PARAMETER RE-SETTING IN FOREIGN LANGUAGE LEARNING

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1. Introduction

The main difference between child second language acquisition and adult FLL is that the adult foreign language learners usually end up with some intermediate stage of development, while the final state of grammar can normally be achieved in the child second language acquisition.

This study aims at a better understanding of why adult foreign language learners differ in their achievements by applying the parameter setting model.

The domain covered in this study is adult foreign language learning (FLL). Adult is defined as a post-puberty learner aged over twelve. By foreign language learning is meant the learning of a language other than a native language in a classroom environment, not in a naturalistic setting.

2. Parameter Setting Model

The theory of principles and parameters aims at explaining universality and variations among languages. Universal Grammar (UG) consists of a set of general principles that underlie all natural languages. Principles are requirements that all human languages have to meet. Principles are hypothesized to be equipped with certain parameters which have various settings. Some of the

parameters are assigned tentative values at the initial stage. The tentative values are called the default values.

Children are then required to check whether the default values of the parameters correspond with the values of the parameter of the particular grammar they are trying to acquire. Children need to change the default values if they are different from those of the parameters that children are going to acquire. If the values are the same, children leave the default values as they are. Differences in these settings would account for the syntactic variation between languages.

When the values of the parameters are assigned, a core grammar is formed. A core grammar is 'a particular instantiation' of the principles and parameters (White 1989). Core grammars vary from language to language because of the following reasons. (i) Not all the principles are substantiated in every language. For example, the subjacency principle does not operate in languages without movement rules. (ii) The parameters are assigned different values. For example, Japanese and English differ in the values of the head parameter (White 1989).

The parameter which this paper focuses on is the head-initial/head-final parameter. It restricts the positions of the head and the complement (Radford 1988). The head-initial/head-final parameter is linguistically motivated by X-bar theory (Radford 1988). X-bar theory claims that there is the following structure in English.

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              XP
        ┌──────┼──────┐
    SPEC      X'      ADJ          SPEC=specifier
         ┌─────┼─────┐
     ADJ      X'      ADJ          ADJ=adjunct
           ┌──┴──┐
           X     COMP              COMP=complement
```

In head-initial languages such as English, the head precedes the complement. The head follows the complement in head-final languages such as Japanese.

The theory of principles and parameters (Chomsky 1981b, Cook 1988) has been applied to the theory of language acquisition. One of the attempts is the parameter setting model (Cook 1985, Cook 1988, Hyams 1983, Hyams 1986, Flynn 1987a, Flynn 1987b, Flynn 1987c, Flynn and Lust 1990, Flynn and O'Neil 1988, Lust 1981, Lust 1983, White 1985, White 1990).

In the Previous research of second language acquisition (SLA), it was pointed out that learners have to re-set the values of L1 parameter when they are different from those of L2 (Flynn 1987a, Flynn 1987b, Flynn 1987c). Learners would have difficulty in learning the target language when the values of the head-initial/head-final parameter are different between L1 and the second language (L2). Acquisition is facilitated when the values are the same.

3. Developmental Problems of Foreign Language Learning

One of the main differences between child second language acquisition and adult FLL is that the adult foreign language learners usually end up with some intermediate stage of development while the final state of grammar can normally be achieved in child SLA. The major problems in FLL are (i) Why is the re-setting of the L1 parameters into those of a foreign language difficult, and (ii) Why are there individual differences among learners?

One of the possibilities is the involvement of another faculty other than UG. It is possible that another faculty is involved in the process of adult FLL and that it interferes with the parameter re-setting in some way. The argument is motivated by the differences between child SLA and adult FLL: the ages of learners and the nature of input.

The difference of the learners' age suggests the difference in cognitive development. Piaget's theory of cognitive development divides the stages of intellectual development into several stages (Flavell 1963, Inhelder and Piaget 1958, Phillips 1969, Piaget and Inhelder 1969, Hatano 1965, Donaldson 1978, Piattelli-Palmarini 1980). The formal operation period (at the ages of 11 or 12 to 14 or 15) allows the formation of hypotheses about abstract relations. Since adult FLL takes place after the age of puberty, there is a possibility that the formal operational thought might be involved in adult FLL. The difference between child and adult language learners is whether the formal operational thought is available or not.

Another difference between child second language acquisition and adult FLL is observed in the nature of input: the availability of direct negative evidence and pedagogical rules. Direct negative evidence is a correction an adult gives to an error of the child (for the definition, see Chomsky 1981a). In adult FLL, learners receive more direct negative evidence compared with L1 learners and child L2 learners in naturalistic settings. Direct negative evidence in adult classroom FLL is given to learners as correction by teachers and as examinations that are corrected by teachers. What the previous studies imply is that UG does not need direct negative evidence because children are impervious to such evidence (Otsu 1989, data provided by Brown and Hanlon 1970, McNeill 1966, Lenneberg 1967). If the process of child language acquisition does not require direct negative evidence, then we can assume that UG is not responsible for handling direct negative evidence.

Teaching the target language by pedagogical rule are observed where the cognitive code (deductive) method is conducted. The cognitive code method is to teach explicit knowledge by pedagogical rules. Pedagogical rules are the statements that teachers give to learners in the classroom. They refer to any kind of explicit grammatical explanations: e.g., to move the wh-phrase to the

front of the sentence. One of the roles of pedagogical rules is that they make hypothesis-testing more efficient (Seliger 1979). There may be some instances when pedagogical rules serve as hypotheses and they make it easy for the learners to test hypotheses rather than to set up hypotheses themselves. Direct negative evidence also helps hypothesis-testing by telling the learners that their forms of the target language are not correct. UG is not, however, responsible for handling hypothesis-testing. Hypothesis-testing is claimed not to be available in child L1 acquisition (Felix 1986). Until the formal operational period, children are cognitively incapable of hypothesis-testing. Hypothesis-testing becomes available only after the puberty.

Here lies the necessity to posit another cognitive faculty in adult language learning: the faculty that is responsible for dealing with direct negative evidence and pedagogical rules. The formal operational thought and the nature of input are, in other words, the two elements that characterize adult classroom language learning but that are lacking in child naturalistic language acquisition. If the two elements are not necessary in child language acquisition, UG may not be responsible for handling them. In adult FLL, learners use the cognitive system because it is capable of handling pedagogical rules and direct negative evidence. To use the cognitive system is to understand and manipulate explicit pedagogical rules. To manipulate the pedagogical rules is not the role of UG but the role of the cognitive system. The deductive method in FLL classroom is therefore claimed to be the cognitive-system-oriented learning.

Pedagogical rules and direct negative evidence help hypothesis-testing, and the formal-operational thought is responsible for hypothesis-testing. Adult foreign language learners are assumed to use both the cognitive system and UG. The degree to which a learner relies on each system seems to vary by individuals and according to the environment (Felix 1986). Some learners may rely heavily on the cognitive system, but some may rely on the two systems
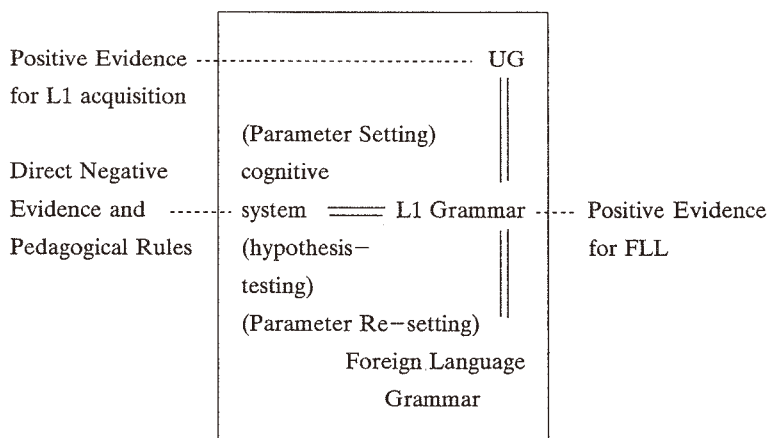
evenly.

4. Description of Studies

The proposed grammar development model of the adult classroom FLL is described as follows. First of all, learners use the cognitive system at the initial stage of learning. It is hypothesized that pedagogical rules and direct negative evidence would appeal to the cognitive system in the FLL classroom. For example, one of the explicit pedagogical rules of English is the WH-movement rule. When learners are able to manipulate the explicit rules, i.e., when they can apply the rule correctly to a variety of sentences, then their cognitive system is claimed to be active with regard to the WH-movement rule.

Second, UG is activated. For the cognitive system to be active simply implies that the learner has the ability to manipulate pedagogical rules. UG has to be eventually activated because the core grammar belongs to UG: unless UG is activated, the parameter re-setting would not take place. When UG becomes active, learners are sensitive to the abstract properties of the foreign language; e.g., the head parameter. To 'be sensitive' means that, for example, learners know that the head must precede the complement in English. Those learners whose UG is activated will be able to tell the appropriate positions of complements, adjuncts, and specifiers, even though they might not be familiar with these linguistic terms.

Third, the values of the foreign language parameters are checked in order to see if they are the same or different from those of L1. Fourth, the values of the L1 parameter are re-set when they are different from those of the foreign language. When the values are the same no re-setting occurs.

Based on the hypotheses above, the model of adult FLL is illustrated at follows.

Chart A: Proposed Model of Foreign Language Learning

```
                      ┌─────────────────────────────────┐
Positive Evidence ----│--------------------------- UG    │
for L1 acquisition    │                            ‖     │
                      │    (Parameter Setting)     ‖     │
Direct Negative       │    cognitive               ‖     │
Evidence and  --------│-- system   ==== L1 Grammar -│--- Positive Evidence
Pedagogical Rules     │    (hypothesis—            ‖     │    for FLL
                      │    testing)                ‖     │
                      │    (Parameter Re—setting)  ‖     │
                      │          Foreign Language        │
                      │              Grammar             │
                      └─────────────────────────────────┘
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The experiment tests the first and the second hypotheses. The third and the fourth hypotheses have already been discussed and studied by Flynn (1987 a, 1987b, 1987c). The experiment consists of two tests (See APPENDIX A). One test evaluated the degree of activation of the cognitive system (Test 1). The other test evaluated the degree of activation of UG (Test 2). By comparing the achievement between the two tests, we could predict which system is more active.

Test 1 consists of a set of sentences to which the WH-movement rule should be applied. One of the sentences is ungrammatical because it did not undergo the needed application of the movement rule. The other sentence is grammatical. The pair of sentences differ only in the position of the wh-phrases. Test 1 was developed to judge how much subjects have activated the cognitive system. The WH-movement rule is one of the rules that were taught in the classroom. The test results should tell whether a learner understands the WH-movement rule, whether he/she can apply it to different sentences, and to

what degree the cognitive system is activated. When subjects succeed in answering the Test 1 questions, their cognitive system is likely to be activated with respect to the WH-movement rule. When subjects fail them, their cognitive system has not been activated yet with respect to the WH-movement rule.

The motivations to claim why Test 1 appeals to the cognitive system are both psychological and linguistic. Psychologically, the WH-movement rule is considered to be handled by the cognitive system because it is one of the explicit pedagogical rules. Subjects were taught the rule that the wh-phrase must be placed at the initial position in an interrogative sentence. No complex linguistic knowledge is necessary to answer Test 1: Subjects do not have to know the phrase structure of English. Since the pair of sentences differ only in the position of the wh-phrases, subjects should only recognize these differences and judge which sentences are correct. This kind of rule manipulation is handled by the cognitive system because subjects are required to apply the WH-movement rule deductively to test sentences. Linguistically, subjects would judge grammaticality only from the positions of the wh-phrases because (i) the sentences consist of unfamiliar words for the subjects, (ii) the Japanese translations are not given to subjects, and (iii) subjects do not know how the words are used. In order to limit the criteria of judgment only to the position of the wh-phrase, unfamiliar words are used in Test 1. Subjects are deprived of semantic cues and they can only resort to the position of the wh-phrases for the grammaticality judgment.

Test 2 consists of a set of sentences which differ in the position of specifiers, adjuncts and complements. One of the sentences is claimed to be ungrammatical by X-bar theory because of the inappropriate position of complements and a djuncts. The test is designed to see how much subjects have activated UG. When the achievement is low, it means that subjects have not yet activated UG or that they are in the process of activating it with respect to the

head parameter, but that they have not succeeded yet. When the achievement is high, it means that subjects are sensitive to the syntactic structure of English and that they have succeeded in activating UG with respect to the head parameter. When subjects fail the Test 2 questions, their UG is assumed to be inactive.

The motivation to claim why Test 2 appeals to UG are also both psychological and linguistic. Psychologically, the position of complements and adjuncts is claimed to be handled by UG because it is not taught as a rule in the classroom and because the notion of the head-complement relation belongs to the properties of UG. The cognitive system would be incapable or providing answers to Test 2 because the criterion of judgment is not taught in the classroom. Subjects do not have any criteria for grammaticality judgment. They would have to resort to their linguistic knowledge (UG) rather than to the cognitive system in answering Test 2. Linguistically, Test 2 is designed to test whether or not subjects are sensitive to the hierarchical structure of English. The knowledge of the head-complement relations and the relative positions between complements and adjuncts is necessary to answer Test 2. That kind of knowledge, however, is not the sort that could be taught. Subjects must resort to sources of knowledge other than the cognitive system.

Some of the sentences in Test 2 were taken from Imai et al. (1989) and Radford (1988). The grammaticality of test sentences was predicted by X-bar theory (Radford 1988). Theoretically the sentence (1b) 'John completely will have read the book' is ungrammatical because the specifier 'have' should not follow the adjunct 'completely'. The sentence (2a) 'I've put your books over right in the corner' is ungrammatical because the specifier 'over' does not allow the other specifier 'right' to exist. The sentence (3b) 'Tom is the student with long hair of physics' is ungrammatical because the complement 'of physics' should immediately follow the head noun 'the student', but the adjunct

'with long hair' should not. The sentence (4b) 'The musical is utterly so exciting' is ungrammatical because the adjunct 'utterly' should not precede the specifier 'so'. The sentence (5a) 'Mary and Tom are John's close few friends' is ungrammatical because 'close' is Noun Adjunct, which modify nouns and therefore must be closer to the noun 'friends' (Imai, et al., 1989). The sentence (6b) 'John worked at the office on the report' is ungrammatical because the complement 'on the report' has to immediately follow the head 'worked'. The sentence (7a) 'John treated May last night badly' is ungrammatical because the complements 'Mary' and 'badly' have to immediately follow the head 'treated'. The sentence (8b) 'John will put the candles himself on the cake' is ungrammatical because no element is allowed to exist between the two complements, 'the candles' and 'on the cake'. The sentence (9a) 'John isn't proud of his country enough' is ungrammatical because the adverb 'enough' is the Adjective-Adjunct which is a word-level adjunct, and it has to immediately follow the adjective 'proud' (Radford 1988). Lastly, the sentence (10b) 'John was completely so in the wrong' is ungrammatical because the adjunct 'completely' should not precede the specifier 'so'.

In conducting Test 2, it is necessary that subjects have the same knowledge about the lexicon. The sentences of each pair do not always consist of the same words. If a subject knows the meaning of every word in one of the sentences and does not know a single word in the other sentence, then the subject tends to judge the former sentence as grammatical rather than the latter sentence. In order to avoid the discrepancy in semantic comprehension between the pair of sentences, semantic cues are given to subjects in Test 2. Given the semantic cues and without knowing the idiomatic use of the phrases, subjects do not have any criteria for grammaticality judgment other than their what is assumed to be an innate linguistic faculty (UG).

The predictions of the results are illustrated in **Chart B**. Numbers indicate

the number correct in each test.

Chart B: Predicted Distribution of the Tests

(Test 1)

```
10 |              /
   |     II      /
 5 |           /
   |          /
 1 |        /      I
   |_____/_____
          1      5     10  (Test 2)
```
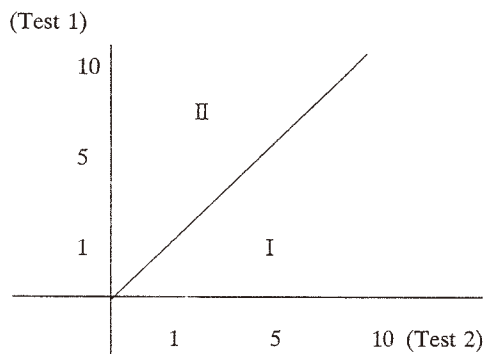
Subjects who fell in category I scored better in the cognitive system test than the UG test. Subjects who fell in category II scored better in the UG test than the cognitive system test. The hypotheses predict that many subjects should fall in category I. It means that the cognitive system is activated first, and UG is activated next. The hypotheses also predicts that the subjects would not fall in category II. The subjects who fell in category II indicate that UG is more activated than the cognitive system. That UG is activated first does not agree with the hypotheses. The hypotheses predict that subjects would per-form better in Test 1 than in Test 2: it is not until subjects are able to succeed in Test 1 that they can succeed in Test 2.

To succeed both in Test 1 and in Test 2 does not mean that the learner has acquired the English language, or does it mean that the learner has suc-ceeded in re-setting the head-initial/head-final parameter. The purpose of the experiment is to see which of the systems is more active with respect to word order. The data would only tell which one of the systems is more active than

the other system. Additionally, there is no causal relationship between the two tests: There is no logical necessity that the two systems are causally related. The claim is that some kinds of the foreign language data would appeal more to the cognitive system than it would to UG. There would be some correlation between the two systems when the cognitive system triggers hypothesis-testing and when it appeals to UG.

Subjects were 134 third-graders (the ninth grade) of a junior high school in Tokyo who aged from fourteen to fifteen. They had been studying English for three years, which means they started studying English after the age of puberty. They have never had a chance to communicate with native speakers of English, nor have they ever been in an English-speaking country.

5. Results

The results in Test 1 and in Test 2 indicated that many subjects chose the grammatical sentence in most of the questions (See APPENDIX B). The correlation of the achievements between Test 1 and Test 2 appears in **Chart C**.

Chart C: Results of the Tests of 134 Subjects
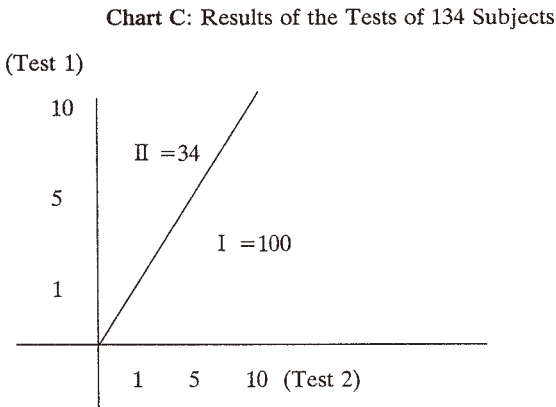
(Test 1)

In order to make clear the differences of achievements between Test 1 and Test 2, item discrimination was calculated (See APPENDIX B). The figures indicate the degree to which a single question sentence discriminated between the subjects with high score on the whole test from those with low score. According to item discrimination, the figures of Test 1 questions were relatively high and had little variation: 0.38 to 0.63. It indicated that the questions in Test 1 were able to differentiate successful subjects from unsuccessful ones. The figures in Test 2 questions were lower than those in Test 1 and they varied from 0.05 to 0.47. It suggested the difficulty in dividing the high scoring subjects from the low scoring subjects in Test 2. Subjects are claimed to be unstable in their performance in Test 2.
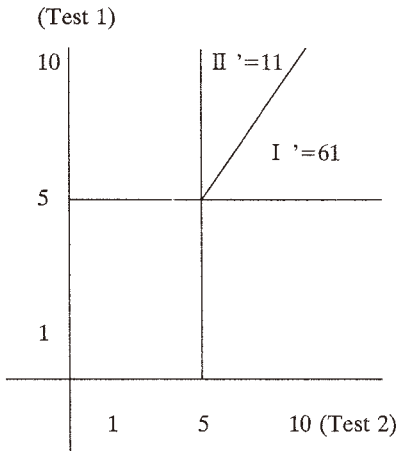
The figures of item discrimination indicated the consistency in the achievement of Test 1 and the inconsistency in the achievement of Test 2. The results of Test 1 were clear cut: If subjects were able to manipulate the rule, they succeed in Test 1. On the contrary, the result of Test 2 was unpredictable: A subject succeeded in some questions, but failed in some others. The instability made the prediction difficult. The result indicated that UG is sometimes active, but sometimes not.

The instability in the achievement in Test 2 indicates the following possibilities: (i) The instability of UG implies the difficulty in re-setting the values of the parameters. In other words, subjects are in the process of re-setting the value of the parameter from the head-final to the head-initial. (ii) If the activation of UG means to set parameters, the instability in Test 2 suggests that resetting a parameter is not an all−or−none switch, but is a kind of continuum. It implies the difficulty to judge the time at which subjects have succeeded in activating UG and in re-setting the parameters. (iii) There is a possibility that some subjects answered Test 2 questions by guessing: Subjects sometimes answered questions correctly, but sometimes they did not. As was discussed

above, the possibility of guessing was fifty percent.

In order to eliminate the possibility of guessing from the data, the subjects who answered less than five questions in each test correctly were excluded. Among the 134 subjects, there were 72 subjects who were considered to have answered without guessing. Among 72 subjects there were 61 subjects who scored better in Test 1. There were 11 subjects who scored better in Test 2 (See **Chart D**).

Chart D: Results of the Tests of 72 Subjects

(Test 1)

```
10 |         | II '=11 /
   |         |        /
   |         |       /
   |         |      /   I '=61
   |         |     /
 5 |----------/
   |         |
   |         |
 1 |         |
   |_____|_____
       1     5     10 (Test 2)
```

As the **chart D** shows, the majority of the subjects fell in the category I'. That many subjects scored better in Test 1 suggested that the cognitive system was likely to be activated first in FLL. The results of the experiment, therefore, are claimed to support the hypotheses.

Next, Pearson's correlation coefficient was computed in order to determine the correlation of activation between the cognitive system and UG. The correlation coefficient between Test 1 and Test 2 among 134 subjects in **Chart C** was 0.16. The figure means that there is little correlations between the two

tests. The correlation coefficient was 0.45 among 72 subjects who were claimed to have answered without guessing. The figure means that there is some correlation between the two tests. That there is a correlation between Test 1 and Test 2 among 72 subjects in **Chart D** implies that the degrees of activation between the cognitive system and UG correlate with each other. To put it simply, if the cognitive system is active, so is UG: If the cognitive system is not active, neither is UG.

The most reasonable interpretation of the experiment is as follows. The consistency of Test 1 result suggested that the generalizability of subjects' application of the WH-movement rule was stable. The differences in the achievements of Test 1 suggested the variation of individual capability in the function of the cognitive system. The inconsistency of Test 2 result suggested the followings: (i) Subjects were in the process of the activation of UG, that is, in the process of parameter re-setting. (ii) The variation suggested the difference in the degree of activation of UG. (iii) Pearson's correlation coefficient implied that the activation of the cognitive system and UG might be related with each other.

6. Conclusion

The purpose of the study was to discuss the following questions: (i) Why is parameter setting difficult in FLL, and (ii) Why are there individual differences among the achieved states of foreign language grammar? One of the possibilities was proposed in this paper: The cognitive system was involved between foreign language data and UG, and it caused the difficulty in activating UG and in resetting the parameters.

Based on the possibility above, the proposed adult foreign language parameter re-setting model suggested the three possibilities to the question why

parameter re-setting was difficult and why individuals varied in the achieved foreign language grammar. (i) Foreign language data were not directly accessible to UG because UG was not responsible to deal with direct negative evidence and pedagogical rules. (ii) The capacity of the cognitive system varied by individuals. (iii) The ability of transition from the cognitive system to UG varied by individuals.

Ackowledgments

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APPENDIX A: Test Questions

Test 1

Instruction (in Japanese): Please choose the correct interrogative sentence that corresponds to the target sentence.

1. John has slandered Mary. (Ask about Mary.)

    (a) Who has John slandered?

    (b) Has John slandered who?

2. The volcano erupted before dawn.

    (a) When did the volcano erupt?

    (b) Did the volcano erupt when?

3. John is a ventriloquist.

    (a) Is John what?

(b) What is John?

4. John was prosecuted for a fraud.

    (a) Was John prosecuted why?

    (b) Why was John prosecuted?

5. The formula is solved by an integration.

    (a) How is the formula solved?

    (b) Is the formula solved how?

6. Mary was strangled by John.

    (a) Was Mary strangled by who?

    (b) By who was Mary strangled?

7. The city was in chaos a decade before.

    (a) Was the city in chaos when?

    (b) When was the city in chaos?

8. John boasts of his pedigree.

    (a) What does John boast of?

    (b) Does John boast of what?

9. John got diarrhea from eating boar.

    (a) Why did John get diarrhea?

    (b) Did John get diarrhea why?

10. Water turns into vapor by seething.

    (a) Does water turn into vapor how?

    (b) How does water turn into vapor?

Test 2

Instruction (in Japanese): Please choose one of the sentences that sounds more natural. (The words with underlines were provided with their Japanese equivalents.)

1. a. John will have <u>completely</u> read the book.

   b. John completely will have read the book.

2. a. I've put your books over <u>right</u> in <u>the corner</u>.

   b. <u>The</u> <u>dispute</u> <u>dates</u> from right before <u>the</u> <u>war</u>.

3. a. Tom is the student of <u>physics</u> with long hair.

   b. Tom is the student with long hair of physics.

4. a. <u>The</u> <u>musical</u> is <u>so</u> <u>utterly</u> <u>exciting</u>.

   b. The musical is utterly so exciting.

5. a. Mary and Tom are John's <u>close</u> <u>few</u> friends.

   b. Mary and Tom are John's few close friends.

6. a. John worked on the report at the office.

   b. John worked at the office on the report.

7. a. John <u>treated</u> Mary last night <u>badly</u>.

   b. John treated Mary badly last night.

8. a. John will <u>bake</u> the cake himself for the party.

   b. John will put <u>the</u> <u>candles</u> himself on the cake.

9. a. John isn't proud of his country <u>enough</u>.

   b. John isn't proud enough of his country.

10. a. John was <u>so</u> <u>completely</u> in <u>the</u> <u>wrong</u>.

    b. John was completely so in the wrong.

APPENDIX B: Results of the Tests

Numbers indicate the subjects who chose either the sentence (a) or (b). The asterisks indicate which sentences are grammatically correct. I.D. stands for Item Discrimination.

Test 1	1	2	3	4	5	6	7	8	9	10
Sent.a	*95	*108	27	25	*89	80	24	*84	*93	36
Sent.b	39	26	*107	*109	45	*54	*110	50	41	*98
I.D.	0.41	0.41	0.50	0.58	0.63	0.41	0.38	0.63	0.44	0.44

Test 2	1	2	3	4	5	6	7	8	9	10
Sent.a	*97	61	*68	*56	35	*79	18	*87	61	*93
Sent.b	37	*73	66	78	*99	55	*116	47	*73	41
I.D.	0.16	0.38	0.05	0.33	0.47	0.25	0.19	0.36	0.16	0.44