Testing the Parallel Developmental Sequence

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Kim and Kwon (2005, 2007) proposed a modular model called the Parallel Developmental Sequence (PDS) Model. The PDS constitutes the Parallel Developmental Stages sequentially, each stage of which three sub-developmental sequences (i.e., the Procedural, the Syntactic, and the Morphological Sequence) are incorporated into. This study investigated whether the theoretical Parallel Developmental Stages reflects L2 learners' actual developmental stages and correlates their language proficiency. The result of the Implicational Scaling showed that the scalability was .81, meaning that the performance PDS produced in real time by the learners significantly corresponds to the theoretical PDS. The analysis of the Spearman Correlation demonstrated that the Parallel Stages were highly correlated with the Grammar test (r=.87), implying that the PDS has its own validity. Thus, the PDS Model can provide a theoretical framework for developing acquisition-oriented teaching and testing.

Keywords: 〔SLA/parallel developmental sequence/acquisition-oriented teaching and testing/제2언어습득/병행발단단계/습득지향 교수 및 평가〕

1. Introduction

Since Corder (1967) proposed that all second language learners pass through a series of developmental stages which constitute a kind of "inbuilt syllabus", there has been a great development in SLA research. In the seventies, a number of studies, commonly referred to as the Morpheme Studies, were carried out to investigate the order of acquisition of grammatical morphemes (Bailey, Maddden, &

Krashen, 1974; Dualy & Burt, 1973, 1974; Krashen, 1977; Larsen-Freeman, 1976). These studies showed that certain grammatical items seemed to be acquired in a particular order, and that this order was similar for children and adults, and for learners from different language backgrounds. However, these studies did not find out an explanatory power why L2 learners follow the predetermined order in language acquisition.

In the eighties, Pienemann and his colleagues (Meisel, Clahsen, & Pienemann, 1981; Pienemann & Johnston, 1987) proposed the Multidimensional Model. The Developmental Sequence, one dimension of the model, consists of five implicational stages in terms of the hierarchical combinations of three components of the Speech Processing Strategies (SPS) proposed by Clahsen (1984). According to Pienemann (1985), the SPS can thus function as a kind of cognitive constraints for determining the developmental sequence of what Anderson (1976) calls procedural knowledge. Thus, the sequence can be considered as the first procedural developmental sequence on procedural mechanisms. However, the Multidimensional Model has also its limitations to be settled. From the theoretical perspective, as Pienemann (1998) pointed out, the SPS which governs the sequence cannot play a "grammar" role in the explanation of the interlanguage (IL) development of linguistic knowledge. In this respect, it might be more accurate to say that the Developmental Sequence represents the sequence of the SPS itself rather than that of grammatical knowledge. From the practical perspective, as Hudson (1993) pointed out, the sequence is too "narrow" (i.e., it constitutes only five stages) to apply to language teaching and language testing.

To overcome these limitations, Pienemann (1998) proposed the Processability Theory which associates Incremental Procedural Grammar (IPG) (Kempen & Hoenkamp, 1987) and the Levelt Model (Levelt, 1989) with Lexical Functional Grammar (LFG) (Kaplan & Bresnan, 1982). By utilizing IPG that involves a time-constrained set of mechanisms for the translation of conceptualizations into

lexico-grammatical forms, he postulated the Processability Hierarchy that constitutes an implicational scale of a set of processing procedures in which the processing procedure of each lower level is a necessary prerequisite for the functioning of the higher level. The hierarchy, in turn, can predict and describe the sequence of both syntactic and morphological IL developments of a target language, by implementing this universal hierarchy into LFG-based descriptions of the target language. In sum, by integrating the universal hierarchy of the processing procedures and the linguistic systems of LFG, the Processability Theory can explain IL developments of both processability and grammaticality in a unified and principled way. Yet, the Processability Hierarchy, as pointed out by Kim and Kwon (2005, 2007), is not so 'strict' that it cannot predict developmental complexity of embedded or subordinate clauses of various types, and hence sequentialize developmental stages of embedded structures.

To deal with this problem, Kim and Kwon (2005, 2007) proposed a modular model called the Parallel Developmental Sequence (PDS) Model, on the basis of the reviews of SLA theories such as the Multidimensional Model (Pienemann & Johnston, 1987), the Minimal Tree Hypothesis (Vainikka & Young-Scholten, 1998), and the Processability Theory (Pienemann, 1998). The PDS comprises the Parallel Developmental Stages implicationally (1X, 2X…, $1X^2$…, $1X^3$…, kX^n (n is the number of embedded clauses)). Each Parallel Stage of the PDS incorporates three sub-developmental sequences: the Procedural Sequence, the Syntactic Sequence, and the Morphological Sequence. Thus, the PDS provides an interface between the three sub-developmental sequences, thereby explaining the interactional processes of IL developments among the three sequences (Full discussion will be elaborated on in the next section).

The question then is whether or not the theoretically built Parallel Developmental Stages of the PDS does reflect the actual developmental stages of L2 learners and does correlate their

language proficiency. Thus, to see whether there is an error on the PDS, the PDS will be tested by a real-time experimental method called the *Flash-window Method* (Kim & Kwon, 2005). In addition, to see whether there is a relationship between the Parallel Developmental Stages and the scores on a standardized test (the Grammar test of the TEPS), the Spearman Correlation and the Kruskal-Wallis Test will also be conducted. Finally, the results and implications will be discussed.

2. The Parallel Developmental Sequence (PDS) Model

2.1 Three Developmental Sequences (Modules)

2.1.1 Procedural Developmental Sequence

Based on the Multidimensional Model (Meisel, Clahsen & Pienemann, 1981), Pienemann and Johnston (1987) proposed the Developmental Sequence for English as a Second Language (ESL). As seen in Table 1, the sequence consists of five implicational stages of X, X+1, X+2, X+3, and X+4 in terms of the hierarchical combinations of three components of the Speech Processing Strategies (SPS) proposed by Clahsen (1984).

TABLE 1
The Developmental Sequence of ESL

Stages	SPS			Critical Structures	Examples
	〔COS〕	〔IFS〕	〔SCS〕		
X	+	·	·	Canonical SVO	〔I kissed Mary〕 yesterday.
X + 1	+	+	+	Do-fronting	*In the park,* 〔I kissed Mary〕 __.
X + 2	−	+	+	Y/N-question	Did 〔you kiss(-*ed*) Mary〕?
X + 3	−	−	+	Wh-question	Who *did* 〔you kiss(=*ed*) __〕 yesterday?
X + 4	−	−	−	Embedded clause	〔I don't know 〔who met Mary〕〕.

According to Pienemann and Johnston, L2 learners pass through from one stage to the subsequent on the sequence only if they can operate the SPS imposed hierarchically on each stage. In this respect, the SPS can function as a procedural mechanism for determining an IL developmental sequence of what Anderson (1976) calls procedural knowledge. However, the sequence is too "sparse" to explain the IL developmental processes of embedded clauses in stages higher than Stage X+4. Consider the following embedded clauses.

(1) a. I know *that John loved Mary at that time*.
b. I wonder *who loved Mary at that time*.
c. I know the girl *whom John loved at that time*.
d. Do you know *who(m) John loved at that time*?
e. *Who(m)* do you think *John loved at that time*?

Since all the examples in (1) contain embedded clauses, represented as [-COS], [-IFS], and [-SCS] in terms of the SPS, they are all the structures belonging to Stage X+4 on the sequence as seen in Table 1. This assumes that their processing complexity will be the same. Yet, even though the examples of (1) all have embedded clauses, there will be any differences in the degrees of the procedural complexity depending on whether the embedded clause in question is an object of a matrix verb, a relative, or an indirect-question. Thus, these differences should also be represented on the developmental sequence of procedural knowledge.

As a possible alternative to this limitation, Kim and Kwon (2006) proposed the Speech Processing Mechanism (SPM) and a set of developmental-stage functions called the SPM functions as seen in (2).

(2) Speech Processing Mechanism (SPM) functions
a. SPM $f(\alpha, \beta) = [\alpha\text{IFM}]/[\beta\text{COM}]$,
b. SPM $f(\alpha, \beta, \gamma) = [\gamma\text{SCM}([\alpha\text{IFM}]/[\beta\text{COM}])^{*}]$
(The value of variable α, β, or γ is '+' or '-'.)

("*" indicates that ([αIFM]/[βCOM]) is recursive.)

The SPM derived from the SPS (Clahsen, 1984) is a kind of procedural mechanism that can quantify the degrees of constituent movements and word order changes to realize grammatical changes (e.g., modality) and sentential forces (e.g., interrogatives). It consists of three components ([αIFM], [βCOM], [γSCM]).[1] The SPM functions, which formularize three components of the SPM as an implicational recursive combination, can sequentialize procedural developmental stages. (2a), as a serial connection combination of [α IFM] and [β COM] among the three components of the SPM, is the SPM function of non-embedded clauses, which can quantify the procedural complexity of simple or matrix clauses. Hence, according

1) First, Initialization Finalization Mechanism (IFM) is a mechanism operating on constituent movements to realize grammatical changes and sentential forces. Hence, as seen in (a-b) below, the variable α of [αIFM] will have a positive value (+) if a certain constituent moves from an internal position to an external position, and *vice versa*. and the variable α will have a negative value (-) if one moves from an internal position to another internal position within a sentence (i.e., double movements). Canonical Order Mechanism (COM) is a mechanism operating on word order changes within a sentence. Hence, as seen in (c-d), the variable β of [βCOM] will have a positive value (+) if no change takes place in the canonical order, and the variable β will have a negative value (-) if any change takes place as the results of the operations of the IFM mechanism. Finally, Sentence Combination Mechanism (SCM) is a mechanism operating on an embedded clause when more than two sentences are combined to form a complex sentence. Hence, as a result of combining two sentences, the variable γ of [γSCM] will have a positive value (+) if a certain constituent moves only within the embedded clause, and the variable γ will have a negative value (-) if one moves to the outside of the embedded clause, i.e., moves to the matrix, as seen in (e-f) (see Kim & Kwon, 2006, pp. 116-128).

a. **Can** [you _ do it]? ([+IFM])
b. What **are** [you _ doing _] now? ([-IFM])
c. **Yesterday**, [John kissed Mary] ___. ([+COM])
d. **What** **are** [you _ doing _] now? ([-COM])
e. [Do you know [***who(m)*** Mary loved __at that time]]? ([+SCM])
f. [***Who(m)*** do you think [_ Mary loved _at that time]]? ([-SCM])

to the values of variable α and β of the SPM function, the developmental sequence of simple or matrix clauses can be ordered into stages from 1x to 4x as seen in Table 2. Also, (2b), as an implicational recursive connection combination of the components derived from inserting the serial combination of (2a), i.e., the [αIFM]/[βCOM], into the implicational component of the [γSCM(/)*], is the SPM function of embedded clauses, which can quantify the procedural complexity of embedded clauses. Hence, depending on the values of variable α, β, and γ of the SPM function, developmental sequence of embedded clauses can be ordered into stages from $1x^2$ to $5x^2$ as in Table 2. In addition, since a complex sentence consists of a matrix and embedded clauses, the developmental stage of a complex sentence can be formalized by combining that of the matrix clause in terms of the simple SPM function (2a) and those of the embedded clauses by the embedded SPM function (2b). The developmental stages of a complex sentence can hence be represented in the form of $kx^n+kx^{n-1}\ldots kx$ (here, n is the number of embedded clauses). According to the SPM functions, to each sentence of the examples (1) above, a procedural developmental stage can be assigned as follows: (1a) is assigned to "$1x^2+1x$", (1b) to "$2x^2+1x$", (1c) to "$3x^2+1x$", (1d) to "$4x^2+3x$", and (1e) to "$5x^2+3x$".

To sum up, the SPM and its functions not only determine an IL developmental sequence of procedural knowledge called the Procedural Developmental Sequence (ProDS), but also predict the critical structures and the error patterns of each stage on the ProDS as seen in Table 2.

However, as Pienemann (1998) pointed out, the SPM and its functions cannot play a "grammar" role in explaining IL developmental processes of linguistic knowledge (i.e., grammaticality) on the ProDS. For example, at Procedural Stage $2x^2$, the operation of SPM

TABLE 2
Procedural Developmental Sequence on SPM

Stages		Procedural Developmental Sequence		
		SPM f (α,β) = [αIFM]/[βCOM]	SPM f (α,β,γ) = [γSCM([αIFM]/[βCOM])]	Critical Structures
Simple Sentence	1x	[·/+]	·	SVO
	2x	[+/+]	·	*Adv*/*Wh*/*Do*-fronting
	3x	[+/−]	·	Aux-*en*/-*ing*, Y/N-Inv, Comp-to
	4x	[−/−]	·	*Wh*-questions
Complex Sentence	$1x^2$	[±/±]	[·([·/+])]	2-Sub-Comp, *that*-clause
	$2x^2$	[±/±]	[+([+/+])]	Indirect-question, Relatives(sub.)
	$3x^2$	[±/±]	[+([+/−])]	Relatives(obj., obl.)
	$4x^2$	[±/±]	[+([−/−])]	Indirect-question(obj.)
	$5x^2$	[±/±]	[−([−/−])]	Long distance-questions
Double Complex Sentence	⋮	⋮	⋮	⋮
	kx^n	±/ ±	(±/±)+(±/±)+⋯	

[+SCM([+IFS]/[+COM])] can predict critical structures such as indirect questions (subject) and relative clauses. Yet, this SPM itself can not explain the grammaticality inherent in such structures. In this respect, it might be more accurate to say that the ProDS represents the sequence of the SPM itself rather than that of grammatical knowledge. Thus, the ProDS needs to be complemented by a syntactic developmental sequence on syntactic mechanisms as in the studies of Vainikka and Young-Scholten (1998).

2.1.2 Syntactic Developmental Sequence

On the basis of the studies of the acquisition processes of GSL learners, Vainikka and Young-Scholten (1994, 1996, 1998) suggested the syntactic developmental sequence as in (3).

(3) The Syntactic Sequence: VP → IP → CP

According to Vainikka and Young-Scholten, the sequence in (3) follows an implicational scale in which the emergence of IP requires

the acquisition of VP and the development of CP is dependent on the previous acquisition of IP. In addition, this development is driven by interaction between UG (i.e., X-bar theory) and L2 input. In this respect, the sequence can be regarded as the first syntactic IL developmental sequence on syntactic mechanisms. However, the sequence is too narrow to explain the developmental processes of double or multiple CP structures. Consider the following structures in (4).

(4) a. Who(m) did Mary kissed in the park?
b. I know *that Mary kissed him in the park.*
c. I know the man *whom Mary kissed him in the park.*
d. Do you know *who(m) Mary kissed him in the park*?
e. *Who(m)* do you think *Mary kissed him in the park*?

According to Vainikka and Young-Scholten's explanation, since all of the examples in (4) contain CP structures, they belong to the CP Stage on the sequence in (3). This implies that their syntactic complexity will be equal. However, in spite of all the examples of (4) having CP structures, there will be any differences in the degrees of the syntactic complexity depending on whether the CP in question is a simple sentence or an embedded clause, and if it is an embedded one, whether it is an object of a matrix verb, a relative clause, or an indirect question. What happens after the Single CP Stages on Vainikka and Young-Scholten's sequence?, and how can the sequence be extended to double or multiple CP structures?

As a possible answer to this question, Kim (2006b) proposed the Revised Syntactic Developmental Sequence (SynDS) by drawing on the Locality Condition (LC) and the Split-CP hypothesis[2] as in (5).

2) 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

(5) Syntactic Developmental Sequence: V→VP→IP→FocP→CP*
('*' indicates that 'CP' is recursive.)

Schematically, the SynDS in (5) can be represented in terms of X-bar theory as in Figure 1, on each stage of which each relevant syntactic mechanism operates successively from the lowest local or minimal domain up to the highest local or minimal domain of X-bar formats in terms of the LC. In this respect, the LC intertwined with X-bar theory plays an important role in the construction of the SynDS in (5) above.

FIGURE 1
X-bar Formats and the Locality Condition

X-bar Format: $[_{CP}{}^{*}\ [_{FocP}\ [_{IP}\ [_{VP}\ [_{V\cdots}]]]]]$
◀——◀——◀——◀——◀—— LC
('*' indicates that 'CP' is recursive)

Now, examine each stage of the SynDS in brief. First, the V stage involves the operations of the lexical-inserting mechanism, resulting in the *flat* [SVO] structures with one-to-one correspondence of the L2 learners' conceptual structures to the argument structures of predicates. The VP stage involves the theta-assigning mechanism which assigns each relevant semantic role to each constituent of the VP including the subject on the basis of the VP-internal subject hypothesis. This is how the lexical projections are completed, resulting in '$[_{VP}$NP$[_{V'}$[VNP]]]' structures. The IP stage is related to the case-marking mechanism which marks each relevant case to each constituent of the IP by virtue of A(rgument) and H(ead)-to-H(ead)

functional projections whose specifier hosts topicalized material (TopP). For example, a root *wh*-question which is a typical FocP structure is analyzed as follows (Haegeman & Guéron, 1999).

$[_{CP}\ [_{FocP}$ Whom$_i$ do+ed$_j$ $[_{AGRP}$ you $[_{AGR'}$ $t_j]$ $[_{TP}$ $[_{T'}$ $t_j]$ $[_{VP}$ invite$_j$ $t_i]]]]$? or
$[_{CP}\ [_{FocP}$ Whom$_i$ did$_j$ $[_{AGRP}$ you $[_{AGR'}$ $t_j]$ $[_{TP}$ $[_{T'}$ $t_j]$ $[_{VP}$ invite$_j$ $t_i]]]]$?

movement (case-driven), and hence functional projections begin to develop, resulting in '$[_{IP}[_{I'}[I][_{VP}...]]]$' structures. The FocP stage hinges 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 '$[_{CP^*}[_{FocP}[_{IP}...]]]$' structures.

Based on the discussions so far, let us assign a developmental stage to each example of (4) in terms of the SynDS in (5). Of the examples in (4), only (4a) belongs to the FocP stage, but the others belong to the CP* (the Double or Multiple CP) stage on the SynDS since they are all the structures which have at least two CPs, and on which the force-matching mechanisms operate. Therefore, the SynDS in (5) comes up against the same problem as does Vainikka and Young-Scholten's Sequence in (3).

To cope with this problem, Kim (2006b) devised *Markedness on Operations*, which quantifies the degrees of syntactic operations resulting from the operation of the force-realizing mechanism for realizing sentential forces such as declaratives and interrogatives as in Figure 2.

As represented on the continuum in Figure 2, weak forces such as the declarative force are located on one side, which are *less marked* in that fewer syntactic changes occur 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). Strong forces such as the focal force are located on the other side, which are *more marked* in that more syntactic movements take place in a sentence as the results of the operation. The

FIGURE 2
Markedness on Operations: Strong/Weak Force

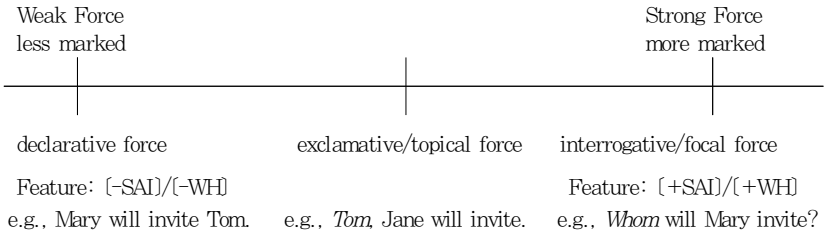

TABLE 3
Syntactic Developmental Sequence on Syntactic Mechanisms

Stages		Sequence	Mechanism	Movement	Critical Structures
Single CP Stages	V	[N]-[V]-[N]	Lexical-inserting	-	Canonical SVO,
	VP	$[_{VP}$[V'[V]NP]]	Theta-marking	Pragmatic mov.	*Adv/Do/Wh*-fronting
	IP	$[_{IP}$[I'[I][VP]]]	Case-marking	A-/H-to-H mov. (case-driven)	Aux-*en*/-*ing*, Y/N-inversion
	FocP	$[_{FocP}$[Foc'[IP]]]	Force-realizing	A-bar/H-to-H mov. (force-driven)	*Wh*-inversion, *Neg*-inversion
Double CP Stages	Base/Bare CP	[CP_1[CP_2[IP]]]	Force-matching (Markedness)	A-bar mov., H-to-H mov. (force-matching-driven)	*that*-clause, *for*-clause
	Non-cancel FocP				Indirect-question(sub.)
	TopP				Relatives (obj., oblique)
	Cancel FocP				Indirect-question(obj.)
	Re-FocP				Long distance-question
Multiple CP Stages		[CP^*[IP]]	Force-matching (Markedness)	A-bar mov. H-to-H mov.	⋮

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 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, according to Markedness, the Double CP stages governed by the force-matching mechanism can be decomposed into a number of discrete stages, i.e., the Base/Bare CP, the Non-cancel FocP, the TopP, the Cancel FocP, and the Re-FocP stage as in Table 3.

In sum, the SynDS not only explains the syntactic development processes of Double or Multiple CP stages (i.e., embedded clauses) as well as those of single ones (i.e., simple sentences), but also predict the critical structures and the error patterns manifested at each stage on the SynDS. However, the SynDS and its mechanisms are unable to explain the IL developmental processes of what Anderson calls procedural knowledge (i.e., processability). Thus, it can be argued that the SynDS needs to be complemented by the ProDS on the SPM discussed above.

2.1.3 Morphological Developmental Sequence

Pienemann (1998) proposed the Morpheme Processability Hierarchy based on the hierarchy of processing procedures[3] intertwined with the Uniqueness Condition (UC) as seen in (6). The UC, one of the well-formedness conditions in LFG, states that the values attributed to a constituent must be compatible, and hence governs the process of feature unification in a sentence.[4] Feature

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3) A set of language processing procedures, which is a core of the Processability Theory, constitutes an implicational hierarchy of Lemma-Category-Phrasal-Sentential-Subordinate Procedure, in which the processing procedure of each lower level is a necessary prerequisite for the functioning of the higher level (Pienemann, 1998).

4) Feature unification, the most prominent characteristic of LFG, is one that for each constituent of a sentence to be grammatically acceptable, each value of the grammatical features has to be matched both within a constituent and between constituents. Take the example of "John has *a toy*". In the NP (noun phrase) *a toy*, lexical entries *a* and *toy* are both annotated with the feature NUMBER, and in both cases this feature has the value *singular*. For the NP to be grammatical, the values of two constituents of the NP have to be matched.

unification, in turn, involves the grammatical encoding of semantic features or relations. Thus, the UC is a prerequisite for the grammatical encoding. From the acquisition perspective, the degrees of the application of the UC into different linguistic contexts determine the development of grammatical encoding.

(6) Morpheme Processability Hierarchy:
Lexical Morphemes→Phrasal Morphemes→Interphrasal Morphemes

According to Pienemann, the hierarchy in (6) forms an implicational scale in which Lexical morphemes are acquired prior to Phrasal morphemes, and Phrasal morphemes prior to Interphrasal morphemes. In this respect, Pienemann first determines a morphological developmental sequence in terms of the UC. Therefore, the hierarchy can provide a reasonable explanation as to which grammatical morphemes or features L2 learners can process or encode at what stage on morphological IL developmental sequence. However, with all its contributions to SLA, Pienemann's hierarchy is constructed so sparsely that it seems to have difficulty in explaining the IL developmental processes of the Interphrasal morphemes in (7).

(7) a. **These boys* are *a good detective*.
b. *I *demanded* that John invit***ed*** Mary *last Sunday*.

According to Pienemann's explanations, since, in the two NPs of (7a), *These boys* and *a good detective,* each value of the feature [Number] is unified within each phrase, they belong to the Phrasal morphemes. But, for the sentence to be acceptable, in addition to this phrasal affixation, feature unification has to take place again

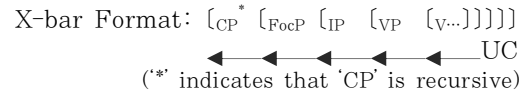
This matching process is called the 'feature unification' (Pienemann, 1998, p. 97).

across the phrasal boundaries, and hence this is considered to be interphrasal affixation rather than phrasal. In (7b), since, in the embedded clause, *John invited-ed Mary last Sunday*, each value of the feature [PAST] is unified across the phrasal boundaries, they belong to the Interphrasal morphemes. But, for the sentence to be grammatical, in addition to this affixation, another unification of [Subjunctive] has to occur again across the matrix and the embedded clause, and hence this can be considered to be double interphrasal affixation. Yet, by Pienemann's definition, both examples in (7) belong to the Interphrasal morphemes on the hierarchy in (6). This assumes that their morphological complexity will not be different. However, though feature unification takes place across the boundaries, there will be a difference in the morphological complexity of these morphemes depending on what linguistic context the UC is applied to, for example, IP or CP, adopting Minimalist terminology.

As a possible solution to this problem, Kim (2006a) proposed the *Unificational Mechanism* (UM), which is derived from intertwining the UC with the X-bar formats of the Minimalist program (Chomsky, 1992) as in Figure 3.

In Figure 3, the X-bar formats consist of V, VP, IP, FocP, and CP* in terms of X-bar theory, and hence this constitutes an implicational scale according to the logic of the Minimal Tree Approach. In addition, on each stage of the syntactic sequence, each relevant syntactic mechanism operates successively from the lowest local or minimal domain up to the highest local or minimal domain of the X-bar formats, and hence this also constitutes an implicational scale according to the logic of LC. Thus, by extrapolating from the syntactic developmental sequence to the UC, the syntactic domains or scopes of the UC into application also constitute an implicational scale. From this, the implicational sequence of the UC into application can be formalized as V-VP-IP-FocP-CP*.

FIGURE 3
Unificational Mechanism (UM)



Thus, the UM postulates that morphology interacts with syntax, and hence morphological IL development is implicationally contingent on syntactic IL development. It is consistent with epidemiological logic that only when IL learners are able to produce a certain syntactic structure, are they able to unify or match grammatical features or morphemes within the structure. Consequently, the UM not only governs the unificational processes of grammatical features or morphemes in real time (plays the role of the UC), but also determines the implicational syntactic domains or scopes on which the UC can operate, or in which feature unifications can take place.

Based on the UM, Kim (2006a) proposed a revised morphological developmental sequence called the Morphological Developmental Sequence (MorDS). As illustrated in Table 4, the Lexical stage involves the insertion of grammatical morphemes or features directly from the lexical entry without the operation of the UC or any exchange of grammatical information between constituents in a sentence (corresponding to Pienemann's Lexical morphemes). The Phrasal stage involves the operation of the UC within the domain of the $[_{VP}...]$ in which feature unification or exchanges of grammatical information take place (corresponding to Pienemann's Phrasal morphemes). The Clausal stage relates to the operation of the UC within the domain of the $[_{IP}...]$, where each grammatical morpheme or feature is unified compatibly (corresponding to Pienemann's Interphrasal morphemes). The Sentential stage involves the application of the UC within the domain of the $[_{FocP}...]$, in which feature unification or exchanges of grammatical information take

place. Finally, at the Intersentential stage, the UC operates across the domains of [$_{CP^*}$...], and hence feature unification or exchanges of grammatical information take place across the matrix and the embedded clauses. Now, in terms of the UM, a developmental stage can be assigned to each example of (7) as follows: (7a) belongs to the Clausal stage, and (7b) to the Intersentential stage, respectively.

TABLE 4
Morphological Developmental Sequence on the UM

Stages	Morphological Sequence		Critical Unifications (Agreements)
	Scopes of the UC	Feature Unification	
Lexical	[N][**V**][N]	No unification	-
Phrasal	[**VP** [$_{V}$…]]	Unification within a VP	Plural agr.
Clausal	[**IP** [$_{VP}$…]]	Unification within an IP	Tense/SV-agr.
Sentential	[**FocP**$_{(=CP)}$ [$_{IP}$…]]	Unification within a CP	Force-agr.
Intersentential	[**CP**…[$_{FocP(=CP)}$…]]	Unification across CPs	Tense/Modality-agr.

To sum up, the UM derived from the extrapolation of the UC to the syntactic developmental sequence captures the relative morphological complexity involved in unifying or encoding grammatical morphemes or features. In this respect, the UM functions as a sorting mechanism for sequentializing the MorDS as well as predicting the scopes of unification and critical unifications (agreements) on each stage of the MorDS as in Table 4. Thus, the MorDS can go beyond Pienemann's Morpheme Processability Hierarchy to explaining the interactional processes of morphological development with syntactic development more systematically by incorporating cognitive mechanisms (i.e., the UC) and linguistic mechanisms (i.e., the LC). However, the MorDS and the UM have trouble in explaining the IL developmental processes of structural systems (i.e., word-order rules), and thus the MorDS should be

complemented by the ProDS and the SynDS.

2.2 Parallel Developmental Sequence (PDS)

The three sub-developmental modules (i.e., the Procedural, the Syntactic, and the Morphological Sequence) discussed so for can be represented as seen in (8).

(8) The Three Sub-developmental Sequence Modules
  (a) Procedural Developmental Sequence Module (ProDS)
    SPM $f(\alpha, \beta, \gamma) = [\gamma$ SCM $([\alpha$ IFM$]/[\beta$ COM$])^{*}]$
  (b) Syntactic Developmental Sequence Module (SynDS)
    V→VP→IP→FocP(CP)→CP* Stage
  (c) Morphological Developmental Sequence Module (MorDS)
    Lexical→Phrasal→Clausal→Sentential→Intersentential Stage

In (8), as discussed above, the three sub-developmental modules (i.e., the ProDS, the SynDS, and the MorDS) are able to provide valid explanations for each own domain, but they have the complementary limitations of not being able to offer explanations for each other domain related to IL development. In other words, the ProDS (8a) explains processability, but can't explain grammaticality. Conversely, the SynDS (8b) explains grammaticality, but can't explain processability. The MorDS (8c) explains the morphological development, but can't explain the structural development (i.e., word-order rules).

A possible alternative to such complementary limitations might be what is called the Modular Approach (Ellis, 1994; Gregg, 1996; Pienemann, 1998; White, 1989), which suggests that each module is in a complementary relation with each other.[5] According to the

5) It can be said that such "complementary limitations" to each other module meet the two requirements of becoming *modular* proposed by Ellis (1994, p. 680), who states "For a theory to be truly *modular*, it is necessary to specify

Modular Approach, these three sub-developmental modules are integrated into a single modular model called the Parallel Developmental Sequence (PDS) Model as illustrated in Figure 4. The PDS constitutes the Parallel Developmental Stages sequentially (i.e., 1X, 2X,…, $1X^2$,…, $1X^3$,…, …kX^n (here n is the number of embedded clauses)), each stage of which the three sub-developmental sequences (the ProDS, the SynDS, and the MorDS) are incorporated into. Therefore, the PDS allows the complementary limitations to have complementary explanations for each other, and thus establishes an interface between the three sub-developmental sequences.

However, a problem has not yet been settled as to how the three modules interact or interconnect with each other in each Parallel Stage. On the logic of the parallel connections of the Parallel Distributed Processing Model (Rumelhart, McClelland & PDP Research Group, 1986), one of the three sub-stages of a Parallel Stage on the PDS is activated first, and then interconnected, and finally synchronized with each other through the synchronization process consisting of parallel activation, parallel connection, and synchronization as in Figure 4. Therefore, the PDS assumes that L2 learners at any Parallel Stage will first activate one of the three parallel mechanisms (i.e., procedural, syntactic, and unificational mechanisms), and then interconnect them, and finally synchronize with each other before moving on to the next stage on the PDS, and by repeating these processes recursively, finally, to pass through all the stages of the PDS up to the last Parallel Stage kX^n.

Yet, another open question has still remained on what leads IL development from one stage to the next higher stage on the PDS. By adopting the concepts of *gaps* and *driving force* proposed by Faerch and Kasper (1986) and White (1987).[6] Kim and Kwon (2005, 2007)

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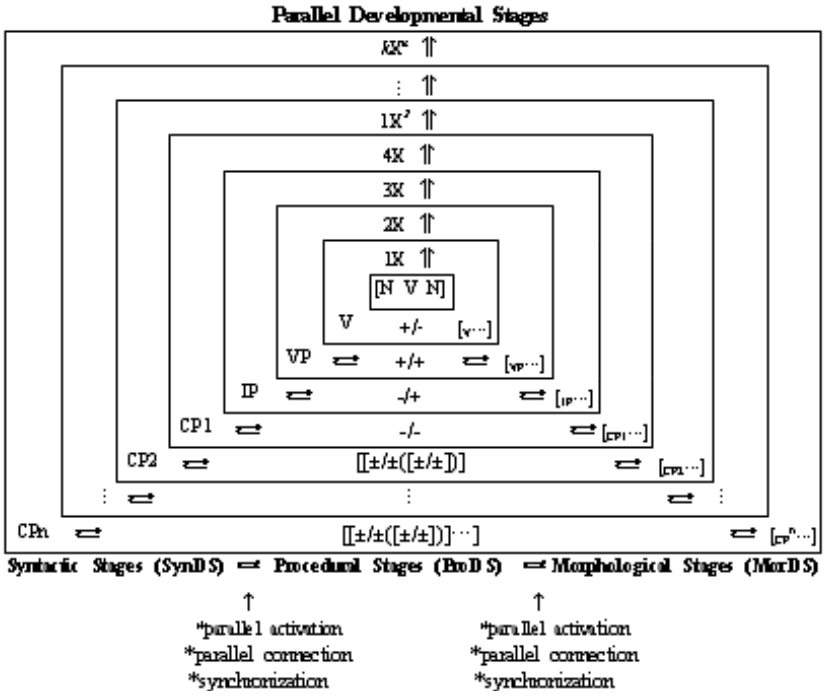
(1) the domain covered by the theory, as narrowly as possible, and (2) the domains that are not covered by the theory, in broad outline″.

6) Faerch and Kasper (1986) suggested that only when there is a *gap* between L2 learner′s output (i.e., the learners′ current IL) and L2 input, and then L2

FIGURE 4
Parallel Developmental Sequence (PDS) Model



suggested parallel developmental gaps as parallel developmental force in order to explain how L2 learners pass through each Parallel Stage on the PDS. IL structures (i.e., the output L2 learners produce) will be called the *triggering force*, and TL (target language) structures (i.e., the L2 input the learners receive in the linguistic environment) will be called the *triggering cue*. And the

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learners perceive the gap as a gap in knowledge, acquisition will take place. Similarly, White (1987) claimed that only when the input is incomprehensible rather than comprehensible, L2 learners are able to pay a closer attention to its syntactic features of a sentence, and thus the *incomprehensible input* is the *driving force* that causes the grammatical changes.

gaps between the triggering force and the triggering cue will be called the *parallel developmental gaps*. Thus, this study assumes that L2 learners develop from one parallel system to the subsequent one in a stepwise fashion on the PDS, by inducing a clue to bridge the parallel developmental gaps through the interaction between the triggering forces and the triggering cues.

Let us examine more specifically how L2 learners proceed from one Parallel Stage to the next higher Stage on the PDS, relying on the concepts of synchronization and the parallel developmental gaps. Suppose an L2 learner who has already been at Parallel Stage $3X^2$, but hasn't yet arrived at Parallel Stage $4X^2$. At this point, the learner can produce structures like (9a) and (9b) below by operating the core parallel systems available to them, while he or she may produce "interim" indirect questions like (9c) without canceling *wh*-inversion in an embedded clause due to the absence of the prerequisite *cancel mechanisms*. As Pienemann (1998) pointed out, these phenomena are almost universal in IL development. However, the learner will be exposed to grammatical sentences like (10a) as positive evidence to (9c) in the L2 input.

(9) a. *Whom does John like in the class?*
b. Do you know *who likes John in the class?*
c. *Do you know ***whom does*** *John like in the class?*

(10) a. Do you know ***whom*** *John like****s*** *in the class?*
b. [$_{FocP}$ do$_m$ [$_{IP}$ you$_n$ [I t_m [$_{VP}$ t_n know-t_m [$_{CP}$ whom$_i$ [$_{FocP}$ t_i [$_{FocP}$ does$_k$ [$_{IP}$ John$_l$ [I t_k [$_{VP}$ t_l [$_V$ like-t_k t_i]]]]]]]]]]].

At the Procedural Stage, as the learner perceives the procedural gaps through the interactions between the triggering force of (9) and the triggering cue of (10a), the learner comes to realize that combing the root *wh*-question in (9a) with the matrix question *Do you know* results in ungrammatical sentence as seen in (9c). Thus,

the learner can infer that when a root question becomes an embedded clause, SAI (Subject/Aux Inversion) has to be canceled, that is, *does* should be moved back to the original position, and this movement brings about word order changes. Substituting these movement and word-order changes for the SPM function, *f* (α, β, ɣ)=〔ɣSCM([αIFM]/[βCOM])〕, since what Pienemann (1998) calls *cancel inversion* takes place (since there is a double movement), the value of the variable α is ′−′. Since the double movements invite, in turn, word order changes, the value of the variable β is ′−′. And since the final landing site of the movements is within the embedded clause, the value of the variable ɣ is ′+′. Consequently, the learner can build up the SPM mechanism, 〔+SCM([-IFM]/[-COM])〕, and hence process cancel inversion structures like (10a).

At the Syntactic Stage, perceiving the syntactic gaps, the learner can infer that when a root *wh*-question becomes an embedded clause, the *wh*-phrase *whom* moves from the 〔Spec, FocP〕 into the 〔Spec, CP〕 position, and at the same time, the FocP, which has already been realized at the FocP Stage, has to be reinverted, that is, the auxiliary *does* is lowered out of the head *Foc* through the head *I* onto the head *V*, as seen in analysis (10b). This process can be called the *reverse* to H-to-H movement. Consequently, the learner can parse the Cancel-FocP structures, 〔$_{CP}$ 〔$_{CP}$ *wh* 〔$_{IP}$...〕〕〕 like (10a).

At the Morphological Stage, perceiving the unificational gaps, the learner can infer that when a root *wh*-question becomes an embedded clause, the 〔+SAI〕 feature has to be changed into 〔-SAI〕, and hence the operator *does* has to be substituted by the appropriate morphological form (i.e., *-s*) to affix the lexical verb *like*. This process can be called *reaffixation*. As a result, the learner can apply the UC across CPs (i.e., 〔$_{CP^*}$〔$_{FopP}$...〕〕), and hence unify morphemes or features such as 〔Tense〕, 〔Force〕, and 〔Subjunctive〕 across a matrix and embedded clauses (i.e., Tense/Force/Subjective-agreements).

Thus, it can be assumed that only when L2 learners first activate one of the three parallel mechanisms of a Parallel Stage through the interaction of triggering forces and triggering cues, and then interconnect them, and finally synchronize with each other through the synchronization processes, will they proceed to the next higher Parallel Stage. Gathering up all these threads, the Parallel Developmental Sequence can be represented as shown in Table 5.

TABLE 5
Parallel Developmental Sequence

Parallel Stages	Parallel Mechanisms			Critical structures	Error Pattern
	Syntactic M.	Procedural M.	Unificational M.		
1X	Lexical-inserting	[·IFM][+COM]	No unification	Canonical SVO	…
2X	Theta-marking	[+IFM][+COM]	Phrasal: [$_{VP}$ ··]	*Adv/wh/Do*-fronting	…
3X	Case-marking	[+IFM][-COM]	Clausal: [$_{IP}$ ··]	*Aux-en/-ing*; Y/N-question	…
4X	Force-realizing	[-IFM][-COM]	Sentential: [$_{CP}$ ··]	*wh*-questions, *Neg*-Inv.	…
$1X^2$		[·SCM([·IFM][+COM)]		*that/for*-clause	…
$2X^2$	Force-matching,	[+SCM([+IFM][+COM)]		indirect question,	…
$3X^2$	Markedness on	[+SCM([+IFM][-COM)]	Intersentential: [$_{CP}$ ··]	relative (obj. oblique)	…
$4X^2$	Operations	[+SCM([-IFM][-COM)]		indirect question(obj.)	…
$5X^2$		[-SCM([-IFM][-COM)]		long distance question	…
kX^3	…	[±SCM([±SCM)]	…	double complex	…
⋮	⋮	⋮	⋮	⋮	⋮
kX^n	…	…	…	…	…

(Adapted from Kim & Kwon, 2007, p. 259)

A closer examination of the Table 5 shows that inherent in the PDS is an implicational relation in which the higher stage can subsume the parallel mechanisms, the critical structures and error patterns of the lower stages, but not *vice versa*. What this implicational relation means is that no Parallel Stage on the PDS can be skipped or beaten, and hence, in a sense, the PDS

constitutes the predetermined shedding processes of the parallel mechanisms. Therefore, L2 learners cannot proceed from one stage to the subsequent until they can *process*, *parse* and *unify* the parallel mechanisms imposed on a given stage in the PDS, just as a caterpillar goes through the ordained shedding process step by step and finally becomes a butterfly. In conclusion, not only can the PDS Model explain processability, grammaticality and unificationality, but also the IL development of simple sentences as well as that of embedded clauses.

3. Testing Parallel Developmental Sequence (PDS)

3.1 Research Method[7)]

3.1.1 Participants

The participants of this research consisted of 258 (39 males and 219 females) Korean EFL students of three universities (two are located in Seoul, and one in Gyeonggi province). The participants' average age was 23.3, ranging from 19 to 35, from freshmen to seniors. Their majors were various, including Korean (17%), English (32%), French (21%), Japanese (6%), Chinese (7%), history (8%), philosophy (4%), economics (2%), law (2%), and engineering (1%).

3.1.2 Instruments

Since there was not much similar research done previously to adapt stimulus sentences from, the stimuli had to be constructed

7) This study may be a complement to Kim and Kwon's (2005, 2007). The study examined only the correspondence of the performance PDS to the theoretical PDS, but this study examines not only the correspondence but also the relationship of the Parallel Stages and language performance (grammar). For the consistencies of the two studies, this study used the same research method as that of Kim and Kwon (2005, 2007).

based on both the longitudinal data from sequence-based SLA research (Pienemann, 1998; Pienemann & Johnston, 1987; Pienemann, Johnston & Brindley, 1988) and the experimental data from research of relatives and *wh*-extractions (Doughty, 1991; Juffs & Harrington, 1995). The stimulus sentences were developed as follows: from each parallel stage on the PDS (see Table 5), critical structures were first chosen. Based on these structures, five critical sentences were composed, which best reflected the parallel mechanisms of each stage of the PDS. In order to minimize the effects of the length of the sentences and words on the experiment, each critical sentence was made up of "7±2" thought groups according to Miller's *magic number* (1956), using basic words and familiar proper nouns. These five critical sentences consisted of stimuli called the *critical sentence set* of forty-five items (see Appendix A).

The critical sentences were converted into two kinds of Sentence Construction Tests (SCT): the Sentence Conversion and the Sentence Combination Test. The SCT is a kind of IL-sensitive tests in that the items are geared to each stage of the PDS. These tests were played in real time onto the *Flash-window Method*. As in Figure 5 and 6, the method consisted of four phases (i.e., the Preparation, the Performance, the Completion, and the Relaxation Phase). In the Preparation Phase, the participants were asked to read a given sentence or two or more sentences on the screen within a given time (160 wpm). At the Performance Phase, in the case of the Sentence Conversion Tests, as seen in Figure 5, they were required to convert the sentence into another pattern (e.g., *wh*-questions) in their mind within a given time (120 wpm). In the Sentence Combination Tests, as seen in Figure 6, they were required to combine two or more sentences to form one complex sentence (e.g., indirect questions) in their mind within a given time.

In the Completion Phase, they were asked to write down the converted or combined sentence they had just processed in their mind (60 wpm). Finally, in the Relaxation Phase, music was played

for about 10 seconds to help them to erase the previous item from their memories, to relieve their tension, and to prepare for the next item.

Since the SCT was implemented in real time, the participants had to process appropriately such grammatical changes in parallel as constituent movements, word-order changes, and unifications of grammatical features or morphemes to convert or combine sentences in real time. In this respect, the Flash-window Method can elicit more spontaneous responses from L2 learners than simple recall tests since it makes them rely less on their recall and more on actual processes in real time. Thus, the real-time method can provide

FIGURE 5
Sentence Construction Test on the Flash-window Method

[Preparation Phase]: Preparing Instruction **Please read the following sentence carefully.** (A cursor will blink for 3 seconds, and then the following sentence will appear.) **John kissed Mary last night.** (This window will disappear in 2 seconds.)
[Performance Phase]: Performing Instruction **Change "*last night*" into "*when*" in the following sentence, and make a *wh*-question in your mind.** (This window will disappear in 5 seconds, and then the following sentence will appear.) **John kissed Mary *last night*?** **↑** **When** (This window will disappear in 3 seconds.)
[Completion Phase]: Completing Instruction **Type the question you thought of on the blank.** **‖ _____?** (This window will disappear in 15 seconds.)
[Relaxation Phase]: Along with a buzzer signaling the end of writing, music is played for 10 seconds, and then another buzzer signals the start of the next item.

FIGURE 6
Sentence Combination Test on the Flash-window Method

[Preparation Phase]: Preparing Instruction **Please read the following two sentences carefully.** (A cursor will blink for 3 seconds, and then the following sentence will appear.) **Do you know ...?** **Who kissed Mary last night?** (This window will disappear in 2 seconds.)
[Performance Phase]: Performing Instruction **Combine the next two sentences to make an indirect-question in your mind.** (This window will disappear in 5 seconds, and then the following sentence will appear.) **Do you know? + Who kissed Mary last night?** (This window will disappear in 4 seconds.)
[Completion Phase]: Completing Instruction **Type the question you thought of on the blank.** ‖___? (This window will disappear in 15 seconds.)
[Relaxation Phase]: Along with a buzzer signaling the end of writing, music is played for 10 seconds, and then another buzzer signals the start of the next item

a more sensitive measure for research into processability of IL development.

Also, in order to demonstrate the relationship of Parallel Developmental Stages of the PDS and scores on a standardized test, this study adopted the Grammar (GR) tests of the TEPS. The GR test was slightly tailored for this research. Out of the 50 items on the test, the last 10 items were excluded because the types and the length of the items and the degree of difficulty were quite different from the other part of the test.

3.1.3 Data Collection Procedures

Participants were given some explanations of two types of SCT, and then presented a set of practice items with a beam projector to

familiarize them with the tests. After the practice items had been run, they were presented the randomized sentence set. The test took about 60 minutes. After the test was completed, the participants were asked to fill out a biodata questionnaire and an *excuse blank*: "I couldn't do my best in the test because of "_____" (such as having a cold, mental distraction, or reluctance). The excuse blank was intended to give an opportunity to make any excuse for a participant who did not bias for best, and hence to exclude his or her data from the corpus. In the GR test section, participants were told not to select an answer from the choices by "wild guessing". The GR test lasted 15 minutes. After the tests were finished, the participants were asked to fill out the questionnaire.

3.1.4 Data Analysis Procedures

Of all the data elicited from the participants through the SCT, the following were excluded in order to minimize the effects of faulty data on the result of the analysis: (a) irrelevant or unintelligible (illegible) cases, (b) cases unanswered to more than three items in a row, (c) cases filled out an excuse blank. The other data were analyzed by the following procedures. For the sake of the analysis, to each response of each participant to each test item, a plus (+), a minus (-) or an equal (=) was given according to the degree of matching of a participant's response against the answer. A '+' was given to a response when it was matched to the answer. A '-' was given when it was either not matched to the answer or incomplete. If a response was not completely matched to the answer, and interim or transitional critical structures were "reconstructed" from it by the IL analysis, a '=' was given to the corresponding parallel stage which the reconstructed structures belong to on the PDS. Also, only trivial or insignificant lexical errors with no relations to the parallel mechanisms were also overlooked.

Criterion for *Pass* of each stage on the PDS was set as follows. If more than four responses of the five items of each stage match the

answers, a positive (+) was marked on the implicational scale, which means that the learner was considered passing the stage in question (called the *pass stage*). If less than four match the answers, a negative (-) was marked on the scale, which means that the learner was considered not passing the stage (called the *non-pass stage*).[8] In the GR test, one point was assigned to each item if it was a right answer, and then the number of right answers was tallied up.

3.2 Results and Discussion

3.2.1 The Correspondence of the Performance PDS to the Theoretical PDS

In order to see whether the theoretical Parallel Developmental Stages reflect the actual developmental stages of the L2 learner, the implicational scaling of the performance PDS was conducted. Of the responses elicited from the total 258 participants through the SCT, 19 cases in the unanalyzable categories were excluded from the analysis. The others (239 cases) were analyzed by the Implicational Scaling Test.

The implicational scaling of those 239 cases was displayed in the *implicational scalogram* table (see Appendix B). On the top of the table, the parallel stages of the PDS are listed from right to left in order of the hierarchy. In the table, the vertical bold line in a reverse-stair shape represents the marginal line of an "idealized" implicational scaling. As shown in the table, the scalogram demonstrated that there were significant degrees of implicational scaling on the actual PDS. The degrees of the correspondence of the performance PDS to the theoretical PDS were calculated by the *Guttman Procedures* (Hatch & Lazaraton, 1991). The calculation showed that the coefficient of scalability was .81, far greater than

8) This research simply followed convention that requires five instances and an 80% cut off points, though there is no well-documented rationale for either of these conventions (Hatch & Lazaraton, 1991, p. 215).

the minimum requirement of .60 for an acceptable scale.[9] The high scalability means that the performance PDS produced in real time by the L2 learners through SCT significantly corresponds to the theoretical PDS built by the study.[10]

3.2.2 The Relationship of the PDS and Language Proficiency

In order to see if there is a relationship between Parallel Developmental Stages of the PDS and the scores on the GR test of the TEPS (see the last two columns in the table in Appendix B), the Spearman Correlation Test was conducted. As illustrated in Table 6, the Parallel Stages of the PDS were highly correlated with the scores on the GR test (ρ=.87, $p<.01$), implying that the validity of the PDS is demonstrated by a concurrent validity test.

TABLE 6
Correlations between PDS and GR

	PDS	GR
PDS	1	
GR	.87*	1

9) In addition to this evidence, some additional proofs were found, for example, the correspondences of the errors predicted by the PDS to the actual ones produced by the participants, and the existence of "transitional" or "On-or-Off stage" on the performance PDS.

10) While the PDS is held to be invariant, there are a few learners who deviate from the ideal PDS. There seem to be some reasons for this deviation. One source may be found in L2 learner's socio-affective factors. As Larsen-Freeman and Long (1991) pointed out, standard-oriented learners, preferring accuracy, tend to elaborate IL rules, and hence will have a tendency to pass from one stage to the next higher stage on the PDS in a stepwise fashion. On the other hand, simplifying learners, favouring communicative effectiveness, tend to simplify the rules, and hence will be liable to skip or beat the stages on the PDS. Another source of this distortion may be responsible for the characteristics of IL rules (sudden vs. gradual rules, simple vs. complex rules) (For full explanation of the IL rules, see Kim, 2006a, pp. 153-155).

A more in-depth analysis, the Kruskal-Wallis Test was run to examine whether there is a rank difference of language proficiency among stages of the PDS. As shown in Table 7, the value for Kruskal-Wallis χ^2 stood at 178.51 for GR. In addition, as in Table 8, the Parallel Stages of the PDS came into line with the order of mean ranks of the GR test, which proves a statistical difference among the stages of the PDS. All these suggest that the PDS has a potential for developing an *IL-sensitive* or *acquisition-oriented scale* in language teaching and testing.

TABLE 7
Kruskal-Wallis Test Statistics (a, b)

	GR
Chi-Square	178.51
Df	9
Asymp. Sig	.000

Note. a. Kruskal-Wallis Test, b. Grouping Variable: PDS

TABLE 8
Kruskal-Wallis Test: Ranks

Stages of the PDS	N (234)	Mean Rank: GR
1X	9	7.39
2X	17	28.94
3X	27	52.74
4X	30	78.32
$1X^2$	38	102.59
$2X^2$	31	135.56
$3X^2$	29	158.78
$4X^2$	26	187.38
$5X^2$	22	201.39
kX^3	5	231.00

4. Conclusion and Implications

On the basis of the reviews of such SLA theories as the

Multidimensional Model (Pienemann & Johnston, 1987), the Minimal Tree Hypothesis (Vainikka & Young-Scholten, 1998), and the Processability Theory (Pienemann, 1998), Kim and Kwon (2005, 2007) proposed a modular model called the Parallel Developmental Sequence (PDS) Model. The PDS comprises the Parallel Developmental Stages sequentially, each stage of which three sub-developmental sequences (i.e., the Procedural, the Syntactic, and the Morphological Sequence) are incorporated into. Thus, the PDS provides an interface between the three sub-developmental sequences, thereby explaining the IL developmental processes of processability, grammaticality, and morphologicality. In addition, it can explain the developmental processes of embedded clauses as well as simple sentences. To see whether the theoretically built Parallel Developmental Stages of the PDS reflects L2 learners′ actual developmental stages and correlates their language proficiency, the Implicational Scaling, the Spearman Correlation, and the Kruskal-Wallis Test were conducted. The result of the Implicational Scaling test showed that the performance PDS produced by the L2 learners significantly corresponds to the theoretical PDS. In addition, the analyses of the Spearman Correlation and the Kruskal-Wallis Test demonstrated that the theoretical PDS has its own validity.

In conclusion, the PDS Model is a kind of acquisitional map along which L2 learners proceed from the initial stage to the next higher stages, in a stepwise fashion, until up to the final stage on the PDS. Thus, just as when we are on our trip to a strange place, relying on the map of that area, we can find out our journey route from where we are now to where we are going to go next, so, by analyzing L2 learners′ IL data, we can find out not only where they are now on the acquisitional map, that is, what structures or rules they are able to process, parse, and unify in terms of the PDS, but also we can predict where they are going to go next on the map, that is, what structures or rules they are able to learn next in terms of the PDS. Thus, the PDS Model can provide a theoretical framework for

developing acquisition-based syllabus, acquisition-tailored teaching, and acquisition-oriented testing.

One implication or application of the PDS into language pedagogy is acquisition-based syllabus. To incorporate the PDS into what we call the notional-functional syllabus, the resulting syllabus can be geared to or tailored for L2 learners′ developmental stages, thereby helping us to develop learner-tailored teaching materials and textbooks. Another is acquisition-tailored teaching. This can be derived from what Pienemann (1985, 1998) calls Teachability Principle, meaning that any instruction will be beneficial if it focuses on structures or rules of the next or subsequent stage of an L2 learner's current stage. Thus, the PDS can provide a possible answer to the principal question, in recent research into Form-focused Instruction, of when and how to provide what rules for IL learners (Doughty & Williams, 1998; Robinson, 1996), thereby giving them a "tailored teaching". A third implication or application is acquisition- oriented testing. The PDS Model can shed a new light on such crucial notions for test developers as developmental sequence and teachability principle, and enables test designer to develop an *acquisition-oriented scale* that is sensitive to language developmental sequence. The resulting scale can function as an *IL-sensitive scale* for identifying L2 learners' current developmental stages, diagnosing the deficiencies in their IL systems, and predicting what rules or structures will be learnable next, thereby giving them a "timely remedy and tailored teaching". Yet, the PDS needs more prescriptions for a developmental sequence of language functions as a theoretical counterpart of the PDS, and for a specific way for applying it to language pedagogy.

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Appendix A
A Critical Sentence Set

1. Parallel Developmental Stage 1X

2. Parallel Developmental Stage 2X

1) Do you wash the dishes everyday?
2) Who opened the windows on this cold day?
3) What happened at the party last night?
4) Who appeared on the concert last night?
5) Do you play tennis with your friends every weekend?

3. Parallel Developmental Stage 3X

1) Did you watch that news on TV last night?
2) Can you go camping with us this weekend?
3) Have you read an English novel recently?
4) Do you want to go there this weekend?
5) Would you like to have a snack after studying?

4. Parallel Developmental Stage 4X

1) When did you see her on the campus?
2) Where would you like to have a drink after the show?
3) What have you been writing since last week?
4) Who do you want to meet at the concert this Friday?
5) What did you give to Mary at the party last night?

5. Parallel Developmental Stage X^2

5.1 Parallel Developmental Stage $1X^2$

1) Did you ask her to go for a drive last night?
2) What does he want you to do this summer vacation?
3) Who does she expect to hold a party next time?
4) Who does he want her to meet this Sunday?
5) I think that John is going with his sweetheart to the concert today.

5.2 Parallel Developmental Stage $2X^2$

1) Did you ask your daughter who liked her in her class?
2) The man who studies mechanics at college will investigate the car accident.
3) Do you know who taught English to this class last year?
4) Have you ever met the lady who was talking with John in the park last night?
5) Do you know who helped him to fix the broken TV?

5.3. Parallel Developmental Stage $3X^2$

1) John has proposed to the girl whom you longed to meet at college.
2) The girl whom you taught in college is going to marry my son next month.
3) The man whom Mary spoke to in the theater studies history at the college.
4) Have you ever met the man whom my father expects me to marry?
5) John employed a woman whom he thought to be honest at the job interview.

5.4 Parallel Developmental Stage $4X^2$

1) Does she know whom John came with to the party last night?
2) Do you want to know why Jane decided to divorce her husband last year?
3) Would you like to know who(m) my mother wants me to meet this Sunday?
4) Do you want to know who(m)Tom ordered to fire her after the audit?
5) Did you ask Mary what she handed John during history class?

5.5 Parallel Developmental Stage $5X^2$

1) Why do you think John parted from his sweetheart last week?
2) Where do you think they went to have drinks after the show?
3) Who does she think John handed the note to during the English test?
4) Who do you think Mary expects him to invite to the reception?
5) Who do you suppose John wants to introduce her to the mayor?

6. Parallel Developmental Stage kX^3

1) Do you want to know who John thinks Mary gave the nice gift to at the party?
2) Who do you guess Mary thinks John loves at the college?
3) Do you know who Mary thinks John asked Alice to invite to the reception?
4) Who do you believe John thinks Mary wants to introduce Alice to the president?
5) Who do you think John believes Mary told Alice to fire after the audit?

Appendix B

The Implicational Scaling Scalogram

Subj.	Parallel Developmental Stages										Stage	TEPS
	X^3	$5X^2$	$4X^2$	$3X^2$	$2X^2$	$1X^2/5X$	4X	3X	2X	1X	Performed	GR
s01	+	+	+	+	+	+	+	+	+	+	10	36
y54	+	+	+	+	+	+	+	+	+	+	10	34
y74	+	+	+	+	+	+	+	+	+	+	10	33
j08	+	+	+	+	+	+	+	+	+	+	10	33
j29	+	+	+	+	+	+	+	+	+	+	10	32
s02	-	+	+	+	+	+	+	+	+	+	9	27
y88	-	+	+	+	+	+	+	+	+	+	9	33
j01	-	+	+	+	+	+	+	+	+	+	9	33
j20	-	+	+	+	+	+	+	+	+	+	9	32
s07	-	+	+	+	+	+	+	+	+	+	9	31
y34	-	+	+	+	+	+	+	+	+	+	9	31
j11	-	+	+	+	+	+	+	+	+	+	9	31
j25	-	+	+	+	+	+	+	+	+	+	9	30
s17	-	+	+	+	+	+	+	+	+	+	9	30
j05	-	+	+	+	+	+	+	+	+	+	9	30
j10	-	+	+	+	+	+	+	+	+	+	9	29
y18	-	+	+	+	+	+	+	+	+	+	9	28
y36	-	+	+	+	+	+	+	+	+	+	9	28
y38	-	+	+	+	+	+	+	+	+	+	9	30
s27	-	+	+	+	+	+	+	+	+	+	9	26
y68	-	+	+	+	+	+	+	+	+	+	9	26
s39	-	+	+	+	+	+	+	+	+	+	9	25
y31	-	+	+	+	+	+	+	+	+	+	9	25
y49	-	+	+	+	+	+	+	+	+	+	9	21
s78	-	+	+	+	+	+	+	+	+	+	9	x
s90	-	+	+	+	+	+	+	+	+	+	9	31
s103	-	+	+	+	+	+	+	+	+	+	9	27
s105	-	+	+	+	+	+	+	+	+	+	9	30
s28	-	(+)	+	(-)	+	+	+	+	+	+	8	27
s95	-	(+)	+	(-)	+	+	+	+	+	+	8	31
y10	-	-	+	+	+	+	+	+	+	+	8	22
y55	-	(+)	+	(-)	+	+	+	+	+	+	8	30
j34	-	(+)	+	(-)	+	+	+	+	+	+	8	24
y57	-	-	+	+	+	+	+	+	+	+	8	31
s03	-	-	+	+	+	+	+	+	+	+	8	x
y79	-	-	+	+	+	+	+	+	+	+	8	29
y01	-	-	+	+	+	+	+	+	+	+	8	24
s05	-	-	+	+	+	+	+	+	+	+	8	27
s16	-	-	+	+	+	+	+	+	+	+	8	25
y78	-	-	+	+	+	+	+	+	+	+	8	32
y102	-	-	+	+	+	+	+	+	+	+	8	25
y56	-	-	+	+	+	+	+	+	+	+	8	25
y77	-	-	+	+	+	+	+	+	+	+	8	28
s26	-	-	+	+	+	+	+	+	+	+	8	28
y60	-	-	+	+	+	+	+	+	+	+	8	28
y40	-	-	+	+	+	+	+	+	+	+	8	28
s40	-	-	+	+	+	+	+	+	+	+	8	25
s42	-	-	+	+	+	+	+	+	+	+	8	25
s63	-	-	+	+	+	+	+	+	+	+	8	30
s106	-	-	+	+	+	+	+	+	+	+	8	26
y112	-	-	+	+	+	+	+	+	+	+	8	26
s107	-	-	+	+	+	+	+	+	+	+	8	28

y110	-	-	+	+	+	+	+	+	+	+	8	22
y106	-	-	+	+	+	+	+	+	+	+	8	26
y45	-	-	+	+	+	+	+	+	+	+	8	23
j06	-	(+)	(+)	(-)	+	(-)	+	+	+	+	7	x
s56	-	-	(+)	(-)	+	+	+	+	+	+	7	22
y58	-	-	(+)	(-)	+	+	+	+	+	+	7	25
s65	-	-	(+)	(-)	+	+	+	+	+	+	7	27
y32	-	-	(+)	(-)	+	+	+	+	+	+	7	30
y02	-	-	(+)	(-)	+	+	+	+	+	+	7	24
j09	-	-	(+)	(-)	+	+	+	+	+	+	7	24
s73	-	-	(+)	(-)	+	+	+	+	+	+	7	24
y90	-	-	-	+	+	+	+	+	+	+	7	28
y65	-	-	-	+	+	+	+	+	+	+	7	27
y71	-	-	(+)	(-)	+	+	+	+	+	+	7	27
y39	-	-	-	+	+	+	+	+	+	+	7	23
s76	-	-	(+)	(-)	+	+	+	+	+	+	7	22
j42	-	-	(+)	(-)	+	+	+	+	+	+	7	21
s88	-	-	(+)	+	(-)	+	+	+	+	+	7	27
s41	-	-	(+)	+	+	(-)	+	+	+	+	7	27
s54	-	-	(+)	+	+	(-)	+	+	+	+	7	23
j04	-	-	-	+	+	+	+	+	+	+	7	26
s18	-	-	-	+	+	+	+	+	+	+	7	22
y100	-	-	-	+	+	+	+	+	+	+	7	22
y101	-	-	-	+	+	+	+	+	+	+	7	22
y108	-	-	-	+	+	+	+	+	+	+	7	22
s25	-	-	-	+	+	+	+	+	+	+	7	23
s29	-	-	-	+	+	+	+	+	+	+	7	24
y105	-	-	-	+	+	+	+	+	+	+	7	24
y13	-	-	(+)	(-)	+	+	+	+	+	+	7	25
s45	-	-	-	+	+	+	+	+	+	+	7	22
s77	-	-	-	+	+	+	+	+	+	+	7	23
s81	-	-	-	+	+	+	+	+	+	+	7	23
s98	-	-	-	+	+	+	+	+	+	+	7	21
s15	-	-	(+)	(+)	(-)	(-)	+	+	+	+	6	27
s96	-	-	-	(+)	(-)	+	+	+	+	+	6	22
s06	-	-	-	(+)	+	(-)	+	+	+	+	6	29
y50	-	-	-	(+)	+	(-)	+	+	+	+	6	17
s94	-	-	-	(+)	+	(-)	+	+	+	+	6	20
y16	-	-	-	-	+	+	+	+	+	+	6	22
y84	-	-	(+)	-	(-)	+	+	+	+	+	6	21
y86	-	-	(+)	-	(-)	+	+	+	+	+	6	21
y87	-	-	(+)	-	(-)	+	+	+	+	+	6	24
y27	-	-	-	-	+	+	+	+	+	+	6	21
s04	-	-	-	-	+	+	+	+	+	+	6	18
s12	-	-	-	-	+	+	+	+	+	+	6	25
y72	-	-	-	-	+	+	+	+	+	+	6	25
y92	-	-	-	-	+	+	+	+	+	+	6	24
y104	-	-	-	-	+	+	+	+	+	+	6	23
j07	-	-	-	-	+	+	+	+	+	+	6	23
y61	-	-	-	-	+	+	+	+	+	+	6	20
s22	-	-	-	-	+	+	+	+	+	+	6	20
119	-	-	-	-	+	+	+	+	+	+	6	24
s14	-	-	-	-	+	+	+	+	+	+	6	28
j15	-	-	-	-	+	+	+	+	+	+	6	25
y23	-	-	-	-	+	+	+	+	+	+	6	24
s46	-	-	-	-	+	+	+	+	+	+	6	22
y08	-	-	-	-	+	+	+	+	+	+	6	21
s62	-	-	-	-	+	+	+	+	+	+	6	25
s67	-	-	-	-	+	+	+	+	+	+	6	21

s48	-	-	-	-	+	+	+	+	+	+	6	16
y62	-	-	-	-	+	+	+	+	+	+	6	16
s99	-	-	-	-	+	+	+	+	+	+	6	19
s85	-	-	-	-	+	+	+	+	+	+	6	30
s86	-	-	-	-	+	+	+	+	+	+	6	23
j13	-	-	-	-	(+)	+	(-)	+	+	+	5	23
y29	-	-	-	-	-	+	+	+	+	+	5	24
y97	-	-	-	-	-	+	+	+	+	+	5	25
y124	-	-	-	-	-	+	+	+	+	+	5	25
y30	-	-	-	-	-	+	+	+	+	+	5	25
s24	-	-	-	-	(+)	(-)	+	+	+	+	5	21
y06	-	-	-	-	(+)	(-)	+	+	+	+	5	19
s37	-	-	-	-	(+)	(-)	+	+	+	+	5	18
s08	-	-	-	-	(+)	(-)	+	+	+	+	5	22
s09	-	-	-	-	(+)	(-)	+	+	+	+	5	23
s49	-	-	-	-	(+)	(-)	+	+	+	+	5	22
s55	-	-	-	-	(+)	(-)	+	+	+	+	5	21
s68	-	-	-	-	(+)	(-)	+	+	+	+	5	23
y83	-	-	-	(+)	-	(-)	+	+	+	+	5	18
s11	-	-	-	-	-	+	+	+	+	+	5	18
y15	-	-	-	-	-	+	+	+	+	+	5	19
s20	-	-	-	-	-	+	+	+	+	+	5	23
j03	-	-	-	-	-	+	+	+	+	+	5	22
y117	-	-	-	-	-	+	+	+	+	+	5	22
y28	-	-	-	-	-	+	+	+	+	+	5	20
j16	-	-	-	-	-	+	+	+	+	+	5	21
y75	-	-	-	-	-	+	+	+	+	+	5	18
s35	-	-	-	-	-	+	+	+	+	+	5	19
y59	-	-	-	-	-	+	+	+	+	+	5	19
s51	-	-	-	-	-	+	+	+	+	+	5	19
s52	-	-	-	-	-	+	+	+	+	+	5	21
s69	-	-	-	-	-	+	+	+	+	+	5	15
y66	-	-	-	-	-	+	+	+	+	+	5	17
s89	-	-	-	-	-	+	+	+	+	+	5	19
y85	-	-	-	-	-	+	+	+	+	+	5	20
j23	-	-	-	-	-	+	+	+	+	+	5	18
y20	-	-	-	-	-	+	+	+	+	+	5	18
s30	-	-	-	-	-	+	+	+	+	+	5	18
s104	-	-	-	-	-	+	+	+	+	+	5	18
y17	-	-	-	-	-	+	+	+	+	+	5	16
j12	-	-	-	-	-	+	+	+	+	+	5	15
y21	-	-	-	-	(+)	(-)	+	+	+	+	5	14
s108	-	-	-	-	-	+	+	+	+	+	5	19
s87	-	-	-	-	-	(+)	(-)	+	+	+	4	17
j02	-	-	-	-	-	-	+	+	+	+	4	25
y43	-	-	-	-	-	(+)	(-)	+	+	+	4	23
y70	-	-	-	-	-	-	+	+	+	+	4	23
y12	-	-	-	-	-	-	+	+	+	+	4	16
j41	-	-	-	-	-	-	+	+	+	+	4	21
y11	-	-	-	-	-	-	+	+	+	+	4	18
s21	-	-	-	-	-	-	+	+	+	+	4	18
s32	-	-	-	-	-	-	+	+	+	+	4	20
s33	-	-	-	-	-	-	+	+	+	+	4	20
y52	-	-	-	-	-	-	+	+	+	+	4	20
s36	-	-	-	-	-	-	+	+	+	+	4	19
y111	-	-	-	-	-	-	+	+	+	+	4	19
y04	-	-	-	-	-	-	+	+	+	+	4	18
y24	-	-	-	-	-	-	+	+	+	+	4	18
j24	-	-	-	-	-	-	+	+	+	+	4	17
s38	-	-	-	-	-	-	+	+	+	+	4	15

s43	-	-	-	-	-	-	+	+	+	+	4	15
y41	-	-	-	-	-	-	+	+	+	+	4	14
y107	-	-	-	-	-	-	+	+	+	+	4	13
s47	-	-	-	-	-	-	+	+	+	+	4	12
s53	-	-	-	-	-	-	+	+	+	+	4	16
s57	-	-	-	-	-	-	+	+	+	+	4	20
s75	-	-	-	-	-	-	+	+	+	+	4	16
s79	-	-	-	-	-	-	+	+	+	+	4	20
j38	-	-	-	-	-	-	+	+	+	+	4	19
j14	-	-	-	-	-	-	+	+	+	+	4	17
s80	-	-	-	-	-	-	+	+	+	+	4	16
s84	-	-	-	-	-	-	+	+	+	+	4	19
s100	-	-	-	-	-	-	+	+	+	+	4	16
j17	-	-	-	-	-	-	-	+	+	+	3	22
y19	-	-	-	-	-	-	-	+	+	+	3	20
y35	-	-	-	-	-	-	-	+	+	+	3	21
y51	-	-	-	-	-	-	-	+	+	+	3	20
s19	-	-	-	-	-	-	-	+	+	+	3	16
y03	-	-	-	-	-	-	-	+	+	+	3	15
s23	-	-	-	-	-	-	-	+	+	+	3	15
y80	-	-	-	-	-	-	-	+	+	+	3	15
y46	-	-	-	-	-	-	-	+	+	+	3	15
s34	-	-	-	-	-	-	-	+	+	+	3	17
y76	-	-	-	-	-	-	-	+	+	+	3	18
j26	-	-	-	-	-	-	-	+	+	+	3	16
s50	-	-	-	-	-	-	-	+	+	+	3	15
s66	-	-	-	-	-	-	-	+	+	+	3	14
y103	-	-	-	-	-	-	-	+	+	+	3	14
s70	-	-	-	-	-	-	-	+	+	+	3	15
s72	-	-	-	-	-	-	-	+	+	+	3	17
s74	-	-	-	-	-	-	-	+	+	+	3	13
s82	-	-	-	-	-	-	-	+	+	+	3	19
j36	-	-	-	-	-	-	-	+	+	+	3	13
y69	-	-	-	-	-	-	-	+	+	+	3	13
j30	-	-	-	-	-	-	-	+	+	+	3	11
s97	-	-	-	-	-	-	-	+	+	+	3	13
s101	-	-	-	-	-	-	-	+	+	+	3	18
s91	-	-	-	-	-	-	-	+	+	+	3	12
s92	-	-	-	-	-	-	-	+	+	+	3	14
j21	-	-	-	-	-	-	-	+	+	+	3	12
j37	-	-	-	-	-	-	-	-	+	+	2	13
y47	-	-	-	-	-	-	-	-	+	+	2	17
j31	-	-	-	-	-	-	-	-	+	+	2	13
j32	-	-	-	-	-	-	-	-	+	+	2	12
j40	-	-	-	-	-	-	-	-	+	+	2	19
s44	-	-	-	-	-	-	-	-	+	+	2	18
s64	-	-	-	-	-	-	-	-	+	+	2	12
s71	-	-	-	-	-	-	-	-	+	+	2	13
s93	-	-	-	-	-	-	-	-	+	+	2	10
j22	-	-	-	-	-	-	-	-	+	+	2	12
s58	-	-	-	-	-	-	-	-	+	+	2	x
s59	-	-	-	-	-	-	-	-	+	+	2	11
s10	-	-	-	-	-	-	-	-	+	+	2	10
j33	-	-	-	-	-	-	-	-	+	+	2	12
j35	-	-	-	-	-	-	-	-	+	+	2	13
j19	-	-	-	-	-	-	-	-	+	+	2	10
s102	-	-	-	-	-	-	-	-	+	+	2	10
j39	-	-	-	-	-	-	-	-	+	+	2	x

y89	-	-	-	-	-	-	-	-	+	+	2	15								
s13	-	-	-	-	-	-	-	-	-	+	1	10								
y91	-	-	-	-	-	-	-	-	-	+	1	12								
s13	-	-	-	-	-	-	-	-	-	+	1	10								
s31	-	-	-	-	-	-	-	-	-	+	1	11								
s60	-	-	-	-	-	-	-	-	-	+	1	08								
j28	-	-	-	-	-	-	-	-	-	+	1	08								
s61	-	-	-	-	-	-	-	-	-	+	1	08								
j18	-	-	-	-	-	-	-	-	-	+	1	07								
s83	-	-	-	-	-	-	-	-	-	+	1	07								
Tot	234	5	206	33	165	74	164	75	119	120	100	139	58	181	28	211	9	230	0	239

+: Pass Stage, -: Non-pass Stage, (+)/(-): Non-parallel Stage, x: Non-attendance at the TEPS

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