論　文 ニダバ (*Nidaba*) 44(2015), 70-79

Morphology and syntax acquisition by Japanese EFL writers

—a study of their developmental course based on Processability Theory —

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1 Introduction

Processability Theory (PT) is "a theory of language development and designed to explain the phenomenon of stage development in SLA (as well as some other phenomenon)" (Pienemann 2011a: 3). Pienemann (1998) and Pienemann (2011b) proposed the main PT framework and the psycholinguistic basis of PT. This developmental schedule is explained by the architecture of the language processor following Levelt's (1989) model of language generation. L2 learners acquire the processing procedures incrementally.

PT predicts the developmental schedule during the course of language production, and based on a universal hierarchy, can be applied across languages. All L2 learners follow the set stages of acquisition.

The following is an overview of the processability hierarchy (Pienemann, 1998: 7).

1. lemma access
2. the category procedure
3. the phrasal procedure
4. the S (sentence) - procedure
5. the subordinate clause procedure (if applicable)

The first procedure in this hierarchy is not a language-specific procedure. New words have to be entered into the lexicon. The second procedure is the category procedure. L2 lexical items have been assigned a grammatical category, lexical morphological markers can be produced. In the third stage, the phrasal procedure has been developed for the L2. A learner distinguishes the head word from another constituent in this phrase. In the next stage, phrases must be assigned syntactic functions. A learner sees the distinction of the head of the phrase from its modifiers, and phrasal morphemes are produced by the learner. In the fifth procedure, the subordinate clause procedure, a learner distinguishes subordinate clauses from main clauses and acquires inter phrasal morphemes (Pienemann, 2011b: 33-37, Pienemann, 1998: 83-86).

A number of studies have presented empirical evidence supporting PT (e.g. Kawaguchi, 2009: 2011, Spinner, 2011; Baten, 2011). Many studies have investigated L2 oral performance by L2 leaners. Sakai (2008) focused on Japanese-speaking university students' oral performance in English with regard to PT in Sakai (2008). Seven EFL (English as a foreign language) learners participated in the study which showed PT may be valid for Japanese-speaking EFL learners.

In the current study, the validity of PT prediction will be examined through data from the writing of 45 Japanese EFL learners. Another purpose of this study is to clarify the developmental schedules of syntactic structures and morphological structures of Japanese EFL learners.

2 Processability Theory

2.1 ESL developmental stages

Table 1 shows the developmental stages of syntax and morphology by L2 learners based on Pienemann (1998: 178) and Pienemann (2011c: 52). The fundamental assumption of PT is that "a learner can acquire only those linguistic forms and functions which he or she can process" (Pienemann, 2011b: 27), so from the bottom to the top, the language learners develop their structures although some variations are assumed.

Once the above hierarchy is applied to ESL (English as a second language) morphology, Pienemann (2011a: 4-6) illustrate a number of regularities in word order and morphology mainly English question formation. For the first developmental stage, bare words and many chunks exist. The production of single word questions appear like "here?" or "my money?" as one lexical item with rising intonation. In the early stages of ESL, learners also produce sentences like "How are you?", "Where's the toilet please?" they may be "chunks".

In stage 2, learners produce sentences formed in a strictly canonical word order, the SVO pattern in English. The question sentences, "He is here?" or "You go home?" appear with rising intonation. Learners attach lexical morphemes such as past *–ed*, plural *–s*, possessive *–s* to lexical categories like nouns, verbs without any grammatical information beyond word boundaries.

In Stage 3, learners can attach WH-words or *Do* to SVO patterns. For instance "Where you lost it?" or "Where you have lost it?" are produced, but their structures are not appropriate forms in English ("Where did you lose it?" or "Where have you lost it?" are used by native speakers). All WH-questions at this stage will be grammatical errors. As for the morphology, learners acquire "plural agreement" in the noun phrase (e.g. two boys).

Table 1. ESL acquisition based on Processability Theory

Stage	*Syntax*	*Morphology*
6	Cancel inversion	
5	Do – 2nd	3rd person singular *–s*
	Aux – 2	
	(Negation - do 2nd)	
4	Yes/no inversion	
	Copula inversion	
	Pseudo-inversion	
	(Particle shift)	
3	Do- fronting	plural agreement
	Adverb-fronting	
	Wh-fronting	
	Negation -Verb	
2	Negation -SVO	past-*ed*, plural -*s*, possessive *–s*
	canonical word order (SVO)	
1	Single word Formulae	

In stage 4, learners can invert the order of subject and the verb. They can produce inversion sentences, for example yes/no inversion (e.g. Has he left his office?) and copula inversion (e.g. Is she sick?). In English, inversion sentences, the auxiliary or the copula has to be brought into initial position.

Stage 5 learners are able to put the auxiliary in second position in WH-questions (e.g. Where has he been?). However, a sentence like "I wonder where has he been" is also produced because of the extension of WH- regularity. At this stage, learners acquire the inter-phrasal morpheme "third person singular marker –s".

In stage 6, learners acquire the subordinate clause procedure and they are able to distinguish between main clause and subordinate clause so they produce indirect questions without inversion (e.g. I wonder where he is).

2.2 Sakai (2008)'s study

Several empirical L2 studies have supported PT, for English language learners (Sakai, 2008; Spinner, 2011), for German language learners (Pienemann, 1998; Baten, 2011), for Japanese language learners (Kawaguchi, 2009; 2011). Other studies, Itani-Adams (2011) investigated bilingual first language acquisition and Håkansson, Salameh and Nettelbladt (2003) studied the language development in bilingual children with and without language impairment. These studies also supported the PT stages.

In one of these studies, Japanese-speaking EFL learners' were investigated by Sakai (2008). Seven EFL learners participated in the study. Sakai (2008) examined the validity of the Processability Theory proposed by Pienemann (1998) with regard to seven university students' oral performance in English.

The participants were all attending a national university of education and they had studied English as foreign language (EFL) for six years. Five oral performance tasks were used. The result showed that PT can predict EFL learners' developmental stages also, but there still remained three questions.

In Sakai's study, 15 syntactic structures such as interrogatives, word order, and negation were focused on but he did not deal with morphology. The validity of PT stages including morphology for Japanese EFL learners is not clear; that is the first question.

The second question regards emergence criteria. Sakai adopted PT's original idea "to apply emergence criteria to syntactic development on the basic of (minimally) one occurrence in a sample" from Pienemann (1998: 133) for his analysis of syntactic structures. He followed the emergence criterion strictly though some researchers use the emergence criterion with some modification (Sakai, 2008: 549).

Pienemann (1998: 131-133, 144-148) discussed the emergence criteria assuming a developmental course based on data which had been collected for a one-year on longitudinal study of the acquisition of German as a second language. On the other hand, in many cross-sectional studies, particular language forms are elicited from participants by a researcher. The actual time of the five tasks used in Sakai's study varied across tasks and participants. In analyzing the data with the interview task and the spot-the-difference task, the first 10 minutes of data are used. On the other hand, the first 5 minutes of data are used from the picture description task and the picture identification task. Only in the story telling task was all the data was used. Sakai said "this study elicited a limited amount of spoken data at one time" and the data elicited from each participant was very limited.

Pienemann who developed the original theory in Pienemann(1998) concluded "The emergence criterion is defined as "the point of first emergence of a structure in an interlanguage system (Pienemann, 2011c: 53)" and "emergence means first systematic use"(Keßler and Pienemann, 2011: 94). Keßler and Pienemann (2011: 85) also talk about emergence criteria below.

> If, for instance, we assume that certain kinds of grammatical forms are learned separately for every new word that enters the learner's lexicon, the structure in question needs to be identified within the context of a range of different lexical items. In other words, the researcher needs to ensure that the data collection contains examples of the given form within variety lexical items (Keßler and Pienemann, 2011; 85).

In considering appropriate emergence criteria for data collected with regard to Pienemann (2011c) and Keßler and Pienemann (2011), in a cross-sectional study, how much data do we need to ensure productivity by learners?

The third question concerns the difference between L2 learners and EFL learners. As discussed above, many studies have supported PT prediction. Many participants in the studies are L2 learners (e.g. Pienemann, 1998; Spinner, 2011; Kawaguchi, 2009; 2011). Can PT predict Japanese EFL learners' developmental stages also? Can Japanese students, who have studied English in order to prepare for classroom written examinations as is usual in Japan perform to their full ability in speaking tasks? (In Sakai's study, the seven participants' majors were Communicative English (n=6) and Methodology in Teaching English as a Foreign Language (n=1).) My research question is this:

> Are the developmental patterns of Japanese EFL learners, as shown by their writing performances, consistent with PT prediction?

3 Study

3. 1 Participants

Data from 45 participants who are studying in a national college of technology in Japan were analyzed. They are all Japanese learners of English. In the study, 20 participants were third year students and 25 were fourth year students (25 were women and 20 were men). Participants' ages ranged from 17 to 20. They had studied English as a school subject (a foreign language) in junior and senior high schools in Japan. The mean period of English study was 6.6 years (SD= 1, Max = 10, Min = 5). Nine participants had experienced study abroad programs for 5 weeks in Australia. The mean score of all participants in TOEIC (Test of English for International Communication) is 379.9(SD= 75.8, Max = 10, Min = 5). A native speaker also participated as a control in these tasks.

3.2 Target structures

This study focused on the structures shown by "Adult Learners of ESL" in Pienemann (1998: 178) and Pienemann (2011c: 52); eight syntactic structures and five morphological structures were tested. In

addition, three syntactic structures related to Sakai's study (2008) were added. These structures are below (the underlining shows the structures focused on in Sakai's study).

Syntactic structures:
Cancel inversion, Do-2nd, Auxiliary 2nd, yes/no inversion, Copula inversion, Pseudo-inversion, Do-fronting, Adverb-fronting, Wh-fronting, Negation Verb, Canonical word order(SVO)

Morphological structures:
3rd person singular –*s*, plural agreement, past particle -*ed*, plural –*s*, possessive –s

3.3 Procedure

The study was carried out for two days and six writing tasks were used. They were (a) picture description task, (b) habitual actions, (c) story-writing task, (d) communication task, (e) introduction task, (f) essay. In tasks (a) to (e), participants wrote English sentences by looking at pictures, in only one task (f), did participants choose a topic and wrote an essay.

The picture description task and the communication task were each 30 min long, the habitual actions and the story-writing task were each 10 min long, the essay was 20 min long.

3.4 Data

The data collected provided 2713 sentences containing 17,619 words. Table 2 shows the number of sentences and words for each task.

Table 2. The sentences and words in each task.

Task	1	2	3	4	5	6	Total
Sentences	437	260	412	1,049	145	410	2,713
Words	3,258	1,563	2,900	5,471	1,152	3,275	17,619

Each word was tagged with its part of speech, and target sentences were tagged by type and error. In judging error, this study did not cover spelling mistakes if I could understand the meaning the word, and errors of articles in noun phrases.

3.5 Analysis

After considering previous studies (e.g. Sakai, 2008; Dyson, 2009; Spinner, 2011) and the volume of the collected data, this study used the emergence criterion of "two different types". When each target structure was used two different ways in two different contexts, I judged the structure was used productively (and marked "+" on Table 3-5). For example, regarding the target structure Do-fronting, when a participant produced "Do you like a dog?" and "Do you have a dog?" we can see the structure was used productively. However for example in Do-2nd, when a participant produced "What kind of book do you like?" and "Which T-shirt do you like?", I saw the participants' productions did not satisfy the emergence criterion.

Table 3. Implicational table: 45 participants based on Processability theory

PT Stage	2			3		4	5		6
Syntax			SVO		ADV,	Y/N, Cop,	Do, Aux 2nd		Can Inv
Participant Morph.	PL	PAST		PL-Agr	DO Fro	Pse Inv	3SG		
3151	+	+	+	+	+	−	−	+	/
3011	+	−	+	+	+	+	−	+	−
3061	+	−	+	+	+	+	−	+	−
4241	+	+	+	+	+	+	−	−	−
4022	+	−	+	−	+	+	+	+	−
3122	+	+	+	+	+	+	−	+	−
3351	+	+	+	+	+	+	−	+	/
4142	+	+	+	+	+	+	−	+	/
4102	+	+	+	+	+	+	−	+	−
4162	+	+	+	+	+	+	−	+	−
4212	+	+	+	+	+	+	−	+	−
3392	+	+	+	+	+	+	−	+	−
4412	+	+	+	+	+	+	−	+	−
4431	+	+	+	+	+	+	−	+	/
3461	+	+	+	+	+	+	−	+	/
3031	+	+	+	+	+	+	+	−	/
3082	+	+	+	+	+	+	+	−	/
4262	+	+	+	+	+	+	+	−	/
4312	+	+	+	+	+	+	+	−	−
4272	+	+	+	+	+	+	+	−	/
4372	+	+	+	+	+	+	/	+	/
3381	+	+	+	+	+	+	/	+	/
4441	+	−	+	+	+	+	+	+	/
4041	+	+	+	+	+	+	+	+	/
4071	+	+	+	+	+	+	+	+	/
3092	+	+	+	+	+	+	+	+	/
4111	+	+	+	+	+	+	+	+	/
3171	+	+	+	+	+	+	+	+	/
3182	+	+	+	+	+	+	+	+	/
4191	+	+	+	+	+	+	+	+	/
3202	+	+	+	+	+	+	+	+	/
3222	+	+	+	+	+	+	+	+	−
3472	+	+	+	+	+	+	+	+	−
3232	+	+	+	+	+	+	+	+	−
4251	+	+	+	+	+	+	+	+	/
4282	+	+	+	+	+	+	+	+	−
4292	+	+	+	+	+	+	+	+	/
4302	+	+	+	+	+	+	+	+	−
3321	+	+	+	+	+	+	+	+	−
4331	+	+	+	+	+	+	+	+	/
4342	+	+	+	+	+	+	+	+	/
3401	+	+	+	+	+	+	+	+	/
4422	+	+	+	+	+	+	+	+	−
4451	+	+	+	+	+	+	+	+	−
3362	+	+	+	+	+	+	−	+	+
NS	+	+	+	+	+	+	+	+	+

Note. PL = regular plural(-s). PAST = past tense marked verbs (-ed). SVO = canonical word order. PL-Agr = Plural agreement. Adv, Do Fro= Adverb, Do front. Y/N, Cop, Pse Inv = Yes/No, Copula, Pseudo inversion. 3SG =third person singular inflection(-s). Do, Aux 2nd = Do, Auxiliary second. Can Inv =Cancel inversion. + = acquired. − = not acquired. / = no obligatory context the form.

The analysis was done by Implicational Scaling. Implicational Scaling has been used to test the validity of PT prediction. In accordance with Hatch and Lazaraton (1991), two calculations are used to judge whether a set of data is truly developmental. A coefficient of reproducibility (Crep) tells us how easily we can predict a participant's performance from his (her) position or rank in the matrix. Over .90 on the scale can be considered "valid". The second calculation, the coefficient of scalability (Cscal), is the figure that indicates whether a given set of patterns are scalable. When the figure is Over .60, we can claim the data are scalable (Hatch and Lazaraton, 1991: 210-214).

4 Results

4.1 Implicational table: 45 participants based on Processability theory

The implicational table by 45 participants is shown in Table 3. Three target structures, Wh-fronting, possessive-*s* and verb negation were not produced sufficiently by participants, so they were excluded from this study. There are many errors shown in the table, we cannot find a marginal line which shows a developmental step as required by Hatch and Lazaraton (1991). It is difficult to analyze with this table, so 30 participants were extracted from the 45 participants by their TOEIC score. The 45 participants were divided into three groups, the higher grade A (430-505), the intermediate grade B (370-415) and the lower grade C (225-300). From each group, the middle 10 participants were extracted.

4.2 Implicational table: 30 participants based on Processability theory

Table 4 shows the implicational scaling for the 30 participants (On the table, the vertical axis is for the target structures, and the horizontal for participants). Below each participant's number, the groups based on TOEIC are shown. At the point of participant number 4022, we see the difficulty in drawing a marginal line. However I tried to do it by drawing line between the structures in stage 5. The coefficient of reproducibility (Crep) is .94, the results for individuals can be predicted based on the table. On the other hand, the coefficient of scalability (Cscal) is .25; when this number is greater than .60, the data are scalable. Thus, this figure sufficiently satisfies the standards of Hatch and Lazaraton (1991). The result shows that in written data of Japanese EFL students developmental stages cannot be predicted by PT.

Table 4. Implicational table: 30 participants based on Processability theory

PT Stage	Participant	3011	3061	4241	4022	3031	3082	4262	4312	4272	4142	4102	3392	4412	4431	3461	3381	4441	4041	4071	3092	3222	3472	3232	4251	4282	4292	4302	3401	4422	4451	NS
Syntax	Morphology	A	A	B	A	A	A	B	B	C	A	A	C	C	C	C	C	C	A	A	A	B	B	B	B	B	B	B	C	C	C	
6	Can Inv	-	-	-	-	/	/	/	-	/	/	-	-	-	/	/	/	/	/	/	/	-	-	-	/	-	/	-	/	-	-	+
5	Do, Aux 2nd	+	+	-	+	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	3SG	-	-	-	+	+	+	+	+	+	-	-	-	-	-	-	/	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4	Y/N, Cop, Pse Inv	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	ADV, DO Fro	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3	PL-Agr	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2	SVO	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	PAST	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	PL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Note. PL = regular plural(-s). PAST = past tense marked verbs (-ed). SVO = canonical word order. PL-Agr =Plural agreement. Adv, Do Fro= Adverb, Do front. Y/N, Cop, Pse Inv = Yes/No, Copula, Pseudo inversion. 3SG = third person singular inflection(-s). Do, Aux 2nd = Do, Auxiliary second. Can Inv =Cancel inversion. + = emerged. - = not emerged. / = no obligatory context the form.

Table 5. Implicational table: 30 participants based on Processability theory (2)

PT Stage		Participant	4241	3011	4102	4412	3082	3461	3381	3061	4022	4441	3031	4262	4312	4272	4142	4041	4071	3092	3222	3472	3232	4251	4282	3392	4431	4451	4292	4302	3401	4422	NS
	Syntax	Morphology	B	A	A	C	A	C	C	A	A	C	A	B	B	C	A	A	A	A	B	B	B	B	B	C	C	C	B	B	C	C	
6	Can Inv		-	-	-	-	/	/	/	-	-	/	/	/	-	/	/	/	/	/	-	-	-	/	-	-	/	-	/	-	/	-	+
	Do, Aux 2nd		-	+	+	+	-	+	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5		3SG	-	-	-	-	+	-	/	-	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+
4	Y/N, Cop Inv		-	-	-	-	-	-	-	+	+	-	+	+	+	+	+	-	-	/	-	/	-	/	-	+	+	-	+	+	+	+	+
	Adv, Do Fro		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3		PL-Agr	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	SVO		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
		PAST	+	-	+	+	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2		PL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Note. PL = regular plural(-s). PAST = past tense marked verbs (-ed). SVO = canonical word order. PL-Agr = Plural agreement. Adv, Do Fro= Adverb, Do front. Y/N, Cop Inv = Yes/No, Copula, inversion. 3SG = third person singular inflection(-s). Do, Aux 2nd = Do, Auxiliary second. Can Inv =Cancel inversion. + = emerged. - = not emerged. / = no obligatory context the form.

4.3 Implicational table: 30 participants based on Processability theory (2)

Next, I tried one more analysis following the index from Pienemann (2011c: 52). From Pienemann (1988) to Pienemann (2011c), pseudo inversion in PT stage 4 was deleted from tables shown in Pienemann (2011c). Therefore, pseudo inversions were removed from my data, and reanalysis occurred as shown in Table 5. We can find a marginal line there. The coefficient of reproducibility (Crep) is .90 and the coefficient of scalability (Cscal) is .23. This figure does not satisfy the standards of Hatch and Lazaraton (1991). This table also does not show a PT developmental pattern. In conclusion, the answer to the research question of this study, "Are the developmental patterns of Japanese EFL learners, as shown by their writing performance consistent with PT prediction?" is NO. PT prediction is not appropriate for Japanese EFL learners' writing data.

5 Discussion

The results from 45 participants writing performance did not provide evidence consistent with PT. The purpose of this study was to see whether PT can predict the developmental stages of Japanese EFL learners. The results are retained for the next study. There are some problems. First, how to deal with pseudo inversions. Three analyses were tried in this study. The first two analyses strictly followed Pienemann (1998) including pseudo inversions in stage 4. The last analysis which removed pseudo inversions, also did not show the validity of PT. As mentioned above, pseudo inversion was in developmental stage 4 in the table of Pienemann (1998: 178). However in the next version of Pienemann (2011c), pseudo inversion was moved to the margin of a page and they did not indicate its stage clearly (Pienemann 2011: 54). On the other hand, the examples of "How are you?" or "Where's the toilet please?" are shown as "chunks" of the early stage of SLA (Pienemann 2011a: 5). I think this minor change was made because it is not clear whether an utterance is Pseudo inversion or a "chunk".

In this study, the error sentences below were produced by some learners.

1) What is it title? (*4142A-410)
2) What is two girls name? (*4071A-404)
3) What's name those girls? (*4272C-404-1)
4) What's the book do you like the best? (*3321B-410-2)
5) What do you like book written Natsume Soseki? (*4111A-410)
6) Which do you like mark of T-shirts, star or hurt (=*heart*)? (*3232B-403)

These sentences show the possibility that learners produce some specific structures (pseudo inversion and Do 2nd) using not a processing component but a "chunk". The use of chunks, which PT predicts in early stages, may continue for a longer period than predicted by PT.

Secondly, Japanese EFL learners' writing data was collected in this study so as to test their foreign language ability under more natural condition. However, I was unable to elicit the target structures Wh-fronting, possessive-*s* and verb negation. Moreover, I cannot analyze some sentences with regard to whether learners produced them with processing procedure or not. In addition, some technical problems regarding writing tasks remain.

Further work is needed to test whether PT can predict the developmental stage of Japanese EFL learners and to clarify the developmental schedules of syntax acquisition of Japanese EFL learners. I hope to clear away these problems step by step.

Acknowledgements

I would like to express my appreciation to all the people who participated in this study. This study is part of the research supported by JSPS KAKENHI Grant Number 2587104.

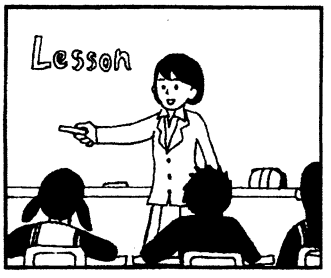
Note

This study is a revised version of the poster presentation at the Japanese Society for Language Sciences, The 15th Annual International Conference of the Japanese Society for Language Sciences, Kwassui Women's University, Japan, June 29, 2013.

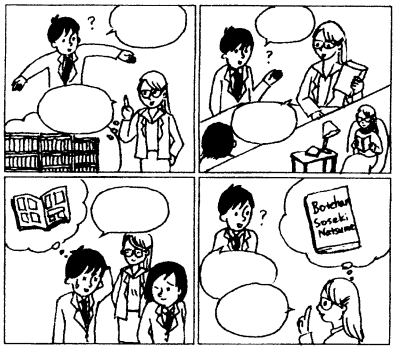
Appendix

Some pictures used in the 5 tasks. A is an example for the habitual actions task, B is for the communication task.

A.



B.



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