures. Hinging on the Markedness, the Double CP Stages governed by the force-matching mechanisms for realizing sentential forces such as declaratives and interrogatives can be decomposed into a number of distinct stages in accordance with the Split-CP hypothesis[3]: the Base/Bare CP, the Non-cancel FocP, the TopP, the Cancel FocP, and the Re-FocP Stages (Full discussion will be presented in the next section). It follows that not only can the SDS explain the syntactic IL developmental process of double or multiple CP structures (i.e., embedded clauses) as well as those of single ones (i.e.,

[2] The locality constraint [condition] on grammatical relations restricts possible syntactic relations: it allows a constituent A to enter into a grammatical relation with a constituent B provided A bears a local relation to B. Thus, locality has impact on selection, on theta-role assignment, on case-assignment, and on movement (Haegeman & Guéron, 1999).

[3] According to the Split-CP hypothesis, the functional projection CP is analyzed into a number of discrete functional projections. In addition to the topmost level, labelled CP, the functional layer dominating IP may contain a projection whose specifier hosts focalized material (FocP), and one or more functional projections whose specifier hosts topicalized material (TopP). (Haegeman & Guéron, 1999).

simple sentences), but it can also predict the critical structures and the error patterns manifested at each stage of the SDS. However, the SDS has set up the only *one* stage of IP-related structures that it seems to have difficulty in capturing any difference in syntactic complexity of various IP-related structures depending on whether they are single IP, double IP, or multiple IP structures.

This limitation invites us to set off our research question: How can we capture the degree of syntactic complexity in IP-related IL structures on what mechanisms? As a possible answer to this question, this study will propose an *IP-related syntactic developmental sequence* (ISDS) by associating the LC with the X-bar formats. The ISDS constitutes an implicational developmental sequence of the Single IP—the Double IP—the Multiple IP Stage in terms of the number of the auxiliary verbs in a sentence, each stage of which can also be decomposed into several stages in terms of the LC of the Minimalist program (Chomsky, 1992). More specifically, the Single IP Stage follows a sub-developmental sequence of the Underspecified IP—the TP (tense phrase)—the AgrP (agreement phrase) in terms of the Split-IP hypothesis[4]. The Double Stage follows a sub-developmental sequence of the ModP (modality phrase)—the AuxP (auxiliary phrase)—the ForP (force phrase) in terms of what we call the *Split-AuxP* hypothesis[5]. The Multiple IP Stage can also be decomposed into several stages in terms of the logic of the force-matching mechanisms (Full discussion will be elaborated on later). Then, it will show that each stage of the ISDS will be examined on the IL data derived from Atkinson (1992, pp. 252-262), Haznedar (2003, pp. 11-25), Pienemann (1998, pp. 169-176), Pienemann and Johnston (1987, pp. 82-83), and Swan and Smith (2001).

II. THEORETICAL BACKGROUND

In a series of studies on GSL, Vainikka and Young-Scholten (1996, 1998) suggested

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[4] The Split-IP hypothesis proposes that the head I be split into two distinct functional heads, AGR and T. The IP domain also contains a specialized projection to encode sentential negation, NegP (Haegeman & Guéron, 1999).

[5] Radford (2004, pp. 132-134) proposes an 'AuxP (i.e., Auxiliary Phrase)' as in the following.

a. She may not be enjoying syntax.

b. [$_{CP}$ [$_{c}$ Ø [$_{TP}$ she [$_{T}$ *may*] not [$_{AuxP}$ [$_{Aux}$ *be*] [$_{VP}$ [$_{V}$ enjoy*ing*] syntax]]

In (a), the head T position of TP is occupied by the modal aux *may*, and the head V position of VP by the verb *enjoying*, and hence the aux *be* seems to occupy some intermediate position between the two. As in the analysis in (b), the intermediate phrase is the AuxP whose head Aux is occupied by the aux *be* since *be* is an aspectual auxiliary (i.e., progressive aspect). On this line, by analogy with the Split-IP hypothesis, this study proposes the *Split-AuxP hypothesis*: the AuxP, the ParP (Participle Phrase). The AuxP whose head Aux hosts auxiliary inflections and the ParP whose head Par hosts participle inflections (Full discussion will be presented in Section 4).

the syntactic developmental sequence. The sequence follows an *implicational scale* where the emergence of IP requires the acquisition of VP and the development of CP is dependent on the previous acquisition of IP. In addition, they argued that this development is driven by UG (i.e., X-bar theory) interacting with L2 input. In this respect, Vainikka and Young-Scholten's Sequence can be considered as the first syntactic IL developmental sequence. Thus, the Sequence can provide a significant explanation for what Lightfoot (1981) called the *logical problems* (i.e., what enables learners to attain linguistic knowledge or competence, given limited input?) as well as what Flex (1984) called the *developmental problems* to SLA. However, despite such implications for SLA research, as Kim (2006, p. 408) pointed out, the sequence is so *sparse* that it cannot explain the developmental processes of double CP structures. Consider the following double CP structures in (1).

(1) a. *Who(m) did* Mary love at that time?
b. I know *that Mary loved him* at that time.
c. I know the man *whom Mary loved* at that time.
d. Do you know *who(m) Mary loved* at that time?
e. *Who(m)* do you think *Mary loved* at that time?

As Kim (2006) argued, all of the examples in (1) belong to the CP Stage under Vainikka and Young-Scholten's sequence since they have CP structures. This implies that the examples in (1) are all at the same stage, thereby assuming that their syntactic complexity will also be the same. However, in spite of all the examples in (1) having CP structures, there will be differences in the syntactic complexity depending on whether the CP in question is a simple sentence or an embedded clause. If it is embedded, it is an object of a matrix verb, a relative clause, or an indirect question. Thus, these differences should also be represented on the syntactic sequence. However, the sequence is too *narrow* to explain the developmental processes of double CP structures, and hence cannot sequentialize the developmental stages of double CP structures.

As a solution to this problem, Kim (2006, p. 409) proposed a *revised Syntactic Developmental Sequence* (SDS) in terms of the LC and the Split-CP hypothesis as in (2).

(2) Syntactic Developmental Sequence (SDS): V→VP→IP→FocP→CP*
(‘*’ indicates that ‘CP’ is recursive.)

According to Kim (2006, pp. 408-411), the V stage involves the operations of the lexical-inserting mechanism, resulting in the *flat* [SVO] structures with one-to-one correspondence of IL learners’ conceptual structures to the argument structures of

predicates. The VP stage is related to the theta-assigning mechanism which assigns each relevant semantic role to each constituent of the VP including the subject in terms of the VP-internal subject hypothesis[6], resulting in '$[_{VP}\ [_{V'}[V...]]]$' structures. The IP stage is involved in the case-marking mechanism which marks a case relevant to each constituent of the IP by virtue of A and H-to-H movement (case-driven), resulting in '$[_{IP}[_{I'}[I][_{VP}...]]]$' structures. The FocP Stage is hinged on the operation of the force-realizing mechanism by which sentential forces (e.g., interrogatives) are realized via the A-bar and H-to-H movement (force-driven) in terms of the Split-CP hypothesis. Hence functional projections are extended, resulting in '$[_{FocP}[_{Foc'}[Foc][_{IP}...]]]$' structures. Finally, the Double (Multiple) CP Stages are related to the operation of the force-matching mechanism by which (more than) two forces are combined via the A-bar and H-to-H movement (force matching-driven), and hence functional projections are completed, resulting in '$[_{CP*}\ [_{FocP}[_{IP}...]]]$' structure. Based on the discussions so far, let us assign a developmental stage to each example of (1) in terms of the SDS in (2). Of the examples in (1), only (1a) belongs to the FocP Stage, but the others belong to the CP* (the Double or Multiple CP) Stage under the SDS because they are all the structures which have at least two CPs, and on which the force-matching mechanisms operate. Therefore, the SDS in (2) comes up against the same problems as Vainikka and Young-Scholten's sequence in that all the structures in (1) except (1a) belong to the CP* Stage under the SDS, just as all the structures in (1) belong to the CP Stages under Vainikka and Young-Scholten's sequence.

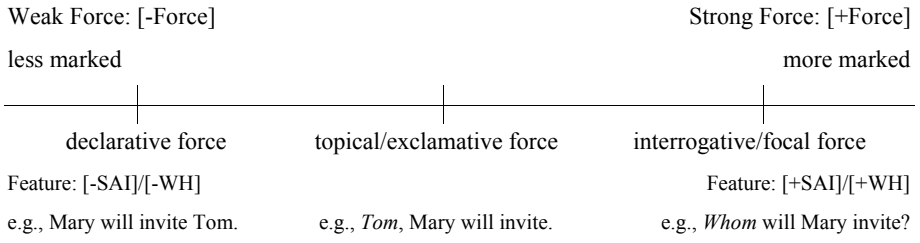
To cope with this problem, Kim (2006, p. 411) devised the *Markedness on Operations* which quantifies the degrees of syntactic operations (movements) resulting from the operation of the force-realizing mechanism for realizing sentential forces such as declarative, topical, and interrogative as shown in Figure 1. On the one end of the continuum, weak forces such as the declarative force are located. These forces are less marked in that fewer syntactic operations ensue in a sentence as a result of the operation of the force-realizing mechanism. The feature [-SAI]/[-WH] can be assigned to these forces (SAI=Subject Auxiliary Inversion, WH=*wh*-words). On the other end, strong forces such as the focal force are located, which are more marked in that more syntactic movements take place in a sentence as the results of the operation. The feature [+SAI]/[+WH] can be assigned to these forces. Hence, the less marked the forces related to force-matching are, the less complex the force-matching process will be; the more marked they are, the more complex the process will be. For example, when the most

[6] The VP-internal subject hypothesis postulates that the base-subject position is not [Spec, IP] but [Spec, VP] where the subject can receive a semantic role from the verb. This study follows the analysis of Haegeman and Guéron (1999, pp. 227-235).

marked forces such as focal forces are combined with each other, the force-matching process will be more complex than when the least marked forces such as declarative forces are combined. Thus, pivoting on the Markedness, the Double CP stages can be decomposed into a number of discrete stages: the Base/Bare CP, the Non-cancel FocP, the TopP, the Cancel FocP, and the Re-FocP stage (See full discussion Kim (2006).).

FIGURE 1

Markedness on Operations (Adapted from Kim (2006, p. 411))



Note: SAI=Subject Auxiliary Inversion, WH=*wh*-words

III. SYNTACTIC DEVELOPMENTAL SEQUENCE OF IP

Let us turn to our research question: How can we capture the degree of syntactic complexity of IP-related IL structures on what mechanisms? Let's go on a journey into exploring the answer to the question.

As discussed in the previous section, the SDS comprises an implicational sequence of V—VP—IP—FocP—CPs in terms of the LC and the Split-CP hypothesis. In addition, the double or multiple CP structures can be decomposed into a number of discrete stages in terms of the Markedness. It follows that the SDS can explain syntactic developmental processes of double or multiple CP structures as well as those of single ones. Thus, going beyond the limitations of Vainikka and Young-Scholten's sequence, the SDS can provide not only a clear definition or at least an operational one for what Anderson (1976) calls *declarative knowledge* but also a theoretical framework for UG-based SLA research. However, the SDS has put the only *one* stage for IP structures unlike CP structures that it cannot capture any differences in the syntactic complexity of various IP structures. Consider the following IL data related to IP structures in (3).

(3) a. *I *invite* her to the party *yesterday*.
b. *He *go* to school *every day*.
c. *I *wait* for you at home *tomorrow*.

d. *It *was building* in 1920.
e. **Did* he *have* won the battle?
f. *He *is working* there *since 1980*.

All of the examples in (3) belong to the IP Stage on the SDS since they contain IP structures. This implies that the examples (3a-f) are all at the same stage, thereby assuming that their syntactic complexity will also be equal. However, in spite of all the examples in (3) having IP structures, there will be differences in the degree of the syntactic complexity depending on the number of auxiliary verbs in a sentence and the syntactic systems of IP-related morphemes or features such as tense systems, modal systems, or aux systems. Thus, these differences should be represented on the syntactic sequence. However, the SDS has set the *single* stage of IP and cannot explain the developmental processes of IP systems, and hence cannot sequentialize the developmental stages of IP-related structures.

As a potential solution to this problem, this study proposes an X-bar format in terms of the Split-IP hypothesis and what we call the *Split-AuxP* hypothesis as seen in Figure 2.

FIGURE 2

An X-bar Format on the LC

X-bar Format:

$[_{CP*}[_{ForP}[_{For'}[For][_{AgrP}[_{Agr'}[Agr][_{TP}[_{T'}[T]([_{ModP}[_{Mod'}[Mod][_{AuxP}[_{Aux'}[Aux]^{*})[_{VP}[_{V'}[V]]]]]]]]]]$

$\longleftarrow \longleftarrow \longleftarrow \longleftarrow \longleftarrow \longleftarrow$ LC

('*' indicates that 'AuxP' is recursive.)

In Figure 2, on each maximal projection of the format does each relevant syntactic mechanism operate successively from the lowest local or minimal domain up to the highest local or minimal domain of the X-bar format in terms of the LC. More specifically, on the $[_{V}...]$ domain does the lexical-inserting mechanism operate, on the $[_{VP}...]$ domain does the theta-assigning mechanism, on the $[_{TP}...]$ domain does tense-realizing mechanism, and on the $[_{AgrP}...]$ domain does SV-agreeing mechanism and the case-marking mechanism (Case-filter). Optionally, on the $[_{ModP}...]$ domain does mod-realizing mechanism operate, and on the $[_{AuxP}...]$ domain does the aux-realizing mechanism. Also on the $[_{ForP}...]$ domain does the force-realizing mechanism, and on the $[_{CP*}...]$ domain does the force-matching mechanism.

From incorporating the LC with the X-bar formats, this study derives an *IP-related developmental sequence* (ISDS) as seen in (4).

(4) IP-related Syntactic Developmental Sequence (ISDS)
a. Underspecified IP→TP→AgrP
b. Underspecified IP→ModP→AuxP*→TP→AgrP →ForP
(‘*’ indicates that ‘AuxP’ is recursive.)

The ISDS constitutes an implicational IL developmental sequence of the Single IP—the Double IP—the Multiple IP Stage in terms of the number of the auxiliary verbs in a sentence, each stage of which can also be decomposed into several distinct stages in terms of the association of the LC with the Split-IP and the Split-AuxP hypothesis. The Single IP Sequence in (4a) follows an implicational scale of Underspecified IP →TP→AgrP in terms of the syntactic mechanisms (SM) along with the Split-IP hypothesis. More specifically, the Underspecified IP Stage is related to the operation of I-identifying mechanism which identifies I-related elements from VP constituents, resulting in ‘$[_{UsIP}[_{UsI'}[I][_{VP}...]]]$’ structures. The TP stage is involved in the tense-realizing mechanism by which tense systems are realized depending on the time of the activity or event of a sentence by virtue of A and H-to-H movement (tense-driven), resulting in ‘$[_{TP}[_{T'}[T][_{VP}...]]]$’ structures. The AgrP stage is contingent on SV-agreeing mechanism on which the specifier and the head are agreed by virtue of A and H-to-H movement (agr-driven), resulting in ‘$[_{AgrP}[_{Agr'}[Agr][_{TP}...]]]$’ structures. The Double IP Sequence in (4b) also follows an implicational scale of Underspecified IP→ModP→AuxP*→TP→AgrP →ForP in terms of the SM along with the Split-AuxP hypothesis. More precisely, the ModP stage is related to the mod-realizing mechanism in terms of which modal features (e.g., *will*, *can*) are specified according to modalities of a sentence (e.g., futurity, possibility) via A and H-to-H movement (mod-driven), resulting in ‘$[_{ModP}[_{Mod'}[Mod]]]$’ structures. The AuxP stage is hinged on the aux-realizing mechanism in terms of which aspect features (e.g., *be/have*+V-*ing*/*ed*) are realized according to aspects (e.g., progressive, perfect) of a sentence via A and H-to-H movement (aux-driven), resulting in ‘$[_{AuxP}[_{Aux'}[Aux]]]$’ structures. The Multiple IP Stages are involved in the aux-matching mechanism by which (more than) two aux-features are matched via A and H-to-H movement (aux-matching driven), resulting in a multiple IP structure ‘$[_{ModP}[_{AuxP}[_{Aux'}[Aux]^{*}]]]]$’ structures. The ForP Stage is associated with the operation of the force-realizing mechanism by which sentential forces (e.g., interrogatives) are realized via the A-bar and H-to-H movement (force-driven). Hence functional projections are extended, resulting in ‘$[_{ForP}[_{For'}[For]]]$’ structures. This is how IP systems are developed in terms of the interaction of the LC and the SM with the Split-IP and the Split-AuxP hypothesis.

IV. SYNTACTIC DEVELOPMENTAL STAGES OF IP

Kim (2006, p. 120) proposed *developmental gaps* as a developmental force in order to explain how IL learners pass through each stage on an IL developmental sequence such as SDS, by adopting the concepts of gaps and driving force proposed by Færch and Kasper (1986) and White (1987). IL structures (i.e., the output L2 learners produce) will be called the *triggering force*, and target language (TL) structures (i.e., the L2 input the learners receive in the linguistic environment) will be called the *triggering cue*. And the gaps between the triggering force and the triggering cue will be called *developmental gaps*. Thus, this study assumes that L2 learners develop from one IL system to the subsequent in a stepwise fashion on the ISDS, by inducing a clue to bridge the developmental gaps through the interaction between the triggering force and the triggering cue.

In the following section, by relying on the developmental gaps, each stage of the ISDS will be examined through the IL data derived from Atkinson (1992, pp. 252-262), Haznedar (2003), Pienemann (1998, pp. 169-176), Pienemann and Johnston (1987, pp. 82-83), and Swan and Smith (2001).

1. The Single IP Stages

The Single IP Stages are *canonical* IP stages in that primary I-features (e.g., tense, agreement) are specified and realized by the operations of the tense-assigning and the SV-agreeing mechanism. The Stages can be decomposed into the Underspecified IP, the TP, and the AgrP in terms of the Split-IP hypothesis (Haegeman & Guéron, 1999), each of which will be elaborated on in what follows.

1) The Underspecified IP Stage

As an initial stage of IP developmental sequence, the Underspecified IP stage, as its name suggests, is the one that I-elements are identified but not specified on their systems (i.e., tense, agreement, and aux systems). To put it simply, the Stage is involved in the operation of I-identifying mechanism by which L2 learners can distinguish a semantic core that affects the argument structure from a semantic periphery that does not affect it, hence identifying but not specifying I-related elements from unitary constituents of '(I)V(I)' structures. Thus, they can produce some defective sentences without matching tense with the time of event or auxiliaries with lexical verbs, or with missing auxiliaries as in (5). These data in (5) reveal that L2 learners can produce some underspecified IP structures, '$[_{UsIP}[_{UsI'}[I][_{VP}...]]]$', but cannot specify a position for I-elements to be base-

generated in or moved into. However, these underspecified IP, as IL systems are developed, can be specified into TP and AgrP in terms of the Split-IP hypothesis. Thus these erroneous sentences in (5) can play a triggering force in IL developments in that they provide an essential linguistic input for L2 learners to proceed from the Underspecified IP Stage to the higher stages of IP developmental sequence.

(5) a. *I *go* to town *yesterday*.
b. *I *can saw* it.
c. *He is *go* with me *now*.
d. *The girl *punished*.
e. *We *watch* TV *since two hours*.
f. *He *has wrote* two books.

2) The TP Stage

The TP stage is associated with the operation of the tense-realizing mechanism by which tense paradigms are realized depending on the time of the stage or the event of a sentence by virtue of A and H-to-H movement (tense-driven), resulting in '$[_{TP}[_{T'}[T]$ $[_{VP}...]]]$' structures.

Let us examine IL developmental processes of tense-systems. At an early TP Stage, L2 learners may produce ungrammatical sentences like (6a) because they regard I-elements (e.g., tense, agreement, aux features) as a unified part of V, which means '(I)V(I)' structures are considered as a unitary constituent (owing to I-elements being usually pronounced with weak stress and contracted in real communication). However, as the frequency of their exposure to the input increases, they will get access to grammatical sentences like (6b).

(6) a. *I *invite* her to the party *yesterday*.
b. I *invited* her to the party *yesterday*.
c. $[[_{TP}\ I_i\ [_{T'}[_{T}\ t_k]\ [_{vp}\ t_i\ [_{v}\ invite_k$ her] *yesterday*]]].

Perceiving the syntactic gaps through the interaction between the triggering force of (6a) and the triggering cue of (6b), L2 learners can recognize that the tense form of the verb *invite* mismatches the event of time *yesterday* in (6a). Then, they can infer that the tense form and the time of the event of the sentence coincide to each other, and hence adding the past affix *-ed* to the end of the associated lexical verb *invite*. As seen in the syntactic analysis of (6c), in order to realize tense, the tense feature *-ed*, which cannot play a theta-role assigner, has to be separated from the lexical verb *invite* and moved

from the head V to the head T, which corresponds to V-to-T movement, thereby the subject NP *I* also should be moved from the [Spec, VP] to the [Spec, TP] position, which corresponds to the A-movement. In this sense, these two movements can be called *tense-driven*. As a result, by establishing the tense-realizing mechanism, the L2 learners are able to form TP structures '$[_{TP}[_{T'}[T][_{VP}...]]]$'.

3) The AgrP Stage

The AgrP stage is related to the operation of SV-agreeing mechanism on which agreement features (i.e., person and number) on the head Agr match those of an NP, that is, the subject NP via A and H-to-H movement (case-driven), resulting in '$[_{AgrP}[_{Agr'}[Agr][_{TP}...]]]$' structures.

Let us examine IL developmental processes of agreement-systems. At the AgrP stage, L2 learners may produce erroneous sentences like (7a) owing to not having yet acquired agreement paradigms. However, they will have access to grammatical sentences like (7b) as positive evidence to (7a).

(7) a. *He *go* to school *every day*.
b. He *goes* to school *every day*
c. $[[_{AgrP}\ He_i\ [_{Agr'}[_{Agr}\ t_j(=3sg)]][[_{TP}\ t_i\ [_{T'}[_{T}\ t_k(=pre)]\ [_{vp}\ t_i\ [_{v}\ go_{kj}]$ to school *every day*]]].

Perceiving the syntactic gaps through the interaction between the triggering force of (7a) and the triggering cue of (7b), the learners can distinguish a semantic core from a semantic periphery. Thus, they can recognize that the associated I-element *-es* has to be separated from the lexical verb *go* and that it should be moved to the head Agr in AgrP via T in TP, which corresponds to the H-to-H movement (V-to-Agr). Thereby the subject NP *He* also moves from the [Spec, VP] to the [Spec, AgrP] via the [Spec, TP] position, which corresponds to the A-movement as in passivization and raising. As seen in the syntactic analysis of (7c), these two movements take place only to assign a nominative case to the subject NP (finite I assigns a nominative case to [Spec, AgrP] via spec-head agreement), and hence these movements are *agr-driven* along with case-driven. As a result, by establishing the case-marking mechanism, the learners are able to produce AgrP projection '$[_{AgrP}[_{Agr'}[Agr][_{TP}...]]]$'

2. The Double IP Stages

The Double IP Stages are *aux*-stages in that aux-features (e.g., modals, auxiliaries) are

integrated into primary I-features (e.g., tense, agreement). The Stages involve the operations of the mod-realizing, the aux-realizing, the force-realizing mechanism, each of which realizes modalities (e.g., futurity, possibility), aspects (e.g., progressive, perfect), and forces (e.g., declarative, interrogative) respectively. The Stages can be disintegrated into the ModP, the AuxP, and the ForP in terms of the Split-AuxP hypothesis. Each stage will be explicated in what follows.

1) The ModP Stage

The ModP stage is associated with the operation of the mod-realizing mechanism by which mod-systems are realized depending on modalities such as futurity, possibility, and necessity via A and H-to-H movement (mod-driven), resulting in '$[_{ModP}[_{Mod'}[Mod][_{VP}...]]]$' structures.

Let us examine IL developmental processes of mod-systems. At an early stage of ModP, L2 learners may be in a dilemmatic situation in which they have to express modality (e.g., futurity, possibility), but they are not able to form such a sentence owing to not having a ModP projection. To cope with this dilemma, they have to rely on a *pragmatic* sentence missing modals as in (8a). However, as the frequency of their exposure to the input increases, they will gain access to grammatical sentences like (8b).

(8) a. *I *wait* for you at home *tomorrow*.
b. I *will wait* for you at home *tomorrow*.
c. $[_{AgrP}\ I_i\ [_{Agr'}[_{Agr}\ will_{jk}(=1sg)]][_{TP}\ t_i\ [_{T'}[_{T}\ t_k(=pre)]][_{ModP}\ t_i\ [_{Mod'}[_{Mod}\ t_j]][_{InfP}\ t_i\ [_{Inf'}[_{Inf}\ t_a(=\varnothing)]]\ [_{vp}\ t_i\ [_{v}\ wait_{a(=\varnothing)}]$ for you at home *tomorrow*$]]]$.

Perceiving the syntactic gaps through the interaction between the triggering force of (8a) and the triggering cue of (8b), they can infer that the modal *will* is needed to express the modality *futurity*, hence preposing the modal *will* to the front of the associated lexical verb *wait*, which is compatible with *bare infinitive*. As in the syntactic analysis of (8c), in order to realize modality, the modal *will* has to be base-generated in the Mod, and the ModP selects the InfP (Infinitive Phrase) *bare infinitive* as its complement, and hence the modal *will* raises the head Mod of ModP via the immediate head T to the head Agr, and the Inf *bare infinitive* lowers onto the verb *wait*, thereby the subject NP *I* also should moves from the [Spec, VP] via the immediate [Spec, TP] to the subject position [Spec, AgrP]. In this sense, these syntactic operations are *mod-driven* along with case driven. As a result, by establishing the mod-realizing mechanism, the L2 learners are able to produce ModP projection '$[_{ModP}[_{Mod'}[Mod][_{InfP}[_{Inf'}[Inf][_{VP}...]]]]$'.

2) The AuxP Stage

The AuxP stage is hinged on the operation of the aux-realizing mechanism in terms of which aspectual paradigms are realized according to aspects of a sentence (e.g., progressive, perfect aspects, passivization) via A and H-to-H movement (aux-driven), resulting in '$[_{AuxP}[_{Aux'}[Aux]]]$' structures.

Take a look at the IL developmental processes of aux-systems. At this stage, L2 learners can produce modal structures like *I can see it here* by operating syntactic mechanisms available to them such as the mod-realizing mechanism, but they are not able to form *true* aux-structures like (10) as they lack the aux-realizing mechanism, and hence they have to resort to *interim* aux-structures as seen in (9) in order to meet communicative needs in such a problematic situation as mentioned above. However, they will come in contact with true aux-structures in (10) as positive evidence to (9).

(9) a. *I *am go* with her *now*.
b. *It *was building* in 1920.
c. *He *has wrote* two articles.

(10) a. I *am going* with her *now*.
b. It *was built* in 1920.
c. He *has written* two articles.

(11) a. $[_{AgrP}$ I$_i$ $[_{Agr'}[_{Agr}$ *is*$_{jk}$(=1sg)$]][_{TP}$ t_i $[_{T'}[_{T}$ t_k(=pre)$]][_{AuxP}$ t_i $[_{Aux'}[_{Aux}$ *be*$_j$$]][_{ParP}$ t_i $[_{Par'}[_{Par}$ $t_a$$]][_{vp}$ t_i $[_{v}$ go-*ing*$_a$] with her *now*$]]]]$.
b. $[_{AgrP}$ It$_i$ $[_{Agr'}[_{Agr}$ *was*$_{jk}$(=3sg)$]][_{TP}$ t_i $[_{T'}[_{T}$ t_k(=past)$]][_{AuxP}$ t_i $[_{Aux'}[_{Aux}$ *be*$_j$$]][_{ParP}$ t_i $[_{Par'}[_{Par}$ $t_a$$]][_{vp}$ t_i $[_{v}$ *build-ed*$_a$ t_i] in 1920$]]]$.
c. $[_{AgrP}$ He$_i$ $[_{Agr'}[_{Agr}$ *has*$_{jk}$(=3sg)$]][_{TP}$ t_i $[_{T'}[_{T}$ t_{jk}(=pre)$]][_{AuxP}$ t_i $[_{Aux'}[_{Aux}$ *have*$_j$$]][_{ParP}$ t_i $[_{Par'}[_{Par}$ $t_a$$]][_{vp}$ t_i $[_{v}$ *write-ed*$_a$ two articles$]]]]$.

Perceiving the syntactic gaps through the interaction between the triggering force of (9) and the triggering cue of (10), they can infer that the aux *be* is compatible with progressive participle *-ing* as in (10a), the aux *be* with passive participle *-ed* as in (10b), and the aux *have* with perfect participle *-ed* as in (10c). As in the syntactic analysis of (11), by analogy with the Split-IP hypothesis, the AuxP can be split into two functional projections, *AuxP and ParP* (participle phrase). AuxP whose head Aux hosts auxiliary inflections dominates ParP whose head Par hosts participle inflections, and thus the head Aux selects present participle, perfect participle, or passive, as its complement contingent on its aspect (i.e., progressive, perfect aspect, or passive) respectively. Now,

the auxiliary *be* or *have* raises from the head Aux of AuxP via the head T of TP which assigns tense to the head Agr of AgrP which agrees person and number. In addition, the head Par (i.e., the participial ending *-ing* or *-ed*) of ParP lowers onto the associated verb *go*, *build*, or *write* respectively. Thereby the subject NP *I* (11a) and *He* (11c) moves from the [Spec, VP] via the [Spec, ParP], the [Spec, AuxP], and the [Spec, TP] to the [Spec, AgrP]), and the object NP *It* (11b) moves from the [NP, V'] via the [Spec, VP], the [Spec, ParP], the [Spec, AuxP], and the [Spec, TP] to the [Spec, AgrP]). In this sense, these syntactic movements are *aux-driven* along with case driven. As a result, by establishing the aux-realizing mechanism, the L2 learners are able to produce AuxP projection '$[_{AuxP}$ $[_{Aux'}$[Aux]$[_{ParP}[_{Par'}$[Par]$[_{VP}$...]]]'.

3) The ForP Stage

The ForP stage is contingent on the operation of the for-realizing mechanism by which sentential forces are realized according to *illocutionary forces* of a sentence (i.e., declarative, exclamative, and interrogative force) via A and H-to-H movement (for-driven), resulting in '$[_{ForP}[_{For'}$[For]]]' structures.

Now, take a look at IL developmental processes of for-systems. On arriving at this stage, L2 learners can produce *pseudo Y/N*-questions like (12a) relying on *Do*-fronting by simply adding *Do* to the sentence initial position in order to meet communicative needs in such a dilemma as mentioned above, but they are not able to form *true Y/N*-question like (12b) as they lack the for-realizing mechanism. However, they will be exposed to grammatical sentences like (12b) as positive evidence to (12a).

(12) a. **Did* he *have won* the battle?
b. *Had* he *won* the battle?
c. $[_{ForP}$ $[_{For'}[_{For}$ $had_{jk}]$ $[_{AgrP}$ He_i $[_{Agr'}[_{Agr}$ t_{jk}(=3sg)]]$[_{TP}$ t_i $[_{T'}[_{T}$ t_j(=past)]]$[_{AuxP}$ t_i $[_{Aux'}[_{Aux}$ $have_j$]] $[_{ParP}$ t_i $[_{Par'}[_{Par}$ t_a]]$[_{vp}$ t_i $[_{v}$ *win-ed*$_a$ the battle?]]]].

Perceiving the syntactic gaps through the interaction of the IL structure (12a) and the TL structure (12b), the learners can recognize that, as in the analysis in (12c), in order to form a *Y/N*-question, the Aux *had* base-generated at the AuxP has to be moved from its base position via the head T and Agr to the head For of the ForP. In addition, the subject NP *he* has to be moved from the VP-internal position via intermediate A-position to the [Spec, AgrP] position. Through the developmental processes of *Y/N*-questions, the L2 learners will naturally recognize C-systems, and finally they proceed from the IP stage which is *force-driven* by the for-realizing mechanism to the CP stage which is *focal-driven* by the foc-realizing mechanism. In this respect, *Y/N*-questions can be regarded as

playing a bridging role in proceeding from the IP to the CP stage.

3. The Multiple IP Stages

The Multiple IP Stages are *multiple* aux-stages in that (more than) two aux-features (e.g., aux verbs, modal verbs) are combined to form a multiple IP structures. The multiple aux-stages are involved in the operations of the mod-matching and the aux-matching mechanism which govern the matching of the aux and the mod features, and the agreeing of modality, aspect, and passive elements. The Stages can also be ordered into stages in terms of the mod-matching and the aux-matching mechanism along with the same mechanisms as applied to the Single and the Double IP structures such as the tense-realizing and the SV-agreeing, the mod-realizing, and the aux-realizing mechanism.

Explore IL developmental processes of multiple aux-systems. On arriving at the stages, L2 learners can produce aux structures like (13a-b) by utilizing syntactic mechanisms available to them such as the mod-realizing and the aux-realizing mechanism, but they might make *simulated* multiple aux structures like (13c) by applying the same mechanisms as those which operated on (13a-b) directly into the production of (13c). However, they will have access to grammatical sentences like (14) as positive evidence to (13c).

(13) a. He *is working now* at his office.
b. I *have worked* for two hours.
c. *He *is working* there *since last spring*.

(14) He *has been working* there *since last spring*.

(15) $[_{AgrP}He_i[_{Agr'}[_{Agr}has_{jk}(=3sg)]][_{TP1}\ t_i[_{T1'}[_{T}\ t_{jk}(=pre)]][_{AuxP1}t_i[_{Aux1'}[_{Aux}\ have_j]][_{TP2}\ t_i\ [_{T2'}\ [_{T}been_m(=per)]][_{AuxP2}\ t_i[_{Aux2'}\ [_{Aux}\ t_m]][_{ParP2}\ t_i\ [_{Par2'}\ [_{Par}\ t_a]][_{vp}\ t_i\ [_{v}\ work\text{-}ing_a]$ there *since last spring*]]].

Now, recognizing the syntactic gaps through the interaction between the triggering force of (13) and the triggering cue of (14), they can infer that the aux *have* is incorporate into another aux *be* which is compatible with perfect participle *been* to form a multiple aux structure. As in the syntactic analysis of (15), in order to realize two associated aspects (i.e., perfect and progressive aspect), the perfect participle *have* forms the associated AuxP1 which selects the progressive participle *be* as its complement to form the AuxP2. Now, to match the AuxP1 with the AuxP2, the aux1 *have* takes *been* the perfect form of the aux2 *be*, which takes *working* the progressive form of verb *work*. As

a result, by establishing the aux-matching mechanism, the L2 learners are able to produce multiple aux projection '[$_{AuxP1}$[$_{Aux1'}$[Aux1][$_{AuxP2}$[$_{Aux2'}$ [Aux2]]]]]'.

4. Summary of the Syntactic Developmental Stages of IP

In sum, the IP-related Syntactic Developmental Sequence (ISDS) can be illustrated in Table 1. The ISDS constitutes an implicational IL developmental sequence of the Single IP—the Double IP—the Multiple IP Stage in terms of the number of the auxiliary verbs in a sentence, each stage of which can also be decomposed into several discrete stages in terms of the association of the LC and the SM with the Split-IP and the Split-AuxP hypothesis.

TABLE 1

IP Syntactic Developmental Sequence (ISDS) on Syntactic Mechanisms (SM)

Stages		Sequence	Movement	Syntactic Mechanisms	Critical Structures
Single IP Stages	Us-IP	[$_{usIP}$[$_{usI'}$[usI][VP...]]	A-/H-to-H (case-driven)	I-identifying Tense-realizing SV-agreeing	Tense-agreements SV-agreements
	TP	[$_{TP}$[$_{T'}$[T...]]			
	AgrP	[$_{AgrP}$[$_{Agr'}$[Agr...]]			
Double IP Stages	ModP	[$_{ModP}$[$_{Mod'}$[Mod...]]	A-/H-to-H (aux-driven)	Mod-realizing Aux-realizing For-realizing	Modals, Aux-*en*/-*ing* *Y/N*-inversion
	AuxP	[$_{AuxP}$[$_{Aux'}$[Aux...]]			
	ForP	[$_{ForP}$[$_{For'}$[For...]]			
Multiple IP Stages		[$_{AgrP}$ [$_{AuxP}$]*]	A-/H-to-H (aux-matching -driven)	Aux-matching	Modals + Aux-*en*/-*ing*

The Single IP Stages follow an implicational sequence of Underspecified IP→TP→ AgrP stage, on each stage of which each relevant syntactic mechanism operates in terms of the LC in accordance with Split-IP hypothesis; the I-identifying, the tense-realizing, and the SV-agreeing mechanism. The Double IP Stages also follow an implicational sequence of Underspecified IP→ModP→AuxP*→TP→AgrP→ForP stage, on each stage of which each relevant syntactic mechanism operates in terms of the LC in accordance with the Split-AuxP hypothesis; the mod-realizing, the aux-realizing, and the for-realizing mechanism. The Multiple Stages are involved in the operations of the mod-and the aux-matching mechanism which govern the matching of aux-features and mod-features, and the agreeing of modality, aspect, and passive elements.

Therefore, as Table 1 revealed, all stages on the ISDS are in an implicational relation all in all, where each higher stage on the ISDS subsumes the syntactic mechanisms, and the critical syntactic structures of the lower stages, but not *vice versa*. What this

implicational relation implies is, as Kim (2006, p. 420) pointed out, that no syntactic stage on the ISDS can be *skipped* and *beaten*, and thus it is not until L2 learners are able to *parse* the syntactic mechanisms on a given stage on the ISDS that they can proceed from one stage to the subsequent stage, just as a caterpillar goes through the foreordained shedding process step by step and finally becomes a butterfly.

V. CONCLUSION AND IMPLICATIONS

The discussions so far return to our research question: How can we capture the degree of syntactic complexity of IP-related IL structures on what mechanisms? As a possible answer to this question, this study has proposed an IP-related Syntactic Developmental Sequence (ISDS) based on the sequence of Vainikka and Young-Scholten (1998) and the SDS (Kim, 2006). The ISDS constitutes an implicational IL developmental sequence of the Single IP—the Double IP—the Multiple IP Stage in terms of the number of the auxiliary verbs in a sentence, each stage of which can also be decomposed into several distinct stages in terms of the association of the LC and the SM with the Split-IP and the Split-AuxP hypothesis. The Single IP Stages follow an implicational sequence of Underspecified IP→TP→AgrP stage, on each stage of which each relevant syntactic mechanism such as the I-identifying, the tense-realizing, and the SV-agreeing mechanism operates in terms of the LC in accordance with Split-IP hypothesis. The Double IP Stages also follow an implicational sequence of Underspecified IP→ModP→ AuxP*→TP→AgrP→ForP stage, on each stage of which each relevant syntactic mechanism such as the mod-realizing, the aux-realizing, and the for-realizing mechanism operates in terms of the LC in accordance with the Split-AuxP hypothesis. The Multiple Stages are involved in the operations of the mod-and the aux-matching mechanism which govern the matching of aux-features and mod-features, and the agreeing of modality, aspect, and passive elements. Also, this study has shown that each stage of the ISDS can be examined on the basis of the IL data from sequence-based SLA research by drawing on syntactic gaps between the triggering force and the triggering cue.

In conclusion, not only can the ISDS explain the IL developments of double or multiple IP structures as well as those of single ones, but it can also predict the critical structures and the error patterns manifested on each stage of the ISDS. Thus, going beyond the limitations of Kim's sequence, the ISDS can determine the syntactic IL developmental sequence for Double or even Multiple IP Stages. Therefore, the ISDS and its mechanisms can complete the SDS (Kim, 2006) and hence provide a theoretical framework for UG-based SLA research. In addition, there may be a pedagogical

implication. As mentioned above, from the fact that each stage of the ISDS is in an implicational relation, a motivating principle for language pedagogy, which Pienemann (1985, 1998) calls *Teachability Principle*, can be derived, which implies that any instruction will be beneficial if it focuses on structures or rules of the next or subsequent stage of the IL learners' current stage on the ISDS. Thus, as Kim (2006, p.421) suggested, the ISDS might provide an alternative to the key questions addressed in recent research into Form-focused Instruction: When and how to provide what rules for IL learners? (Doughty & Williams, 1998; Ellis, 2003; Park, 2006; Robinson, 1996). Specifically, an answer to *when* to teach them will be the stage subsequent to IL learners' current stage. An answer to *what rules* to teach will be the critical structures or rules of the subsequent stage governed by the relevant syntactic mechanisms. And an answer to *how* to teach them can be obtained by utilizing the concept of syntactic gaps presented in this study.

Although the ISDS and its syntactic mechanisms can provide these implications for SLA research and language pedagogy, this may be "theoretical", and therefore there should be an empirical test on whether there is any "error" on the ISDS (An empirical test for the ISDS is now being designed according to the research design (Kim, 2008a 2008b) which consists of Sentence Construction Tests played on the real-time *Flash Window Method* proposed by Kim and Kwon (2007)).

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Applicable Levels: All

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