Cognitive processes triggered by oral corrective feedback in second language learning

Megumi Fujio
Department of Integrated Studies in Education
McGill University, Montreal
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ABSTRACT

This mixed methods study was conducted to explore learners' cognitive processes triggered by different types of oral corrective feedback (recasts and prompts) and to examine their relationships with the outcomes of second language learning. The study addresses two research questions: 1) What kinds of cognitive processes are triggered by different types of oral corrective feedback (recasts and prompts)? and 2) What are the relationships (if any) between these different types of cognitive processes and the outcome of second language learning?

Forty-two beginning and intermediate learners of Japanese participated in the study. The participants were assigned to one of three groups: recast, prompt, and control. The participants engaged in a picture description task with a native speaker of Japanese in a one-on-one format in two treatment sessions. When the learners produced an erroneous form of the target structure (polite past adjectives), the participants in the recast group received a reformulation of their error, while those in the prompt group received feedback in the form of prompts. The control group performed the same task without feedback. Immediately after the completion of a picture description task, the recast group and the prompt group watched the video-recording of the feedback episodes and reported what they were thinking after they received corrective feedback. The control group watched the video-recording of the picture description task and reported what they were thinking after they produced an erroneous utterance. All the participants took pre-test, immediate post-test, and delayed post-test consisting of a picture description task.

In regard to prompts, it was revealed that there are seven types of categories of cognitive processes triggered by prompts. Three categories are essential cognitive processes that occur as a learner self-repairs: recognition, knowledge search, and correct knowledge application. Four

categories are additional processes that also occur for some learners: no recognition, knowledge search, no knowledge retrieval, and incorrect knowledge application. There was considerable individual variation, with some learners skipping processes and others engaging in more processes. The results suggest that additional categories of cognitive processes are associated more with less successful outcomes in second language learning.

With respect to recasts, four categories of cognitive processes were found: recognition of problem, recognition of recasts as correct utterance, recognition of recasts as corrective feedback, and awareness of correct conjugation rule. The results indicate that two categories (recognition of recasts as corrective feedback and awareness of correct conjugation rule) are associated more with less successful outcomes in second language learning. However, these findings are not conclusive because of the limited number of reports produced in the recast group.

The findings of this study will provide information about learners' internal mechanisms that connect oral corrective feedback with second language learning.

RÉSUMÉ

Cette étude à méthodologie mixte a été menée dans le but d'explorer les processus cognitifs des apprenants déclenchés par différents types de rétroaction corrective à l'oral et d'examiner leur relation avec l'apprentissage d'une langue seconde.

L'étude aborde deux questions de recherche: (a) quels types de processus cognitifs sont déclenchés par différents types de rétroaction corrective à l'oral (reformulations et incitations) et (b) quelles sont les relations, s'il y a lieu, entre ces différents types de processus cognitifs et le résultat de l'apprentissage d'une langue seconde.

Quarante-deux apprenants débutants et intermédiaires de japonais ont participé à l'étude. Les participants ont été affectés à l'un des trois groupes suivants: reformulation, incitation, et groupe-témoin. Les participants ont pris part, en tête-à-tête, à une tâche de description d'images aux côtés d'un locuteur japonais de souche au cours de deux sessions de traitement. Quand les apprenants ont produit une forme erronée de la structure cible (adjectifs passés sous forme "polie"), les participants appartenant au groupe de reformulation ont reçu une reformulation de leur erreur, alors que ceux appartenant au groupe d'incitation ont reçu des commentaires sous forme d'incitations. Le groupe-témoin a exécuté la même tâche sans recevoir de commentaires. Immédiatement à la fin d'une tâche de description d'images, le groupe de reformulation et le groupe d'incitation ont visionné l'enregistrement vidéo des épisodes de commentaires et ont signalé ce qu'ils pensaient lorsqu'ils ont reçu la rétroaction corrective. Le groupe-témoin a visionné l'enregistrement vidéo de la tâche de description d'images et ses membres ont signalé ce qu'ils pensaient lorsqu'ils ont produit un énoncé erroné. Tous les participants ont passé un

prétest, un posttest immédiat et un posttest différé consistant en une tâche de description d'images.

En ce qui concerne les reformulations, l'étude a révélé qu'il existe sept types de catégories de processus cognitifs déclenchés par les reformulations. Trois catégories constituent des processus cognitifs essentiels qui se produisent alors qu'un apprenant s'autocorrige: la reconnaissance, la recherche de connaissances, et l'application correcte de connaissances. Quatre catégories constituent des processus supplémentaires qui se produisent également dans le cas de quelques apprenants: aucune reconnaissance, recherche de connaissances, aucune récupération de connaissances et application incorrecte des connaissances. L'écart entre les individus s'est avéré considérable; certains ignorant les processus et d'autres se livrant à davantage de processus. Les résultats suggèrent que des catégories supplémentaires de processus cognitifs sont davantage associées aux résultats moins réussis dans l'apprentissage d'une langue seconde.

En ce qui concerne les reformulations, quatre catégories de processus cognitifs ont été trouvées: la reconnaissance du problème, la reconnaissance des reformulations en tant qu'énoncés corrects, la reconnaissance des reformulations en tant que rétroactions correctives, ainsi que la prise de conscience de la bonne règle de conjugaison. Les résultats indiquent que deux catégories (la reconnaissance des reformulations en tant qu'énoncés corrects et la prise de conscience de la bonne règle de conjugaison) sont associées davantage à des résultats moins positifs dans l'apprentissage d'une langue seconde. Cependant, ces découvertes ne sont pas concluantes en raison du nombre limité de rapports produits dans le groupe de reformulation.

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Chapter 1: Background

In the field of second language acquisition (SLA), it has been proposed that oral corrective feedback has positive roles to play in language learning (Ellis, 2007; Lyster, Saito, & Sato, 2013; Loewen, 2009; Mackey, 2012; Sheen, 2011). There have been a number of experimental studies on the effects of oral corrective feedback on second language learning, and the results of these studies suggest that corrective feedback promotes second language development (Ammar & Spada, 2006; Doughty & Varela, 1998; Ellis, Loewen, & Erlam, 2006; Han, 2002; Iwashita, 2003; Leeman, 2003; Li, 2010; Long, Inagaki, & Ortega, 1998; Lyster, 2004; Lyster & Izquierdo, 2009; Lyster & Saito, 2010; Mackey & Goo, 2007; Mackey & Philp, 1998; McDonough, 2007; McDonough & Mackey, 2006; Mifca Profozic, 2013; Yang & Lyster, 2010). Although positive effects of oral corrective feedback on second language learning have been observed, the internal mechanisms that mediate oral corrective feedback and second language development are still largely unknown. Little is understood about what kinds of cognitive processes[1] occur after learners receive different types of oral corrective feedback and how these different processes affect second language development. One reason for this dearth of information is the methodological limitations of previous investigations. Studies examining the effects of oral corrective feedback have employed an experimental design that enabled researchers to analyze the relationship between factors such as corrective feedback and second language learning outcomes, but this method has not yielded precise information about the processes of learning.

[1] Cognitive processes discussed in this dissertation include processes such as perception, memory and thinking (Carroll, 2008).

There have been a limited number of studies exploring learners' cognitive processes and their relationships to oral corrective feedback through the use of learner introspection (Egi, 2007a, 2007b; Kartchava & Ammar, 2014; Mackey, 2006). Previous corrective feedback studies focused on two types of cognitive processes: learners' perceptions of corrective feedback and learners' noticing the gap between their non-target-like utterances and the correct forms. Some studies suggest that learners' noticing the gap triggered by corrective feedback may contribute to second language learning (Egi, 2010; Mackey, 2006). However, these studies do not provide information about what kinds of cognitive processes other than noticing are triggered by different types of corrective feedback. In addition, it is unknown whether or not these processes are related to second language learning outcomes.

In order to fill this gap, this dissertation aims to explore what kinds of cognitive processes are triggered by oral corrective feedback and to examine whether those processes are related to the outcomes of second language learning. The study employs an embedded mixed-methods study design (Creswell & Plano Clark, 2011), which enables the investigator to analyze both the cognitive processes and the learning outcomes.

This study addresses two research questions:

Research question 1

What kinds of cognitive processes are triggered by different types of oral corrective feedback (recasts and prompts)?

Research question 2

What are the relationships (if any) between these different types of cognitive processes and the outcomes of second language learning?

The findings of this study are expected to advance our understanding of the effects of corrective feedback by providing information about the cognitive processes triggered by recasts and prompts and their association with second language learning outcomes.

This chapter provides general background to the study and presents the research questions. Chapter 2 provides the review of the literature. The literature review includes four parts. The first part presents SLA theories that account for the effectiveness of oral corrective feedback in second language learning. The second part presents two types of oral corrective feedback: recasts and prompts. The third part provides a review of studies examining the effectiveness of recasts and prompts. The last part presents stimulated recall methods and provides a review of studies using stimulated recall to examine learners' cognitive processes after receiving oral corrective feedback.

Chapter 3 describes the methodology used in this study. Chapter 4 first reports interaction data and the results of statistical analyses examining the effectiveness of recasts and prompts. Then, it gives the results that answer research questions 1 and 2. Chapter 5 discusses the results of the study and addresses its significance and limitations. Then, it proposes the pedagogical implications. Possibilities for future research and general conclusions end the chapter.

Chapter 2: Literature Review

This chapter consists of four parts. The first part will provide theoretical perspectives on corrective feedback within the framework of a cognitive-interactionist approach. The second part will present two types of corrective feedback, recasts and prompts, which are the focus of this study. The third part will provide a review of studies that have examined the effectiveness of prompts and recasts. The fourth and final part will present stimulated recall method, which was used in this study, and will review studies that have explored learners' cognitive processes triggered by oral corrective feedback and their relationships with second language development.

2.1. Theoretical Perspectives on Corrective Feedback

The effectiveness of oral corrective feedback in second language learning is explained by SLA theories based on interaction and information-processing approaches. The interaction approach attempts to explain why interaction and learning can be linked using psychological concepts such as noticing and attention (Gass & Mackey, 2007; Mackey, 2012). Three hypotheses (Interaction Hypothesis, Noticing Hypothesis, and Output Hypothesis) that relate to the interaction approach will be discussed in this section. The information-processing approach takes into account the ways in which second language information is automatized and restructured through repeated activation (McLaughlin & Heredia, 1996; Mitchell & Myles, 2004). Skill Acquisition Theory will be presented later in this section within the framework of the information-processing approach.

2.1.1. Interaction Hypothesis

The Interaction Hypothesis evolved from early observational studies that focused on the components of interaction and second language development (Gass, 1997; Mackey, Abbuhl, & Gass, 2012; Spada & Lightbown, 2009). These studies were mainly concerned with negotiation for meaning. Negotiation for meaning refers to "the process in which, in an effort to communicate, learners and competent speakers provide and interpret signals of their own and their interlocutor's perceived comprehension" (Long, 1996, p. 418). Hatch (1978) analyzed the interaction between native speakers (NSs) and non-native speakers (NNs) and illustrated how second language knowledge develops through conversations. She claimed that language learning evolves out of learning how to communicate.

Long (1981) examined conversations between NSs and NNSs and reported that NSs adjust the complexity of their language through interactional modifications, such as clarification requests, confirmation checks, and repetitions, to avoid communication breakdowns. These adjustments make the utterance more comprehensible to NNSs. Long (1981) proposed that participation in conversation with native speakers, made possible through interaction, is the necessary and sufficient condition for second language acquisition. This is known as the Interaction Hypothesis (Long, 1996). Long's original Interaction Hypothesis was influenced by the Input Hypothesis (Krashen, 1985). The Input Hypothesis claims that second language acquisition is primarily facilitated through exposure to comprehensible input, which is input that is slightly more advanced than the learner's interlanguage (Krashen, 1985). Long and other researchers (Varonis & Gass, 1985) suggested that linguistic input is simplified through interactions where meaning is negotiated, and that input that becomes more comprehensible is important for second language acquisition.

In his revised version of the Interaction Hypothesis, Long (1996) states:

> Negotiation for meaning, and especially work that triggers interactional adjustments by the NS or more competent interlocutor, facilitates acquisition because it connects input, internal learner capacities, particularly selective attention, and output in productive ways. (Long, 1996, pp. 451-452)

While the original hypothesis focused on the way that input becomes comprehensible to a learner, the updated version is more concerned with the learner's cognitive processes that lead to second language learning (Spada & Lightbown, 2009). Interactional adjustments produced during interaction help learners to realize and notice problems in their interlanguage, helping them pay attention to input or their own output to overcome those problems. The revised Interaction Hypothesis also gives more importance to the role of corrective feedback:

> Environmental contributions to acquisition are mediated by selective attention and the learner's developing L2 processing capacity, and these resources are brought together most usefully, although not exclusively, during negotiation for meaning. Negative feedback obtained during negotiation work or elsewhere may be facilitative of L2 development, at least for vocabulary, morphology, and language-specific syntax, and essential for learning certain specifiable L1-L2 contrasts. (Long, 1996, p. 414)

Long (1996) suggested that learners need to pay attention to learn certain types of L2 structures, for which input alone is not sufficient. When learners produce a non-target-like utterance, negative feedback informs them that their own form is erroneous and helps them attend to the problems in their non-target-like utterance and notice the correct form in the input (Long, 2007).

2.1.2. Noticing Hypothesis

Schmidt (1995) defines 'noticing' as conscious registration of the occurrence of some event. 'Noticing' should be differentiated from 'understanding', which is the recognition of a general principle or rule. Schmidt (1995) presents the following examples of 'noticing' and 'understanding':

> In foreign language vocabulary learning, conscious registration of the form (phonological or orthographic) of a word is an example of noticing. Knowing the meaning of a word and knowing its syntactic privileges of occurrence (other than in collocations and fixed expressions) are matters of understanding… In morphology, awareness that a target language speaker says, on a particular occasion, "He goes to the beach a lot" is a matter of noticing. Being aware that *goes* is a form of *go* inflected for number agreement is understanding. (Schmidt, 1995, pp. 29-30)

The Noticing Hypothesis states that "what learners notice in input is what becomes intake for learning" (Schmidt, 1995, p. 20). Input is what is available to be learned and intake is what is cognitively registered through learners' perceptions and further processing (Robinson, Mackey, Gass, & Schmidt, 2012). In order for L2 learning to occur, linguistic forms or certain aspects in the input need to be noticed so that they become intake. Schmidt claims that all learning involves noticing.[2] There can be instances of incidental learning (learning without intention), but learning does not occur without noticing. For example, it is possible to learn new vocabulary through extensive reading without having the intention to learn such vocabulary. However, if readers do not pay attention to the new words encountered, they will not learn these words.

[2] Schmidt (1995) suggests that while noticing is necessary for all learning, understanding may be necessary for more explicit learning.

It has been suggested that oral corrective feedback which contains a correct form promotes second language development by helping learners notice target-like utterances in the input they receive (Egi, 2010; Loewen, 2012; Mackey, 2012; Mifka Profozic, 2013; Sheen, 2011). By receiving corrective feedback, learners' attention is directed towards the problematic parts of the interlanguage. This helps learners notice the correct utterance in the input, changing input into intake, which leads to second language learning (Schmidt, 1990). Oral corrective feedback also assists learners to notice the mismatch between their erroneous utterance and the target-like utterance (Egi, 2007a). It has been suggested that this cognitive comparison is beneficial for L2 knowledge restructuring (Doughty, 2001; Mifka Profozic, 2013).

2.1.3. Output Hypothesis

The Output Hypothesis claims that "the act of producing language (speaking or writing) constitutes, under certain circumstances, part of the process of second language learning" (Swain, 2005, p. 471). Output is not simply the product of learning; rather, it is a part of the learning process (Swain, 2005). The Output Hypothesis was first proposed on the basis of Swain's (1985) argument against Krashen's (1985) Input Hypothesis. Krashen's (1985) Input Hypothesis claims that the one and only necessary and sufficient condition for second language acquisition is to be exposed to input that is beyond the learner's current level. Krashen (1989) argued that output is just an indication of second language skills already acquired by learners, and that producing output itself does not facilitate second language acquisition. Swain (1995) opposed this position, claiming that receiving input is not the only causal condition for SLA; output is also necessary for learning some aspects of a second language. Her argument stemmed from the study of grade 6 French immersion students whose grammatical performance was non-nativelike in spite of 7

years of comprehensible input in L2. Swain observed these students and found that they had limited opportunities to produce output and were not pushed to produce language that is more appropriate or precise. Swain claimed that this lack of output may be the reason that the students showed limited L2 ability although they had enough comprehensible input. When listeners receive input and try to make sense of an utterance, they often use semantic and pragmatic information to assist comprehension. Listeners parse sentences using this information, sometimes circumventing syntactic processing. In the case of producing output, learners need to create linguistic forms to convey a message: a task which requires syntactic processing. Swain also noted that when learners simply get their message across with grammatically inaccurate forms or in a sociolinguistically inappropriate way, they need to be pushed to produce output with grammatical accuracy and social appropriateness so that the restructuring of L2 knowledge will occur (Swain, 2005). Swain explained that "output that extends the linguistic repertoire of the learner as he or she attempts to create precisely and appropriately the meaning desired (Swain, 1985, p. 252)" is necessary for second language acquisition.

Swain (1995) proposed three functions of output that contribute to second language acquisition: noticing, hypothesis testing, and a metalinguistic function. The first function of output is 'noticing or triggering'. The activity of producing the target language first helps learners to notice shortcomings in their target language. When learners try to produce output, they encounter a situation in which they do not know precisely how to phrase the meaning that they want to convey. At that moment, they realize which aspects of their interlanguage are lacking, and their attention is led to the relevant target language input.

Although both Schmidt and Swain stress the importance of noticing in second language learning, their focus is slightly different. While Schmidt (1990) focuses mainly on noticing in

relation to certain aspects of input, Swain discusses noticing a problem in learners' interlanguage system. Swain explains that noticing what they do not know helps learners to pay attention to the necessary information in the input and it leads to second language learning (Swain, 2005).

The second function of output is 'hypothesis testing'. It is considered that learners' errors reveal hypotheses held by them about how the target language works (Swain, 1995). Output provides opportunities for learners to test hypotheses about comprehensibility or linguistic well-formedness. Some rules in the learner's interlanguage could be the same as those of the target language, but other rules could be different. When the learner's interlanguage differs from the target language, learners test new linguistic hypotheses by producing output. That is, learners make use of their output to elicit necessary information from an interlocutor concerning whether the language forms they create work or do not work (Swain, 1995).

The important output function in relation to oral corrective feedback is hypothesis testing. Research has shown that learners produce modified output, which reflects their hypothesis, in response to corrective feedback such as clarification requests or repetitions (Lyster et al., 2013; Mackey, 2012; McDonough, 2005; Swain, 2005). When learners are trying to produce modified output, they exploit their linguistic resources and experiment with new structures and forms (Swain, 1995). The processes in which learners engage to modify their output after receiving corrective feedback are part of the second language learning process (Swain, 2005).

The third function of output is the 'metalinguistic function'. Swain proposed that using language to reflect on language produced by others or by oneself mediates second language learning (Swain, 2005). When learners use language to reflect on language, they externalize their thoughts about language by speaking. This talk may help learners to deepen their awareness of linguistic rules and can contribute to a restructuring of their interlanguage (Swain, 1998).

2.1.4. Skill Acquisition Theory

Skill Acquisition Theory explains how people progress in learning a skill from the initial learning stage through to highly skilled behavior (DeKeyser, 2007a). In Skill Acquisition Theory, learning is construed as the gradual transformation from the initial representation of knowledge to eventual automatic performance. There are three stages through which skills are acquired (DeKeyser, 2007a, b). In the initial stage, the learner acquires knowledge about the skill through observation or analysis. This type of knowledge is called declarative knowledge (knowledge that) (Ortega, 2009). The next stage is to turn this knowledge into a behavior, and the knowledge used at this point is called procedural knowledge (knowledge how) (DeKeyser, 2007b). The last stage is automatization, in which learners minimize the cognitive demand and fully master the skill. In the case of SLA, learners acquire declarative knowledge of an L2 through explanations presented by teachers or textbooks, and this knowledge is converted into the ability to use the L2 through practice (procedural knowledge). Once procedural knowledge is established, it can turn into a fast and errorless use of the L2 through repeated practice (DeKeyser, 2007a).

Skill Acquisition Theory considers practice as a key part of learning (DeKeyser, 2001), and corrective feedback provided during practice is considered to be important (Lyster & Sato, 2013). Feedback makes the learner notice when a change to the learner's rule is necessary, and it makes the learner pay greater attention to his or her own output and the interlocutor's input. This process helps the learner to decrease the number of errors, a necessary step for ultimate errorless performance (Leeman, 2007).

2.2 Recasts and Prompts

2.2.1. Classifications of oral corrective feedback

Corrective feedback is typically defined as "information provided to learners about the ill-formedness of their L2 production" (Loewen, 2012, p. 24). Corrective feedback occurs in relation to learners' oral as well as written productions. While oral corrective feedback is normally provided just after a learner has produced a non-target-like utterance, written feedback is often provided some time after the text is written (Loewen, 2012).

Corrective feedback has received considerable attention in the field of SLA (Sheen, 2011). Researchers have analyzed interactions that occur between a learner and a teacher or an interlocutor and have reported different types of feedback (Chaudron, 1977; Ellis & Sheen, 2006; Loewen, 2009; Lyster & Ranta, 1997; Milla & García Mayo, 2014; Panova & Lyster, 2002). Loewen and Nabei (2007) proposed the classification of corrective feedback according to two criteria: other repair or self-repair, and the explicitness of corrective feedback. Figure 1 illustrates their classification of corrective feedback.

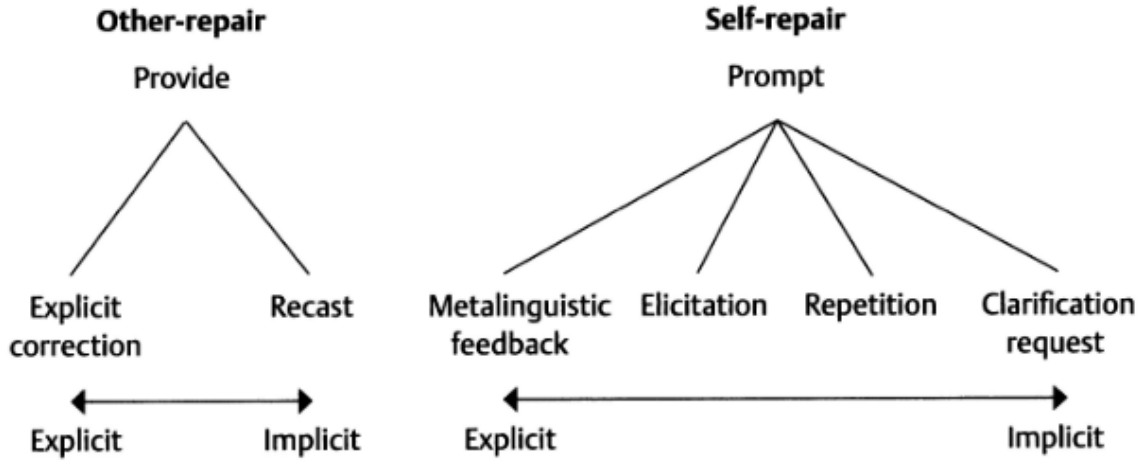

Figure 1. Options for corrective feedback (Loewen & Nabei, 2007, p. 362).

The first criterion is whether the repair of the error is conducted by others or by the learners themselves. When the correct form is provided to the learner by the teacher or interlocutor, the feedback is regarded as other-repair. When the correct form is not provided by the teacher, and the learner is prompted to correct the error by him/herself, it is considered self-repair.

The second criterion is the explicitness of corrective feedback, and it is on a continuum in this classification. Ortega (2009) defines explicitness as "the perceptual salience (e.g. intonation) and linguistic marking (e.g. metalanguage) with which the negative information is delivered" (p.75). While Ortega's definition of explicitness focuses on specific features of corrective feedback, Lowen and Nabei take more broad view to determine the explicitness. Corrective feedback is more explicit when it provides an overt indication that the learner's utterance is problematic. If corrective feedback does not include a clear indication of the problem, it is regarded as more implicit. However, whether or not the indication of the error is overt depends on different factors such as the focus of the interaction (Egi, 2010; Ellis & Sheen, 2006; Loewen & Philp, 2006; Mackey, 2012). Thus, it is more appropriate to ascertain the explicitness of feedback using a continuum rather than with a dichotomous determination.

2.2.2. Recasts

Recasts are defined as "the reformulation of the learner's erroneous utterance that corrects all or part of the learner's utterance and is embedded in the continuing discourse" (Sheen, 2011, p. 2). The following is an example of a recast:

Example 1 (Ellis & Sheen, 2006, p. 576)

T: When you were in school?

L: Yes. I stand in the first row (trigger)

T: You **stood** in the first row? (recast)

The learner produces a non-target-like form in line 2. In the following line, the interlocutor reformulates the learner's error (a recast). It has been reported that recasts are the most frequently used corrective feedback in second language classrooms (Brown, 2014; Llinares & Lyster, 2014; Loewen, 2009; Lyster & Mori, 2006; Lyster & Ranta, 1997; Sheen, 2011).

Recasts seem to be a simple phenomenon, but they can vary depending on their features (Ellis & Sheen, 2006; Williams, 2012). When recasts involve reformulations of a whole utterance, they are considered to be a full recast (Sheen, 2011). The recast in example 1 illustrates a full recast. In contrast, the following example shows a partial recast, which involves a reformulation of part of the erroneous utterance:

Example 2 (Ellis & Sheen, 2006, p. 579)

L: Yeah, Whitman comes to my mind.

T: Comes to mind.

Recasts can also appear a single time or multiple times. Examples 1 and 2 are considered single recasts. The following example illustrates multiple recasts:

Example 3 (Ellis & Sheen, 2006, p. 579)

L: Kal told me, your height is rather shorter.

T: Rather short. Rather short.

In the second turn, the teacher provides a recast twice in a single move, which is considered a multiple recast (Sheen, 2011). Although the multiple recast in this example occurs in the teacher's turn, some researchers report that multiple recasts are used in an extended episode rather than in a single turn (Braidi, 2002; Loewen, 2009).

Another important characteristic of recasts is whether the focus of attention is on the form or on the meaning. The following example shows a recast that focuses on the meaning:

Example 4 (Sheen, 2011, p. 3)

S: How much weigh?

T: What?

S: How weight are you?

T: How much do I weigh?

In the first turn, the student produced an erroneous sentence, and the teacher did not understand the meaning of the message. In the next turn, the student produced a non-target-like utterance again. In the fourth turn, the teacher reformulated the learner's problematic utterance to check what the learner intended to say. In this episode, there was a communication breakdown between the student and the teacher, and the focus of the attention is on meaning. Sheen (2011) calls this type of recast a 'conversational recast'. Some researchers (Long, 2007) take the position that recasts that contribute to second language learning are those which focus on the meaning. However, research has shown that recasts that are potentially beneficial for second language learning can also focus on the form (Ellis & Sheen, 2006). The following is an example of a

recast that focuses on form:

Example 5 (Sheen, 2011, p. 3)

S: Women are kind than men.

T: Kinder.

The student produced an erroneous utterance, but according to Sheen, its meaning is clear. The teacher provided a recast in order to provide a well-formed utterance rather than trying to understand what the learner was trying to say. In this episode, the focus of the attention is not on the meaning, but on the form. Sheen (2011) calls this type of recast a 'didactic recast'. Didactic recasts draw the learner's attention to the location of the error and they are provided for a pedagogical purpose. Since recasts appear in situations in which the interlocutor's focus is either on the meaning or on the form, the recasts discussed in this chapter include both conversational recasts and didactic recasts.

Recasts have several functions that contribute to second language learning: (a) providing positive evidence, (b) offering negative evidence, and (c) presenting a juxtaposition of an erroneous form and a target-like form (Mackey, 2012). Positive evidence refers to "the input and basically comprises the set of well-formed sentences to which learners are exposed" (Gass, 2003, p. 225).[3] Negative evidence refers to "the type of information that is provided to learners concerning the incorrectness of an utterance" (Gass, 2003, p. 225).

[3] Mackey (2012) points out that concept of 'positive evidence' varies in the second language acquisition literature. For example, information about whether the target language that the learner created is acceptable or not is sometimes considered positive evidence (Mackey, 2012). However, there are researchers who use a concept similar to Gass's. For example, Braidi (2002) states that "positive evidence provides the learner with a model of utterances that are possible and grammatical in the language" (p. 2). This study employs Gass's definition of positive evidence.

The first function of recasts is to provide positive evidence. A recast is a reformulation of an error, so that it becomes a well-formed utterance. Positive evidence is an important source of information for second language development, and receiving recasts as positive evidence is facilitative of second language acquisition (Leeman, 2003).

The second function of recasts is to provide negative evidence. When negative evidence is provided to learners, it helps to draw their attention to problems in their interlanguage. Recasts can provide both positive and negative evidence (Egi, 2010; Sheen, 2011). The following example shows the way that both of these types of evidence can be provided by recasts:

Example 6 (Sheen, 2006, p. 387)

1. S: They hired me. But when I meet someone in…
2. T: Met.
3. S: When I met someone, there's a foreigner in there.
4. T: Was, was.
5. S: Yeah, I felt so incomfortable.
6. T: Un-.
7. S: Uncomfortable to speak with them.

In line two, the teacher provides a recast. It offers negative evidence signaling that 'meet' is an erroneous form. At the same time, it provides positive evidence in the form of 'met'. This example shows that recasts can provide negative evidence and may help the learner to direct his or her attention to the correct form.

Although example 6 illustrates the way in which recasts provide both positive and negative evidence, it is not always the case that recasts are perceived as offering negative

evidence. Nicholas, Lightbown, and Spada (2001) suggest that recasts are sometimes viewed only as providing positive evidence. When learners perceive the recast simply as a part of a conversation, they do not notice that the recast is a response to their erroneous utterance. In this type of case, recasts provide only positive evidence. Lyster (2004) also points out that learners may perceive recasts as conversational responses, and recasts may be ambiguous as corrective feedback to a learner's non-target-like utterances (Lyster, 1998; Lyster & Ranta, 1997). There is empirical support for the claim that recasts do not always provide negative evidence. Egi (2007a) analyzed L2 learners' perception of recasts regarding morphosyntactic errors and reported that learners interpret about 34% of recasts as negative evidence and 26% of recasts as both negative and positive evidence. Researchers suggest that the question of whether or not recasts provide negative evidence depends on learners' perceptions (Egi, 2007a; Mackey, Gass, & McDonough, 2000). It has been reported that learners tend to notice recasts as corrective feedback when recasts are partial and targeted at a small number of errors. Additional prosodic emphasis assists learners in noticing that recasts are responses to their erroneous utterances (Loewen & Philp, 2006; Williams, 2012).

The third function of recasts is to present a juxtaposition of an erroneous form and a target-like form. Recasts are normally provided immediately after the learner's erroneous utterance. This immediate contrast between their problematic utterance and the correct form assists the learner to notice the gap between his or her error and the target-like form (Long, 1996; Goo & Mackey, 2013). Once the learner notices the gap, this information is further processed, leading to restructuring of his or her second language knowledge.

2.2.3. Prompts

Prompts are defined as corrective feedback that pushes learners to self-repair or modify their output (Lyster, 2004). Prompts are not a single type of corrective feedback technique, but include various feedback techniques that share the same characteristic, which is withholding the correct utterance. Prompts typically include the following four types of teacher response (all examples from Lyster, 2004, p. 405):

1. *Clarification requests* are phrases such as "Pardon me" and "I don't understand" used to indicate that the student's message has either been misunderstood or ill. For example:

Student: *Et le coccinelle.* "And the (M) ladybug"

Teacher: *Pardon?* "Sorry?"

Student: *La coccinelle* . "The (F) ladybug"

2. *Repetitions* replicate the student's error verbatim, usually with rising intonation and stress to highlight the error. For example:

Student: *La chocolat.* "(F) Chocolate"

Teacher: *La chocolat?* "(F) Chocolate?"

Student: *Le chocolat.* "(M) Chocolate"

3. *Metalinguistic clues* provide comments, information, or questions related to the well-formedness of the student's utterance. For example:

Student: *Parce qu'elle cherche, euh, son, son carte.*

"Because she's looking for, um, her, her (M) card"

Teacher: *Pas son carte*. "Not her (M) card"

Student: *Euh, sa carte?* "Um, her (F) card?"

4. *Elicitation* entails direct questions such as "How do we say that in French?" or pauses

that allow students to complete the teacher's utterance. For example:

Teacher: *Il vit où un animal domestique? Où est-ce que ça vit?*

"Where does a pet live? Where does it live?"

Student*: Dans un maison.* "In a (M) house"

Teacher: *Dans . . . ? Attention.* "In… ? Careful"

Student: *Dans une maison.* "In a (F) house"

Just as recasts take different forms, prompts appear in various ways. Prompts include a variety of corrective feedback techniques, the choice of which is at the discretion of the interlocutor or teacher. Prompts can include both single corrective feedback as well as multiple corrective feedback in one feedback episode (Ammar & Spada, 2006; Lyster & Izquierdo, 2009).

Prompts have two functions. First, they provide negative evidence. When prompts are provided, they signal that the learner's utterance was problematic. This helps learners focus their attention on the linguistic form they produced. Second, they provide an opportunity to produce modified output. Since prompts do not provide exemplars, learners are expected to modify their erroneous utterances by themselves. In order to produce modified output, learners need to extend their linguistic knowledge and create a new hypothesis about how the target language works. These processes help to strengthen the representation of the learner's linguistic knowledge and induce a restructuring of the learner's interlanguage.

2.3. Empirical Studies Examining the Efficacy of Recasts and Prompts

A substantial amount of research focusing on the efficacy of corrective feedback has been generated in the last two decades (Afitska, 2015; Li, 2010; Loewen, 2012; Mackey & Goo, 2007; Lyster & Saito, 2010; Lyster et al., 2013; Mackey, 2012; Mifka Profozic, 2013; Sheen, 2011).

There are two main groups of studies that have examined the effectiveness of prompts and recasts. The first group investigated the efficacy of recasts on second language learning and were conducted in both lab settings and L2 classrooms. The second group of studies compared the effectiveness of recasts and prompts, and they were mainly conducted in L2 classrooms. The following section will discuss these two groups of studies on a group-by-group basis.

2.3.1. Studies investigating the effectiveness of recasts

Long (1991, 1996) suggested that recasts have a facilitative role in second language learning because they provide positive evidence without interrupting the flow of communication. Although the idea that recasts facilitate second language learning was put forward, at the time there was no empirical evidence showing a link between recasts and second language development. In the late 1990s, SLA researchers started using a pre-and post-tests study design to examine the relationship between recasts and subsequent language learning (Ortega, 2009). Mackey and Philp (1998) investigated the effects of recasts on the development of question forms in English in a lab setting. The results showed that interactions with recasts had a positive impact on second language development, especially for more advanced learners. Their study provided the first empirical evidence for a link between recasts and second language learning (Mackey, 2012).

This positive relationship between recasts and L2 development is also supported by Han's (2002) laboratory study. Han investigated the efficacy of intensive recasts on the acquisition of the past tense in English and reported that recasts are beneficial for second language learning. Leeman (2003) also found that recasts had a facilitative role on learning noun-adjective agreements in Spanish. In addition, McDonough and Mackey (2006) examined the relationship

between recasts and acquisition of the past tense in English and found that recasts are a significant predictor of second language development. These studies support the claim that recasts play a facilitative role in second language learning.

The studies discussed above were conducted in lab settings. Doughty and Varela (1998) claimed that recasts can be effective in L2 classrooms. They investigated the effects of corrective recasts (repetitions of error followed by recasts if necessary) on learning the past tense and conditional past in a content-based ESL classroom. Doughty and Varela suggest that corrective recasts were beneficial for learning the target structures. Although Doughty and Varela's study showed the potential effectiveness of recasts in L2 classrooms, the findings of their study must be interpreted with caution. The corrective recasts used in their study were a combination of repetitions of error and recasts. It is not clear whether the efficacy of corrective recasts stemmed from repetitions of errors or recasts; thus, the evidence suggesting the benefits of recasts in L2 classrooms is not conclusive.

While most recast studies focused on the acquisition of morphosyntax, such as question forms or the past tense in English, some studies reported recasts as having a positive effect on pronunciation and speech perception development (Lee & Lyster, 2016; Saito, 2013; Saito & Lyster, 2010). Saito and Lyster (2010) examined the impact of recasts and form-focused-instruction on the development of /ɹ/ by Japanese learners of English. The results showed that recasts combined with form-focused instruction were beneficial for improving learners' pronunciation of /ɹ/. Saito (2013) also investigated the effects of recasts on the development of speech perception of /ɹ/ by Japanese learners of English and found that recasts had a positive impact on the development of L2 speech perception. A summary of studies that examined the effectiveness of recasts is presented in Table 1.

Table 1

Summary of Studies Examining the Effectiveness of Recasts

Study report	Research setting	Recasts type	Target structure	Results
Mackey & Philp (1998)	ESL lab	Recasts	Question forms	Recasts are effective.
Han (2002)	ESL lab	Recasts	Past tense	Intensive recasts are effective.
Leeman (2003)	SFL	Recasts	Noun-adjective agreements	Recasts are effective. (The benefits of recasts are attributable to positive evidence.)
McDonough & Mackey (2006)	EFL lab	Recasts	Past tense	Recasts are a significant predictor of second language development.
Doughty & Varela (1998)	ESL classroom	Corrective recasts (repetitions of error followed by recasts if necessary)	Past tense Conditional past	Corrective recasts are effective.
Saito & Lyster (2010)	ESL classroom Japanese learners	Recasts	Pronunciation /ɹ/	Recasts combined with FFI were beneficial for improving learners' pronunciation of /ɹ/.

Study report	Research setting	Recasts type	Target structure	Results
Saito (2013)	EFL classroom Japanese learners	Recasts	Pronunciation and speech perception of /ɹ/	Recasts promote learners' attention to phonetic aspects of second language speech.
Long, Inagaki & Ortega (1998)	SFL lab JFL lab	Recasts	Spanish Adverb placement Object topicalization Japanese Adjective ordering Locative construction	Recasts were effective for learning adverb placement in Spanish, but not beneficial for the other three structures.
Iwashita (2003)	JFL lab	Recasts	Locative word order Locative particle use, *te*-form verb morpheme	Recasts were effective only in learning the *te*-form verb morpheme.

ESL = English as a second language, SFL = Spanish as a foreign language, EFL = English as a foreign language

FFI = Form focused instruction, JFL = Japanese as a foreign language

Although previous studies have supported the claim that recasts have beneficial effects on second language acquisition, some researchers point out that recasts may not promote second language learning as much as other types of corrective feedback (Ammar & Spada, 2006; Lyster, 2004; Lyster & Ranta, 1997). They claim that learners, especially in L2 classrooms, tend not to recognize recasts as responses to their erroneous utterances, and that recasts may not facilitate language development when they go unnoticed. Some studies show that recasts with certain characteristics (rising intonation, shortened length, and only one change) are more noticeable to learners; hence, these types of recasts are more effective (Loewen & Philp, 2006, Mackey, 2012).

The efficacy of recasts is influenced by various factors such as the target structure (Iwashita, 2003; Long, Inagaki, & Ortega, 1998), learners' proficiency level (Ammar & Spada, 2006; Mackey & Philp, 1998), learners' perceptions of recasts (Egi, 2007b), and learners' working memory (Mackey, Philp, Egi, Fujii, & Tatsumi, 2002; Trofimovich, Ammar, & Gatbonton, 2007). Previous studies show that recasts are effective for some structures, but not for all. For instance, Long et al. (1998) examined the effects of recasts on the acquisition of four different structures (adverb placement and object topicalization in Spanish, and adjective ordering and locative construction in Japanese) and found that recasts were effective for learning adverb placement in Spanish, but not beneficial for the other three structures. This pattern was also found in Iwashita's (2003) lab study. Iwashita examined the effects of oral corrective feedback on the acquisition of three structures (locative word order, locative particle use, and the *te*-form verb morpheme) in Japanese. The results show that recasts have a facilitative role only in learning the *te*-form verb morpheme. These studies suggest that the effectiveness of recasts is influenced by the target structure.

Recasts' effectiveness also depends on learners' perceptions, particularly whether or not

learners notice the gap between their erroneous utterance and the correct form. Egi's (2007b) study shows that there is a positive relationship between noticing the gap and second language learning. Recasts are most effective when learners notice the mismatch between their error and the correct form.

Another factor that may influence the efficacy of recasts is the learner's working memory capacity. Mackey et al. (2002) investigated the relationship between learners' working memory and the effects of recasts on the acquisition of question forms by Japanese learners of English. Learners' verbal working memory capacity was measured by listening-span tests in L1 and L2, and their phonological short-term memory was assessed by a non-word recall task. The results showed that learners with lower working memory capacity performed better in an immediate-post-test, while learners with higher working memory capacity performed better in the delayed-post-test. These results suggest that learners' working memory capacity influences the effectiveness of recasts, and that a high working memory may be connected to long-term effects stemming from recasts.

In sum, research shows that recasts generally play a facilitative role in second language learning, but their effectiveness is mediated by various factors, such as their characteristics, target structure, learners' noticing the gap, and learners' working memory capacities. When these factors work positively and the optimal conditions are created, recasts promote second language learning.

2.3.2. Studies comparing the efficacy of recasts and prompts

Although the effectiveness of recasts has been reported in lab studies, some researchers (Ammar & Spada, 2006; Lyster, 1998; Lyster & Ranta, 1997) have suggested that recasts are

ambiguous as corrective feedback, and that they may have limited efficacy relative to other types of corrective feedback, especially in L2 classrooms. They claim that prompts may be more effective than recasts, because the corrective intent of prompts is more salient and they encourage learners to self-repair. To examine this claim, researchers compared the effectiveness of recasts and prompts in L2 classrooms. Lyster (2004) investigated the effectiveness of recasts and prompts with respect to immersion students' abilities to assign grammatical genders in French. The participants were divided into four groups: form focused instruction (FFI) with recasts, FFI with prompts, FFI only, and a control group with neither FFI nor corrective feedback. The results showed that the FFI with prompts group outperformed all the other groups on the written measures, while the performances of the FFI with recasts group and the FFI only group were almost the same. The findings suggest that prompts may be more effective than recasts in L2 classrooms.

Lyster's findings are also supported by Ammar and Spada's (2006) study. Ammar and Spada examined the benefits of recasts and prompts, focusing on the acquisition of the third-person singular possessive determiners (*his* and *her*) in English. The participants were divided into three groups: one with recasts, one with prompts, and a control group. The results showed that both the recast and the prompt groups outperformed the control group, but the prompt group outperformed the recast group. The results also showed that while the high-proficiency learners benefitted equally from both prompts and recasts, the low-proficiency learners derived more benefits from prompts than from recasts. The study suggests that prompts more generally facilitate second language learning, whereas the effectiveness of recasts is dependent upon a learner's proficiency. Similar to Lyster's (2004) study, this study posits the effectiveness of prompts over recasts in second language classrooms.

In addition to these studies, Yang and Lyster's (2010) classroom study in China supports the superior efficacy of prompts for learning regular past tense in English. Three EFL classes in China were assigned to either a prompt group, a recast group, or a control group. The results showed that the prompt group outperformed the other groups in its use of regular past tense forms; however, recasts and prompts were equally effective for irregular past tense forms. This study provides additional evidence for the superior effectiveness of prompts.

Although the studies discussed above suggest that prompts are more effective than recasts for some learners on some measures of particular forms, there are other studies that reported equal levels of efficacy. Lyster and Izquierdo (2009) examined the effectiveness of prompts and recasts on the acquisition of grammatical gender in French at the college level. Learners of French were divided into a recast group and a prompt group, and received corrective feedback over two treatment sessions. Corrective feedback treatments were provided one-on-one in a lab setting. The results showed no significant difference between these two groups, suggesting that recasts were as effective as prompts. Lyster and Izquierdo suggest that both recasts and prompts can promote second language learning, but they may work differently. Recasts promote second language learning by providing positive evidence, whereas prompts facilitate language acquisition by encouraging learners to produce modified output.

Kartchava and Ammar's (2014) ESL classroom study also reported that there is no difference between recasts and prompts in relation to their benefits on the acquisition of the past tense and questions in the past (e.g., How long did you stay?). Participants in their study were divided into three experimental groups (recasts, prompts, and a combination of both) and a control group and the results showed no significant differences among the groups in terms of learning either the past tense or questions in the past. Kartchava and Ammar claim that the

absence of differential effects may be because the duration of the treatment sessions was short (there were two 120-minute sessions). However, Yang and Lyster's (2010) study showed that prompts were effective on the acquisition of regular past tense with relatively short treatment sessions (approximately two hours over a period of two weeks). The difference between these two studies is whether or not participants engaged in form-focused-practice during treatment sessions. Form-focused-practice consists of "collaborative tasks designed especially to draw learners' attention to form (Lyster, 2007, p. 77)". In Yang and Lyster's study, participants worked on form-focused-tasks, such as dictogloss[4] (Swain & Lapkin, 2001), when they received oral corrective feedback, and this may have helped learners to gain awareness of the target structure. In contrast, participants in Kartchava and Ammar's study engaged in regular communicative tasks during treatment sessions. The participants in Yang and Lyster's study may have been more attentive to the target structure during treatment sessions, and they benefitted more from corrective feedback than the participants in Karchava and Ammar's (2014) study.

The studies discussed above focused on the effectiveness of multiple prompts and recasts. There have been a few studies that compared the effectiveness of a single prompt (clarification requests) and recasts. McDonough (2007) investigated the efficacy of recasts and clarification requests on the acquisition of the past tense in English in a lab setting. The results showed no significant differences between the recast and clarification request groups. McDonough suggests that no differences were observed between these two feedback groups because only clarification requests (and not a combination of feedback techniques, such as clarification requests and metalinguistic feedback) were employed in this study. This lack of a combination of corrective

[4] Dictogloss is a text reconstruction task. Learners listen to a short, dense text read at normal speed and jot down familiar words and phrases. Then, they work together in small groups to reconstruct the text by sharing their sources. Different versions are then compared in a class (Kowal & Swain, 1994; Lyster, 2007).

feedback did not allow the study's interlocutor to provide the optimal feedback necessary for the learners to restructure their interlanguage. McDonough's explanation is in accord with Lyster's claim that the effectiveness of prompts may be attributable to the variety of corrective feedback techniques (Lyster et al., 2013).

The limited efficacy of clarification requests was also observed in Mifca Profozic's (2013) classroom study. Mifca Profozic examined the effectiveness of recasts and clarification requests on learners' acquisition of the French *passé composé* and *imparfait*. The results showed recasts to be more effective than clarification requests. Mifca Profozic explained that recasts were more effective because they helped learners to notice the difference between their erroneous utterances and the correct forms. It is possible that participants in this study may have benefitted from receiving positive evidence to acquire the target structures. The summary of studies examining the effectiveness of recasts and prompts is presented in Table 2.

Table 2

Summary of Studies Examining the Effectiveness of Recasts and Prompts

Study report	Research setting	CF type	Target structure	Results
Lyster (2004)	French immersion Classroom	Recasts Prompts • Clarification requests • Repetition • Elicitation • Metalinguistic feedback	Grammatical gender	FFI with prompts was most effective on the written measures.
Ammar & Spada (2006)	ESL Classroom	Recasts Prompts • Repetition • Elicitation • Metalinguistic feedback	Third-person singular possessive determiners (*his* and *her*)	Prompts were more effective than recasts for lower proficiency learners.

Study report	Research setting	CF type	Target structure	Results
Yang & Lyster (2010)	EFL Classroom	Recasts Prompts • Clarification requests • Repetition • Elicitation • Metalinguistic clue	Past tense	Prompts were more effective than recasts on the acquisition of regular past tense. Prompts and recasts had the same level of efficacy in relation to irregular past tense forms.
Lyster & Izquierdo (2009)	FSL lab	Recasts Prompts • Clarification requests • Repetition	Grammatical gender	Prompts and recasts had same level of efficacy.
Kartchava & Ammar (2014)	ESL Classroom	Recasts Prompts • Repetition • Elicitation • Metalinguistic information Recasts + Prompts	Past tense	No significant differences across groups including the control. No type of corrective feedback was effective.

Study report	Research setting	CF type	Target structure	Results
McDonough (2007)	EFL lab	Recasts Prompts • Clarification requests	Past tense	Recasts and prompts (clarification requests) had same level of efficacy.
Mifca Profozic (2013)	FFL Classroom	Recasts Prompts • Clarification requests	Passé composé Imparfait	Recasts were more effective than prompts (clarification requests).

ESL = English as a second language, EFL = English as a foreign language, FFI = Form focused instruction

FSL = French as a second language, FFL = French as a foreign language

In sum, corrective feedback studies comparing the effectiveness of recasts and prompts have overall produced mixed results. Although some studies suggest that prompts are more effective than recasts, others provide some evidence showing that both types of feedback have the same level of efficacy. These studies indicate that the relative effectiveness of prompts depends on different factors rather than showing a categorical superiority of prompts on all measures. For instance, the type of task in which learners engage when they receive prompts may mediate the efficacy of prompts (Kartchava & Ammar, 2014; Yang & Lyster, 2010). In addition, the target structure may influence the relative effectiveness of prompts. McDonough points out that prompts are more effective when they are used in combination instead of a single prompt. Prompts have superior effectiveness over recasts when these factors converge to create optimal conditions.

Previous corrective feedback studies provide information about the effectiveness of prompts and recasts, but the accumulation of primary studies renders it difficult to determine the efficacy of these two corrective feedback types. Quantitative meta-analyses synthesize these primary research findings and inform about the overall effects of different types of corrective feedback (Li, 2010; Norris & Ortega, 2006).[5] To date, there have been several meta-analyses that have focused on the effectiveness of different types of oral corrective feedback (Li, 2010; Lyster & Saito, 2010; Mackey & Goo, 2007). Mackey and Goo (2007) analyzed the effectiveness of three types of corrective feedback: recasts, negotiation (e.g., clarification requests) and metalinguistic feedback (comments about the learner's non-target-like utterance). The results

[5] A meta-analysis refers to quantitative research upon the effects of a certain treatment on a response variable (Glass, 1976). To execute a meta-analysis, the results of primary studies are converted into numerical values (called effect sizes), and each study's effect size is combined to produce a summary of the findings across primary studies (Norris & Ortega, 2006).

show that the effect size of recasts in the post-tests was the largest across the three types of feedback. That is, the results of the meta-analysis indicate that recasts might have superior efficacy over other types of feedback. However, Mackey and Goo suggest that the results must be interpreted with caution. The analysis includes a limited number of studies (only four studies focusing on negotiation, and only three studies focusing on metalinguistic feedback). Furthermore, the studies that focused on negotiation or metalinguistic feedback did not include delayed post-tests, so it was impossible to compare the long-term effects across the three types of feedback. Mackey and Goo's meta-analysis provides some information about the effects of different types of oral corrective feedback, but its limitations make it difficult to determine whether or not their findings reveal a general pattern.

Another meta-analysis of oral corrective feedback was conducted by Li (2010). Li's meta-analysis included 33 primary studies (22 published studies and 11 Ph.D. dissertations). Li conducted a meta-analysis using a scheme focused on types of corrective feedback techniques (recasts, metalinguistic feedback, explicit corrections, and clarifications). The results show that explicit corrections had a larger immediate effect than recasts and metalinguistic feedback (the immediate effects of clarification requests were not calculated because of the lack of primary studies). The effect sizes of recasts and metalinguistic feedback were relatively similar. Li notes that these results should be interpreted carefully: the number of studies that included explicit correction was small, and this could have affected the results of the analysis.

Lastly, Lyster and Saito (2010) examined the effectiveness of feedback in relation to the types of corrective feedback provided (recasts, prompts, and explicit correction). The analysis included 15 published classroom-based studies. The results showed that the effect sizes were large for prompts and medium for recasts and for explicit correction in within-group contrasts.

Lyster and Saito (2010) suggest that "the effects of prompts are larger than those of recasts in classroom settings" (p. 294), but they also suggest that more classroom studies are necessary before clear conclusions are drawn.

Each of these meta-analyses produced different results. These different results can be attributed to differences in the selection criteria for primary studies chosen by each analysis. For instance, Li's meta-analysis included both published studies and Ph.D dissertations whereas Mackey and Goo's as well as Lyster and Saito's meta-analyses included only published studies. In addition, each primary study used different ways of operationalizing corrective feedback and different methodologies. Another factor that needs to be considered is that the number of studies included in these analyses (e.g., clarification requests studies in Li's analysis) were relatively small. This may impose limitations on the general patterns that can be extrapolated from various corrective feedback studies.

2.4. Corrective Feedback and Learners' Cognitive Processes

The corrective feedback studies reviewed in the previous section provide information about the effectiveness of oral corrective feedback on second language development. However, these studies do not inform about learners' internal processes that mediate corrective feedback and the outcome of language learning. Researchers have used introspective methods to tap into the learner's mind and explore cognitive processes that occur after receiving oral corrective feedback and whether those processes are related to second language development (Mackey, 2012).

2.4.1. Introspective method

Learners' internal cognitive processes, such as thoughts, perceptions and motives, are unobservable. In order to access learners' internal processes, researchers have used introspective methods, which consist of individuals' reflection upon their mental processes (Brown & Rogers, 2002; Dörnyei, 2007; Gass & Mackey, 2000). There are two assumptions underlying introspection: (a) it is possible to observe internal processes in much the same way as one can observe external world events, and (b) humans have access to their internal processes at some level and can verbalize them (Gass & Mackey, 2000). Introspective methods subsume different approaches that aim at eliciting data about internal processes involved in carrying out a task (Dörnyei, 2007).

2.4.2. Ericsson and Simon's model

Verbal reports are a special type of introspection based on an information processing model presented by Ericsson and Simon (1980, 1984). Within an information processing framework, information is stored in several areas of memory with different capacities: short-term memory (STM) with a limited capacity and long-term memory (LTM) with a large capacity. Recently acquired information by the central processor[6] is kept in STM and accessible for a subject's verbal report, whereas information kept in LTM needs to be retrieved before it is reported.

[6] The central processor "controls and regulates the non-automatic cognitive processes, determines what small part of the information in sensory stimuli and LTM finds its way into STM. This is the information that is *heeded or attended to*" (Ericsson & Simon, 1993, p. 14).

Ericsson and Simon (1993) postulated that cognitive processes are “a sequence of states in which each state corresponds to information (thoughts) in attention and STM” (p. 32). Figure 2 illustrates their views about cognitive processes and verbalization.

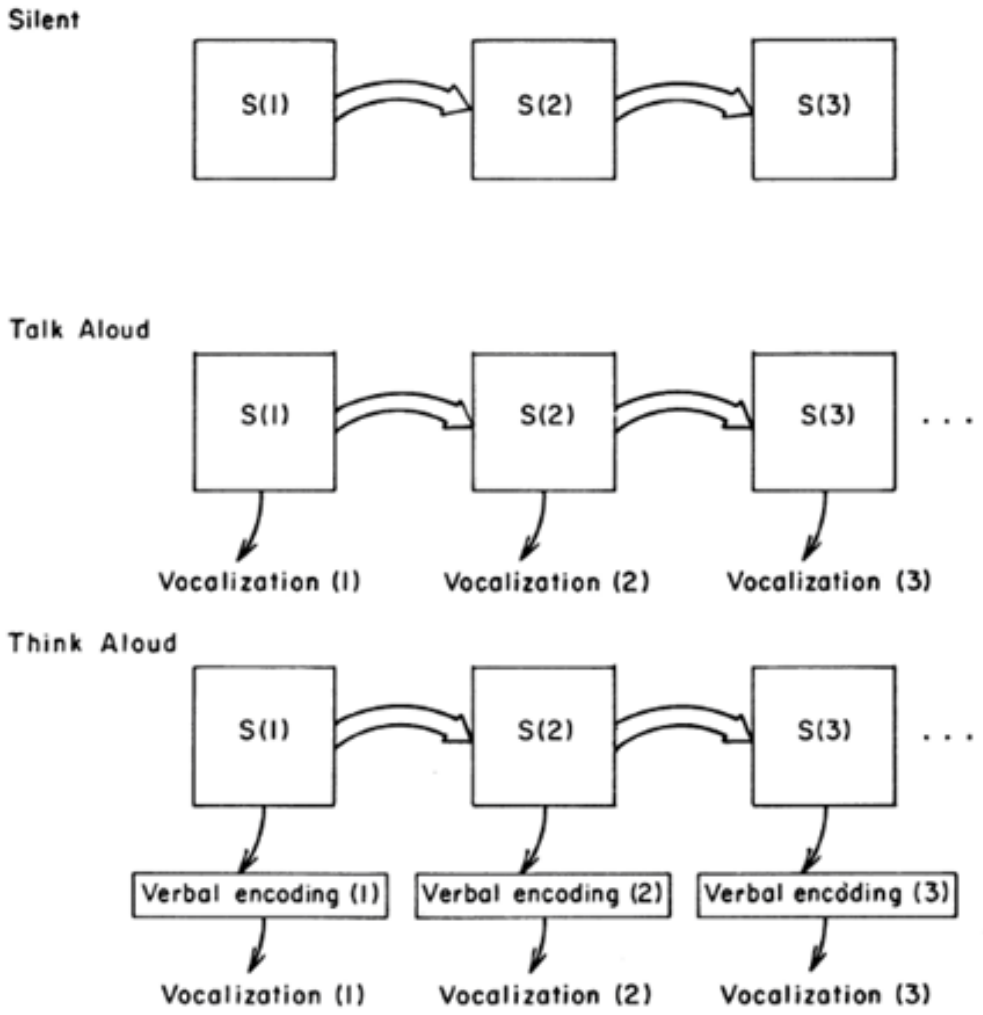

Figure 2. The states of heeded information in a cognitive process and their relation to verbalizations under three different conditions. (Ericsson & Simon, 1987, p. 33)

The top panel shows a normal (silent) cognitive process, which is a sequence of states of heeded information (thoughts) without producing a verbal report. The middle panel illustrates a verbal report of information that is already linguistically encoded. This type of report is called a “talk

aloud," wherein subjects simply verbalize their silent, internal speech (Gass & Mackey, 2000). The bottom panel shows a verbal report called a "think aloud." In this reporting format, subjects need to encode non-verbal information into a verbal form to vocalize it. For example, a subject encodes visual information, such as the spatial location of certain items into verbal form to vocalize that information. Ericsson and Simon (1993) reviewed a number of studies comparing subjects' task performances with and without verbal reports, and found a relatively consistent pattern showing no differences between these conditions. This finding suggests that there was no influence of verbal reports on the outcomes of task performance and that the verbal reports reflect the information processed during task performances.

There are two major types of verbal reports: concurrent reports and retrospective reports (Bowles, 2010; Færch & Kasper, 1987). Both types of reports have advantages and disadvantages. The disadvantage of a retrospective report is that the participant's memory can decay within the time lag between the task's completion and the verbal reporting. If the time lag is longer, some information may be lost from LTM, resulting in incomplete verbal reports. Using concurrent reports might seem to be a solution to this problem, but there are concerns about the use of concurrent reporting in language research. It is unnatural and difficult to carry out communicative tasks while verbalizing one's own thoughts. Also, concurrent verbalization can become an additional task that may alter subjects' cognitive processes during the primary language task (Jourdenais, 2001).

2.4.3. Issues with verbal reports: Validity and reliability

2.4.3.1. Validity

Although verbal reports provide researchers with access to learners' internal processes and thoughts, there are concerns about their use, mostly regarding their validity and reliability.

The idea of validity is concerned with "whether information that is captured within verbal reports corresponds with information that is actually heeded as a task is carried out" (Green, 1998, p. 10). The issue of validity has two components: veridicality and reactivity. Veridicality refers to the accuracy of verbal protocols as a reflection of cognitive processes, while reactivity refers to the influence that verbal reports could have upon task performance (Gass & Mackey, 2000). When verbal reports include distorted information or additional information about processes that may not have occurred during an event, the validity of the method should be questioned. Nisbett and Wilson (1977) claimed that using verbal reports as a means to access learners' thought processes is problematic because of the veridicality issue. They claimed that subjects may provide inaccurate reasons for their thoughts instead of accurately reporting what they were thinking (Nisbett & Wilson, 1977). Ericsson and Simon argued against Nisbett and Wilson's position. They pointed out that subjects' inaccurate reports occur when they are asked to provide reasoning, not their thoughts during a task. When subjects are asked to verbalize their thoughts per se, verbalization reflects the cognitive processes that occurred during the task. However, if participants are asked to provide reasoning, this creates extra mental activities that affect their verbalizations, resulting in problematic verbal reporting. Ericsson and Simon suggested that it is important to ask participants to verbalize what they were thinking during the event and not to ask them to verbalize *why* they thought the way they did.[7]

Another potential threat to verbal reports is memory decay when there is a time lag between the event and the verbalization (Someren, Barnard, & Sandberg, 1994). Bloom (1954) examined the accuracy of recall in a general education study and suggested that recall is reliable

[7] Adopting Ericsson and Simon's suggestions (1993), Gass and Mackey (2000) recommended that interviewers should ask questions such as "what were you thinking when ~?" rather than "why did you ~?" to avoid veridicality issues.

as long as it is conducted only a short period of time after the event. He reported that recall was highly accurate (95%) within about 48 hours after an event, but that the accuracy dropped to about 65% two weeks later.

Ericsson and Simon (1994) present principles that should be followed in order to prevent issues that may threaten the validity of verbal reports. Firstly, the interviewer should avoid asking participants to provide reasoning. Instead, the interviewer should ask them to verbalize thoughts they had during an event. Secondly, the time lag between the event and retrospective recall session must be as short as possible in order to prevent memory decay. By following these procedures, the validity of a verbal report is maximized.

Another issue with veridicality is reactivity, which is the influence of verbalization on task performance. It could be a serious issue for concurrent verbal reports in which learners verbalize their thoughts while performing a task. Ericsson and Simon's (1993) model predicts that the processes enacted with and without verbalizations are similar and reactivity does not occur. Recent studies show no differences in task performance with and without verbal reports, supporting the claim that reactivity does not happen (Bowles, 2010; Leow & Morgan-Short, 2004). For instance, Leow and Morgan-Short (2004) compared the performances of a think-aloud group and a non-think-aloud group and found no significant differences between the groups. Although such non-reactivity has been evidenced in previous studies, the issue of reactivity is still controversial, and some researchers claim that verbalization itself acts as an additional task and may alter cognitive processes (Jourdenais, 2001).

2.4.3.2. Reliability

According to Green (1998), the reliability of the data elicitation technique refers to "the likelihood that similar verbal reports might be produced by the same individual presented with

the same or very similar tasks" (Green, 1998, p. 11). If a subject's verbal reports are very different when he or she performs the same task under identical conditions, the reliability of the technique is questionable. Green (1998) suggests that individuals are relatively consistent, and that verbal reports produced by individuals at similar skill levels usually show similarities.

2.4.4. Stimulated recall method

The stimulated recall method is one type of introspective method used to elicit data regarding learners' cognitive processes. Stimulated recall is conducted after tasks are completed, and a stimulus such as a video- or audio-recording is provided during the recall session. For example, participants watch a video clip of their own task performance and then verbalize what they were thinking during the task. Stimulated recall has an advantage over simple post-session interviewing, which relies heavily on a subject's memory to recall mental processes that occurred during a task. The presentation of a cue from the same sequence as the original event assists the subject's retrieval from his or her long-term memory, helping to increase the validity of the verbal report. Bloom (1954) states that "a subject may be enabled to relive an original situation with great vividness and accuracy if he is presented with a large number of the cues or stimuli which occurred during the original situation" (p. 25). The stimulated recall method has been used by L2 researchers to explore learners' cognitive processes after receiving oral corrective feedback.

2.4.5. Oral corrective feedback studies using introspective methods

There have been studies that employed introspective methods to explore L2 learners' internal processes triggered by oral corrective feedback and their relationships with second

language development (Egi, 2010; Gass & Lewis, 2007; Kartchava & Ammar, 2014; Kim & Han, 2007; Mackey, 2006; Mackey et al., 2000; Moroishi, 2002). These studies focused on specific types of cognitive processes: 'learners' perception of corrective feedback' and 'noticing the gap'. It has been suggested that corrective feedback facilitates second language learning because it helps learners pay attention to their problematic utterances and notice the gap between their erroneous utterance and the correct form (Adams, 2003; Mackey, 2012). It is assumed that, for corrective feedback to be effective, a learner must perceive the teacher's or interlocutor's responses as feedback on errors. However, it has been claimed that learners sometimes perceive corrective feedback (especially implicit feedback, such as recasts) as conversational responses, and they are not always aware that such feedback is a response to an erroneous utterance (Nicholas et al, 2001; Lyster, 2004; Lyster & Ranta, 1997). In that case, 'noticing' does not occur, and it does not lead to L2 learning. To test this claim, researchers examined how learners perceive oral corrective feedback and to what extent noticing occurs by using introspective methods. There are two types of studies in this line of research. The first type examines learners' perceptions of oral corrective feedback (Egi, 2010; Gass & Lewis, 2007; Kim & Han, 2007; Mackey et al., 2000; Moroishi, 2002). The second type investigates the links between noticing and second language development (Egi, 2007; Kartchava & Ammar, 2014; Mackey, 2006). A summary of these studies is given in Table 3.

Table 3

Summary of Studies Exploring Learners' Cognitive Processes

Study report	Research setting	Feedback type	Target structure	Focus of introspection	Link with production data	Results
Mackey et al. (2000)	ESL, IFL lab	Recasts + negotiation	—	Perception	—	Learners tended to recognize lexical and phonological feedback more accurately than morphosyntactic feedback.
Gass & Lewis (2007)	IFL lab	Recasts + negotiation	—	Perception	—	Learners tended to recognize lexical feedback more accurately than morphosyntactic feedback.
Kim & Han (2007)	EFL classroom	Recasts	—	Noticing the gap	—	'Noticing the gap' occurred least frequently with recasts targeting morphosyntactic errors.
Moroishi (2002)	JFL classroom	Recasts	—	Perception	—	Learners perceived morphosyntactic feedback accurately more than half of the time.

Study report	Research setting	Feedback type	Target structure	Focus of introspection	Link with production data	Results
Egi (2010)	JFL classroom	Recasts	—	Perception noticing the gap	+ uptake repair modified output	1. Learners perceived recasts as corrective feedback more frequently when they produced uptake. 2. Learners noticed the gap more frequently when they produced correct repair. 3. Learners noticed the gap more frequently when they produced modified output.
Mackey (2006)	ESL classroom	Recasts + negotiation	Question Plurals Past tense	Noticing the gap	+ L2 development	There was a positive relationship between noticing and second language development in relation to question forms.
Egi (2007)	JFL lab	Recasts	—	Perception noticing the gap	+ L2 development	Learners made greater improvement of their L2 when they perceived recasts as corrective feedback or noticed the gap.

Study report	Research setting	Feedback type	Target structure	Focus of introspection	Link with production data	Results
Kartchava & Ammar (2014)	ESL classroom	Recasts Prompts Recasts + prompts	Past tense Questions in the past	Noticing teachers' corrective intent	+ L2 development	Prompts and the combination of prompts and recasts were noticed as correction more often than recasts. There were no differences across groups in relation to second language development.

ESL = English as a second language, IFL = Italian as a foreign language, EFL = English as a foreign language

JFL = Japanese as a foreign language

Using stimulated recall, Mackey, Gass, and McDonough (2000) investigated the extent to which learners recognize feedback and the target of that feedback (phonological, morphosyntactic, or lexical). Ten ESL learners and seven learners of Italian as a foreign language (IFL) participated in task-based interactions with a native speaker and received interactional feedback (both negotiation moves, such as clarification requests, and recasts). After completing the tasks, the learners watched a videotape of the task and were asked to verbalize the thoughts they had during the task session. The results showed that learners' perceptions of corrective feedback differed according to the linguistic target. ESL learners recognized feedback on lexical and phonological forms relatively accurately (83% and 60%, respectively), but recognized morphosyntactic feedback less accurately (13%). IFL learners also recognized feedback on lexical forms more accurately (66%), but recognized morphosyntactic and phonological feedback less accurately (24% and 21%, respectively). These results appear to demonstrate that the recognition of corrective feedback as a response to learners' errors is gradient, and that the extent to which they recognize such responses as feedback depends on the target's linguistic domain. These results also suggest that learners tend to recognize meaning-oriented feedback (lexical) more accurately than form-oriented feedback (morphosyntactic). Mackey, Gass, and McDonough conducted post-hoc analyses and found that morphosyntactic errors were mostly treated through recasts. They suggest that learners' less accurate recognition of recasts targeting morphosyntactic errors may be due to a lack of opportunities for learners to get involved in negotiation with corrective feedback.

Gass and Lewis (2007) replicated Mackey's (2000) study. The results showed that both non-heritage learners and heritage learners perceived lexical and phonological feedback more accurately, but they perceived morphosyntactic feedback fairly inaccurately. Their study

provided additional support for Mackey's findings that learners tend to recognize lexical feedback more accurately than morphosyntactic feedback.

Whereas the above studies examined learners' perceptions of interactional feedback including both negotiation moves (e.g., clarification requests) and recasts, some studies have exclusively focused on recasts. Kim and Han (2007) examined learners' perceptions of recasts in EFL classrooms, and they extended their investigation by examining not only whether learners perceive recasts as feedback but also whether they notice the gap between their erroneous utterances and the correct forms. The results showed that students interpreted recasts as corrective feedback more than half the time (69% for simple recasts and 58% for complex recasts).[8] The order of students' successes in noticing the gap between recasts targeting specific linguistic domains and their erroneous forms is as follows (from most-noticed to least-noticed): phonology > lexis > morphology > syntax. The results also provide support for the claim that the perception of corrective feedback is dependent on linguistic domain, and that feedback targeting morphosyntactic errors is less noticeable.[9]

The studies discussed above show that corrective feedback targeting morphosyntactic errors is less noticeable. However, Moroishi's study examining Japanese as a foreign language (JFL) learners' perception about corrective feedback showed that learners perceived morphosyntactic feedback accurately more than half the time. Moroishi explains that JFL learners tend to be sensitive to teachers' feedback. This may help learners recognize the corrective feedback regardless of linguistic domain.

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[8] Simple recasts involve one change; complex recasts contain more than one change.

[9] Although Kim and Han's study is informative, it should be noted that their L2 class was form-oriented rather than content-oriented.

The studies reviewed above focused on learners' perceptions of corrective feedback, but there have been a few studies that investigated both learners' perceptions of feedback and their relationship to uptake and/or modified output (Egi, 2010; Révész, 2002). Egi (2010) explored learners' perceptions of recasts and their relationship with modified output or uptake using stimulated recall. Twenty-four JFL learners carried out information gap activities with a native speaker and received recasts during treatment sessions. After completing the sessions, the participants reported their thoughts. The results showed that learners perceived recasts as corrective feedback more accurately when they produced uptake. The results also showed that the learners not only perceived recasts as corrective feedback, but also that they noticed the gap between their non-target utterance and the correct form when they produced modified output or correct repair. Egi's study provides empirical support that noticing the gap has a positive relationship with modified output.

The aforementioned studies provide information about learners' perceptions of corrective feedback and noticing the gap, or the relationship between the recognition of recasts and uptake or modified output. Although these studies are informative, they do not show if there is a direct link between learners' internal processes triggered by corrective feedback and second language development. Yet, there have been a few studies that investigated the link between these two factors using both experimental design and introspective methods. Mackey (2006) examined links between interactional feedback, learners' noticing, and second language development in her classroom study. Twenty-eight intermediate-level ESL learners participated in this study and they were randomly assigned to one of two ESL classes: experimental or control. The experimental group carried out communicative activities in class, and received interactional feedback (negotiation moves and recasts) targeting questions, plurals, and the past tense. The

control group also completed communicative activities, but no feedback was provided. The participants in both groups took pre- and post-tests that consisted of picture description tasks. Noticing was identified as learners' reports indicating that they were aware that their production was problematic or they had received feedback about their problematic forms. Data on noticing were collected through four methods: learning journals filled out in class, an oral stimulated recall session, written responses to a focused question in the first language, and written responses on questionnaires in the second language. The results showed a positive relationship between learners' noticing of the gap and second language development in terms of question forms. The links between noticing and learning for the other two linguistic targets were less clear. Mackey's study provides empirical support for potential links between noticing and second language development. However, it is unknown which type of feedback in the study actually contributed to second language learning, since the experimental group received both negotiation and recasts, and the type of feedback that promoted language development is not identifiable.

While Mackey's study used both negotiation moves and recasts to examine the relationship between learners' perceptions and subsequent learning, Egi (2007) focused exclusively on recasts in her lab study. She examined the relationship between learners' perceptions of recasts and second language development. Forty-nine JFL learners engaged in picture description tasks and received recasts during interaction sessions. They also took custom-made immediate post-test and delayed post-test. Two techniques were used to collect data about learners' perceptions of recasts. One technique was immediate reports, "a technique used to elicit data immediately after the completion of the specific event" (Gass & Mackey, 2007, p. 60). Thirty-one participants were asked to verbalize their thoughts after hearing two knocking sounds made by an interlocutor just after she had provided a recast. The task resumed after the

participant finished making a verbal report. The other technique was stimulated recall, and 18 participants undertook stimulated recall sessions after the immediate post-test. Learners' recognitions of recasts were categorized into four groups: response to content, negative evidence, positive evidence, and both negative and positive evidence (noticing the gap). The results showed that learners made greater improvements on short-term learning when they recognized recasts as positive evidence or as both positive and negative evidence (noticing the gap) than when they recognized recasts as a response to content. The findings reveal that recognition of recasts as corrective feedback and noticing are related to second language development. Although Egi's study provides important information about the links between learners' internal processes and their language development, it has some methodological issues. Firstly, a pre-test was not conducted in this study, because it was not predictable what kinds of errors would occur during the treatment sessions. Secondly, a control group was not included in the study, making it possible that the learners could have improved their L2 without recasts. These issues limit the significance of the results of the study.

While Egi's study focused on recasts, Kartchava and Ammar (2014) examined learners' perceptions of three types of oral corrective feedback (recasts, prompts, and a combination of both) and their relationship to second language learning. 'Noticing' in their study concerns "detection of CF and/or the correct form" and "noticing of help" (p. 436). Four college-level ESL classes were assigned to one of the following conditions: the recast group, the prompt group, the recast and prompt group, and the control group. There were two treatment sessions and participants took pre- and post-tests. To measure noticing, the researchers used lesson reflection sheets and the immediate report technique, in which participants wrote down their thoughts about what was happening in class after corrective feedback was provided. The results showed that the

prompt group and the prompt and recast group noticed the teachers' corrective intent more often than did the recast group. However, there were no differences across groups in relation to second language development. Kartchava and Ammar's study provides evidence that prompts are more noticeable than recasts, but possible relationships between the noticeability of corrective feedback and second language development were not observed.

In sum, corrective feedback studies using introspective methods lead to the following revelations. Firstly, the extent to which learners recognize feedback as a response to learners' errors depends on factors such as the linguistic domain and learners' sensitivity to corrective feedback. Secondly, there is a link between learners' perceptions of feedback and subsequent modified output. When learners notice the gap between an erroneous utterance and the correct form, it is more likely to lead to modified output. Thirdly, learners' recognition of corrective feedback may be linked to second language development, particularly when they notice the gap between a non-target-like utterance and a correct form.

The findings of previous studies provide important information about the mechanisms through which corrective feedback leads to second language learning. However, there are some limitations with these studies. First, these studies focused mainly on recasts. The only study that analyzed learners' cognitive processes in relation to prompts was Kartchava and Ammar's (2014) study. In order to better understand learners' cognitive processes triggered by prompts, more studies are needed. Second, the previous studies focused only on learners' perceptions of the corrective feedback or noticing the gap. Other types of cognitive processes, such as locating errors or retrieving linguistic knowledge, have not been included. This is problematic when it comes to understanding the mechanism by which prompts lead to second language development. Prompts have two functions that contribute to second language learning: they provide negative

evidence and push learners to produce modified output. With respect to negative evidence, Kartchava and Ammar's (2014) study shows that teachers' corrective intent is more salient with prompts, indicating that prompts provide negative evidence. In regard to pushed modified output, it has been suggested that learners engage in cognitive processes to produce modified output and these processes are part of second language learning (Swain, 2005). However, there have not been any studies that explore learners' cognitive processes triggered by prompts other than noticing. Thus, it is still unknown what kinds of cognitive processes occur after receiving prompts and whether these processes are related to second language development. The current study will fill this gap by exploring cognitive processes triggered by both prompts and recasts and will examine their relationships with the outcomes of second language learning. The study will use inductive analysis[10] to explore cognitive processes. This enables the investigator to generate information regarding cognitive processes that is grounded in narrative data collected in this study.

2.5. Summary

The first part of this chapter discussed second language theories that explain the benefits of corrective feedback on second language development. The interaction approach accounts for learners' internal processes subsequent to the corrective feedback they receive. When corrective feedback is provided during interaction, it helps a learner notice that an utterance is problematic. Then, the learner searches for the solution, aiming to create a target-like utterance. If the correct

[10] Inductive analysis involves "discovering patterns, themes, and categories in one's data, in contrast to deductive analysis where the data are analyzed according to an existing framework" (Patton, 2002, p.453). Qualitative research is often exploratory in nature and employs inductive analysis (Teddlie & Tashakkori, 2009).

form is provided by an interlocutor and the learner notices the correct form in the input, it leads to intake. This is explained by the Noticing Hypothesis. If the correct form is not provided, the learner searches for a solution to correct the error and tries to retrieve linguistic knowledge. After a solution is obtained, the learner may produce modified output, which provides opportunities to test hypotheses about the target structure. The Output Hypothesis predicts that producing modified output contributes to second language learning. These processes overall help learners to restructure their interlanguage system.

In regard to the Skill Acquisition Theory, corrective feedback facilitates second language development by helping learners notice that a change is necessary when they make an erroneous utterance. Their L2 use eventually becomes faster through practice and more accurate if corrective feedback is provided during the practice sessions.

The second part of this chapter described recasts and prompts. Recasts appear in different ways, and their effectiveness is influenced by various factors, such as their characteristics (e.g., length, number of changes, and intonational stress), focus of the interaction (form-focused or meaning-focused), and the target structure. Recasts have three functions: providing positive evidence, offering negative evidence, and presenting a juxtaposition of an erroneous form and a target-like form. Recasts promote second language learning by helping learners to pay attention to the correct form in the input and to notice the gap between their erroneous utterance and target-like form.

Prompts include different types of corrective feedback techniques that do not provide the correct form and encourage learners' self-repair. They are used either as a single prompt or multiple prompts, which combine different types of corrective feedback techniques. Prompts have two functions: they provide negative evidence and encourage learners to produce modified

output. Prompts facilitate second language learning by helping learners to notice the problem they have and by pushing them to produce modified output.

The third part of this chapter reviewed studies examining the effectiveness of recasts and prompts. While some studies show superior effectiveness of prompts over recasts, other studies show the same level of efficacy between these two. The relative effectiveness of prompts may depend on factors such as the type of tasks in which learners engage when prompts are provided, the type of prompt (i.e., whether or not they are multiple prompts), and the linguistic target.

The last part of the chapter presented stimulated recall methods as one type of introspective method used to elicit data about learners' internal processes. It reviewed corrective feedback studies that have investigated learners' perceptions of corrective feedback or the relationship between noticing and second language development. These studies show that: (a) the extent to which learners recognize the corrective intent of feedback depends on factors such as the linguistic domain and learners' sensitivity to corrective feedback; (b) noticing the gap and subsequent modified output are related; and (c) there may be a link between noticing the gap and second language development. Although previous studies provide information about noticing and second language learning, they do not provide information about the cognitive processes that occur between receiving corrective feedback and producing pushed modified output. The goal of the current study is to fill this gap by exploring learners' cognitive processes after receiving oral corrective feedback (prompts and recasts) and by examining their relationships with the outcomes of second language learning.

The next chapter will present the research design used in this study and report three phases of the study: data collection, data analyses, and data integration.

Chapter 3: Methodology

This chapter will first present the research design used in the current study. Then, it will report the three phases of the study: data collection, data analyses, and data integration.

3.1. Research Design

This study employs an embedded design, which is one type of mixed methods research design (Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009). Mixed methods research design is defined as "a procedure for collecting, analyzing, and 'mixing' both quantitative and qualitative methods in a single study or a series of studies to understand a research problem" (Creswell, 2015, p. 537). Mixed methods research design was chosen because this study required both quantitative and qualitative data to answer the research questions. In relation to the first research question, concerning the cognitive processes triggered by different types of oral corrective feedback (recasts and prompts), qualitative data were used. Qualitative data in this study consist of participants' verbal reports of their cognitive processes triggered by oral corrective feedback. With regard to the second research question, investigating the relationships (if any) between these different types of cognitive processes and the outcomes of second language learning, both qualitative data and quantitative data were used. Quantitative data used to answer research question 2 consist of participants' immediate post-test and delayed post-test scores.[11] The immediate post-test scores show second language learning outcomes in the short-term while the delayed post-test scores show the outcomes of second language learning in the long-term. The qualitative data and quantitative data were integrated in order to examine the

[11] In this study, participants took a pre-test. The pre-test assesses participants' ability to produce the target structure before the treatment sessions. Pre-test scores were used to examine the effectiveness of recasts and prompts, but they were not used to answer research question 2.

relationships between the cognitive processes triggered by oral corrective feedback and the outcomes of second language learning.

An embedded design is defined as "a mixed methods approach where the researcher combines the collection and analysis of both quantitative and qualitative data within a traditional quantitative research design or qualitative research design" (Creswell & Plano Clark, 2011, p. 90). Embedded design was chosen for the current study because it enables the investigator to collect both types of data in a single experimental study (Creswell, 2003). A stimulated recall method used to collect qualitative data was embedded in the experimental design of this study.

Figure 3 illustrates this study's design. There are three phases in the current study: data collection, data analyses, and data integration. The first phase of this study is data collection. Quantitative data (pre-test, immediate post-test, and delayed post-test scores) and qualitative data (verbal reports) were collected at this stage. The second phase of the study is data analyses. In regard to the qualitative data, coding was performed on the transcription of verbal reports, and codes and categories of learners' cognitive processes were produced. As for the quantitative data, two procedures were conducted. First, the participants in the prompt group and the recast group were divided into two subgroups (the High group and the Low group) based on their immediate post-test score and delayed post-test score. Second, statistical analyses were conducted to examine the effectiveness of recasts and prompts. Although this procedure is not directly related to the research questions in this study, it is useful for providing information about the effectiveness of recasts and prompts used in the study. The final phase of this study is data integration. Quantitative data (subgroups created based on the immediate post-test and delayed post-test scores) and qualitative data (categories of cognitive processes) were mixed at this stage. Detailed information on each phase will be provided in the following sections.

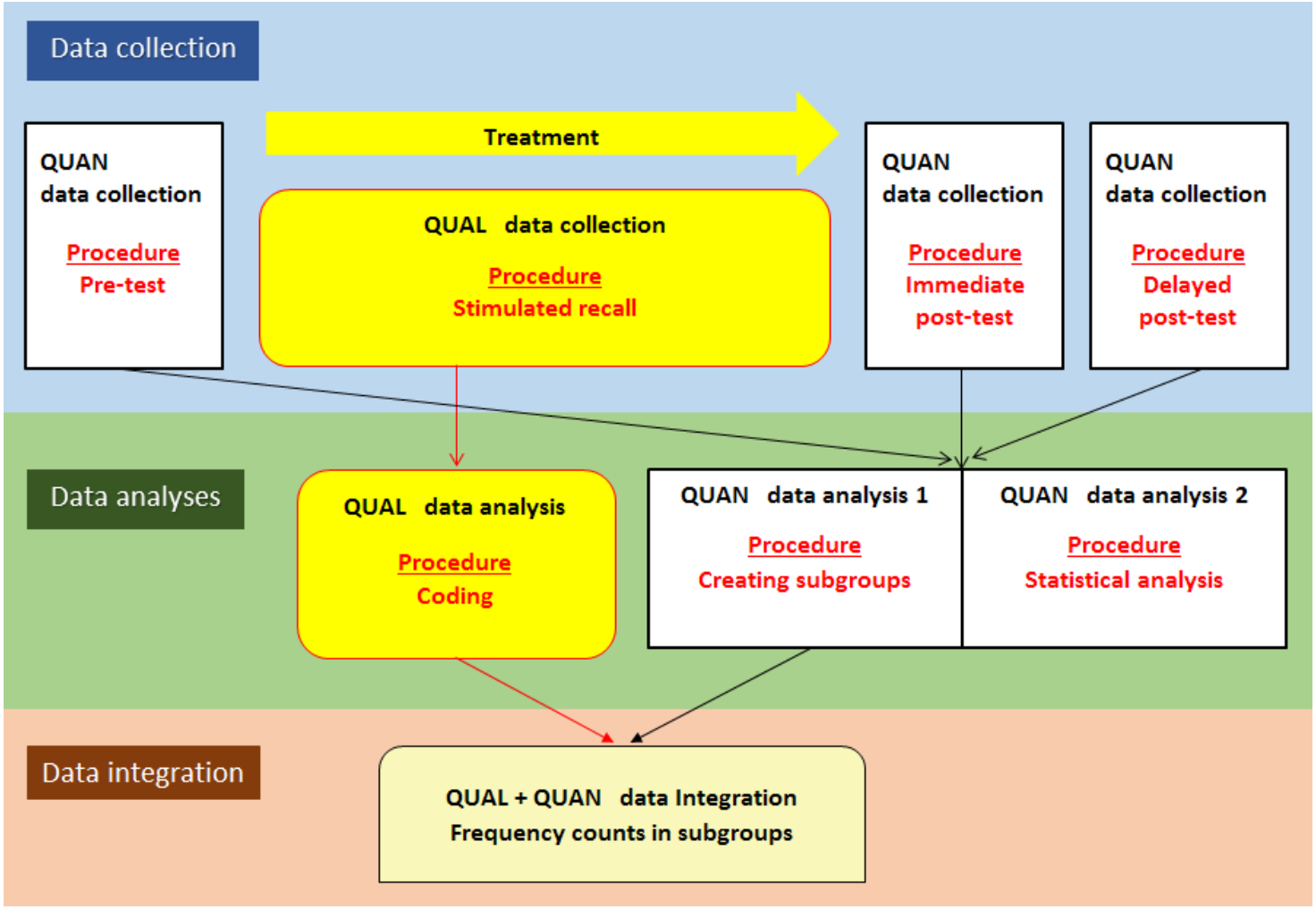

Figure 3. Research design diagram.

Note: QUAN = quantitative, QUAL = qualitative

3.2. Data Collection: The Experiment

3.2.1. Research context

The data were collected at an English-language university in Montreal, Canada. The data collection was done twice: in the winter of 2015 and, later, in the fall of 2015. Since the population of potential participants (learners of Japanese) is relatively small in Montreal, data were collected twice to increase the number of participants. The experiment was conducted in a lab setting.

3.2.2. Learner participants

Participants in this study were 42 novice high and intermediate low level learners of Japanese. Their proficiency level was selected because these learners had learned about the target structure, but they had not gained control over its use in oral production. Two participants who scored more than 90% on the pre-test were excluded from analysis. One participant was identified as an outlier regarding his post-test scores, and he was excluded from the analysis. Thus, the data from 39 participants were analyzed in this study.

All participants were taking either their second or their third semester of Japanese at the time of data collection. Thirty-one learners (79%) were taking their second semester of Japanese when they participated in the study in the winter of 2015. Eight learners (21%) were taking their third semester of Japanese when they took part in the study in the fall of 2015. All participants had completed the first semester of Japanese or an equivalent summer Japanese course prior to the study. They had been introduced to the target structure, and they had learned all necessary adjectives to perform communicative tasks that they completed in the study.

The participants were between the ages of 18 and 27, with an average age of 20.6 years. Fourteen participants spoke English as a first language, and six participants spoke French as a first language. One participant spoke both English and French as a first language. Fourteen participants spoke Chinese as a first language, and two participants spoke Korean as a first language. One participant spoke German as a first language, and one participant spoke Romanian as a first language. The length of formal Japanese language learning was between 0.5 and 4 years, and the average length was 1.0 year. Eight participants took an intensive summer Japanese course, which is equivalent to two semesters of a Japanese course. This is why the average length of formal Japanese language learning was relatively short. Each participant was paid $35 CAD after he or she had completed all the sessions.

3.2.3. Researchers

The five researchers in this study were three female and two male native speakers of Japanese, including the primary investigator and her four research assistants. The investigator had a total of 12 years of teaching experience of Japanese in North America prior to the study. Two research assistants had taught Japanese in North America before the study. Two research assistants did not have teaching experience of Japanese. The research assistants conducted the experiment in the winter of 2015. They collected the data of 31 participants (79%). One research assistant collected data from the prompt group. Another research assistant collected data from the recast group. The other two research assistants collected data from the control group. The investigator continued the experiment in the fall of 2015 and collected the data of 8 participants (21%). The investigator collected the data of three participants in the prompt group, three participants in the recast group, and two participants in the control group.

All the research assistants were individually trained by the investigator to carry out tasks for the tests and the treatment sessions. The training was given four times and each training session lasted from 30 minutes to one hour. First, the investigator explained the purpose of the research project. Next, the research assistants read the description of the tasks for the tests and the treatment sessions. Then, they had a role play with the investigator following the same procedure used in the real tests and the treatment sessions. The investigator played the role of the student during the training.

The two research assistants who were in charge of the recast and prompt groups also received training to provide oral corrective feedback. First, the investigator explained what recasts and prompts are to the research assistants. Then, the research assistants watched a video-recording of a session with corrective feedback conducted by the investigator. After watching the video, the research assistants engaged in role play with the investigator and practiced providing recasts or prompts. After they became familiar with providing recasts or prompts, they had a practice session with a learner of Japanese who was not a participant in the study.

The investigator watched all video-recorded sessions conducted by these two research assistants and confirmed that they consistently provided corrective feedback as they were trained.

All the research assistants elicited participants' verbal reports in this study. They received training before they conducted stimulated recall sessions. First, the investigator provided the written instructions for the stimulated recall (Appendix A). Then, the research assistants did a role play with the investigator. The investigator played the role of a student, and the research assistants practiced collecting verbal reports.

3.2.4. Target structure

The target structure was polite past adjectives in Japanese. Below is a description of the adjectives in Japanese and their conjugation rules in *Nakama* (Hatasa, Hatasa, & Makino, 2009), the textbook used at the participants' university.

There are two types of adjectives in Japanese. Both of them modify nouns directly and can be used at the end of sentence to describe a noun. One is called an い(i)-adjective because it ends in い(i) before a noun, as in 大きいうち(ooki i uchi)(*big house*) and ちいさいうち(chi i sa i u chi) (*small house*). The other type is called a な(na) –adjective, because the adjective takes な(na) before a noun as in りっぱなうち(rippana uchi)(*fine house*) and きれいなうち(kire i na uchi)(*pretty house*). (p.146)

This chapter introduces the past tense forms of adjectives and the copula verb です(desu). Like the present forms, the formation of past tense forms differs depending on the adjective type. (p.227)

A.い(i)-adjectives

The past affirmative form of い(i)–adjective is formed by replacing い(i) with かったです(ka t tadesu).

The past negative form is formed by replacing い(i) with くありませんでした(ku a rimase n deshita) or くなかったです(kunaka t tadesu). (p.227)

B. な(na)–adjectives and copula verb です(desu)

> The ending of the な(na)–adjectives and the copula verb are very similar. In both cases, you will change です(desu) to でした(deshita) for the past affirmative form, じゃありません(ja arimasen)／じゃない(ja nai) です(desu) to じゃありませんでした(ja arimasen deshita)／じゃなかったです(ja nakatta desu) for the past negative form. (p. 227)

The following examples show target-like utterances of polite past adjectives produced by the students in this study.

Example 7 (Student 1, Treatment Session 1)

S (student): *Zasshi wa omoshirokattadesu*.

The magazine was interesting.

Example 8 (Student 10, Treatment Session 1)

S: *Metoro wa benrideshita.*

The metro was convenient.

Example 7 illustrates the correct usage of polite past of i-adjectives, and example 8 shows the correct form of na-adjectives.

It has been reported that acquisition of adjective morphemes is more difficult than acquisition of verb morphemes for learners of Japanese (Noda, 2001). Example 9 is a non-target-like utterance produced by a learner of Japanese as reported by Noda (2001). Example 10 shows a target-like utterance.

Example 9

**Atsuideshita*[12].

Was hot.

Example 10

Atsukattadesu.

Was hot.

Atsui (hot) is an i-adjective. The correct morpheme of *Atsui* (hot) is produced by replacing "*i*" with "*kattadesu*." In example 10, the learner produced a non-target-like utterance by changing "*desu*" to "*deshita*", which is applicable only to na-adjectives and copula verbs. It is known that learners of Japanese tend to overgeneralize in forming the morphemes of na-adjectives. Kinoshita (2007) reported that this kind of non-grammatical adjective use is found even among some advanced learners of Japanese.

Kinoshita (2007) analyzed the production of adjective morphemes by using transcripts of 90 learners' Oral Proficiency Interview Tests. He reported that more than 75% of adjective production was in the present tense, and the error rate for producing past adjectives was higher than the error rate for present adjectives. On the basis of these results, Kinoshita claimed that the acquisition of past adjectives may be difficult for learners of Japanese.

In the current study, polite past adjectives were chosen as a target structure because the participants had not mastered producing this structure orally. In fact, the accuracy rate of the pre-test in this study was 34.1%. Although the participants had not acquired oral production of the

[12] The subject noun phrase normally has to be present in sentences in English. However, missing constituents, such as subject noun phrases, are allowed in Japanese (Tsujimura, 2005)

polite past adjective before the study, the target structure was introduced to them, and they were ready to master it.

3.2.5. Oral corrective feedback

3.2.5.1. Prompts

When students in the prompt group produced an erroneous polite past adjective during treatment sessions, they received oral corrective feedback in the form of prompts from the researcher. Prompts in this study included four types of corrective feedback techniques: clarification requests, repetitions, elicitations, and metalinguistic feedback (Lyster, 2004). Clarification requests were operationalized as a phrase which indicates that the student's message was not understood or ill-formed (Lyster, 2004). In this study, the researcher's utterance *"Moo ichido ittekudasai* (please say it again)" was used as a clarification request. In Japanese, *"Moo ichido ittekudasai"* is employed when an interlocutor signals that he/she didn't understand what others said. It is used to clarify the previous utterance rather than directly elicit a reformulation. In Japanese, there is no short common phrase equivalent to "Pardon?" (which indicates that the message was not understood). The equivalent of "what?" or "huh?" does not work in this context/situation.

The following example illustrates a clarification request used in this study.

Example 11 (Student 4, Treatment Session 1)

S: **Tomodachi no ie wa semaideshita.* (Error)

Friend's house was cramped.

R (researcher[13]):	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	*Semakattadesu.*	(Successful repair)
	Was cramped.	

Repetitions were operationalized as the replication of the student's erroneous form of adjective with rising intonation to highlight the error (Lyster, 2004). The following example shows a repetition used in this study.

Example 12 (Student 18, Treatment Session 1)

S:	**Sushi wa, aa, oishiikattadeusu.*[14]	(Needs repair)
	Sushi, um, was delicious.	
R:	*Oishiikattadesu?*	**(Repetition)**
	Was delicious?	
S:	*Oishikattadesu.*	(Successful repair)
	Was delicious.	

Elicitations were operationalized as pauses that allow students to complete the researcher's utterance (Lyster, 2004). The researcher provided the initial part of the adjective and expected the student to complete the utterance. The following example demonstrates an elicitation used in this study.

[13] Researcher refers to both the investigator and the research assistants.

[14] The correct form of the polite past adjective of *oishii* is *oishikattadesu*. *Oishiikattadesu* is an erroneous form because the "i" in front of *kattadesu* was not dropped.

Example 13 (Student 4, Treatment Session 1) .

S:	**Yasudeshita.*	(Needs repair)
	Was inexpensive.	
R:	*Yasu*_____.	**(Elicitation)**
	(Was) inexpensive.	
S:	*Yasukattadesu*	(Successful repair)
	Was inexpensive	

Metalinguistic feedback was operationalized as the provision of explanation about how to form polite past adjectives. When a student made an erroneous utterance, the researcher provided an explanation such as "*Omoshiroi* is an i-adjective, so you need to drop "*i*" and add *kattadesu*" or "*Genkina* is a na-adjective, so you need to drop "*na*" and add "*deshita*". The following example shows how metalinguistic feedback was used in this study.

Example 14 (Student 5, Treatment Session 2)

S:	**Omoshiro, a, omoshiro, omoshiroidesu?*	(Needs repair)
	(Was) interesting, ah, interesting, is interesting?	
R:	*Omoshiroi* is i-adjecitve, so you need to drop "*i*"	**(Metalinguistic**
	and you need to add "*kattadesu*".	**feedback)**
S:	*Oh, a, omoshirokattadesu.*	(Successful repair)
	Oh, ah, was interesting.	

In this study, various prompts were provided, as necessary, one at a time and in a given sequence. There were four types of combination sequences: (a) clarification requests only; (b) clarification requests and repetitions; (c) clarification requests, repetitions, and elicitation; (d) clarification requests, repetitions, elicitations and metalinguistic feedback. When a student made an error, a clarification request was provided. If the student's modified output was still erroneous, then a repetition was provided. If the student's utterance still contained an error, an elicitation was given. Metalinguistic feedback was provided last. This order was the same across all sessions in the prompt group. The investigator watched all video-recorded sessions and confirmed that the order of the prompts was consistent. The following examples show all four types of sequences in relation to the provision of prompts.

1. Clarification requests only

Example 15 (Student 18, Treatment Session 1)

S:	**Uh, Shimizu-san wa genki…genkikattadesu.*	(Error)
	Uh, Shimizu-san was energetic.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	*Genkideshitsa.*	(Successful repair)
	Was energetic.	

2. Clarification requests and repetitions

Example 16 (Student 17, Treatment Session 1)

S:	**Isogashiideshita.*	(Error)

Was busy.

R: *Moo ichido ittekudasai.* **(Clarification request)**

Please say it again.

S: **Isogashiideshita?* (Needs repair)

Was busy?

R: **Isogashiideshita?* **(Repetition)**

Was busy?

S: *Isogashii, oh, isogashikattadesu.* (Successful repair)

Busy, oh, was busy

3. Clarification requests, repetitions, and elicitations

Example 17 (Student 10, Treatment Session 1)

S: **A, tanoshiideshita.* (Error)

Ah, was fun.

R: *Moo ichido ittekudasai.* **(Clarification request)**

Please say it again.

S: **Tenisu wa...tanoshiideshita.* (Needs repair)

Tennis…was fun.

R: **Tanoshiideshita?* **(Repetition)**

Was fun?

S: **A, desu?* (Needs repair)

Ah, is (fun)?

R: *Tanoshi*_____. **(Elicitation)**

(was) fun.

S: Oh, *tanoshikattadesu.* (Successful repair)

Oh, was fun.

4. Clarification requests, repetitions, elicitations, and metalinguistic feedback

Example 18 (Student 36, Treatment Session 1)

S: **Tenisu wa tanoshiideshita.* (Error)

Tennis was fun.

R: *Moo ichido ittekudasai.* **(Clarification request)**

Please say it again.

S: **Tenisu ga tanoshii, katta, tanoshiikattadesu.*[15] (Needs repair)

Tennis was fun, was fun.

R: **Uu, tanoshiikatttadesu?* **(Repetition)**

Well, was fun?

S: **Tanoshiikattadesu, deshita.* (Needs repair)

Was fun. Was (fun).

R: *Tano*_____. **(Elicitation)**

(was) fun.

S: **Tanoshii, katta, de...* (Needs repair)

(Was) fun…

R: *Eetone, ee, tanoshii* is i-adjective, O.K., so you need **(Metalinguistic**

[15] *Tanoshiikattadesu* is erroneous because the "i" in front of *kattadesu* was not dropped. The correct polite past form of *tanoshii* is *tanoshikattadesu*.

	to drop “i”, and you need to add “*kattadesu*” after “*tanoshi*”.	**feedback)**
S:	*Hai, hai, wakarimashita*.	(Final needs repair)
	Yes, yes, I understood.	

3.2.5.2. Recasts

In this study, recasts were operationalized as a reformulation of a student’s non-target form with the original meaning intact (Lyster, 2004). Students in the recast group received the reformulation of an error when they produced a non-target-like utterance. The following example illustrates a recast used in this study.

Example 19 (Student 25, Treatment Session 1)

S:	**Depaato wa kireekattadesu.*	(Error)
	Department store was clean.	
R:	*Kireedeshita.*	**(Recast)**
	Was clean.	
S:	*Kireedeshita.*	(Successful repair)
	Was clean.	

While students are expected to produce modified output after receiving prompts, it is not necessary to do so after receiving recasts (Ortega, 2009). In this study, students’ modified output, such as a repetition of a recast, was not controlled. It was up to the students whether or not they produced modified output.

3.2.6. Materials

3.2.6.1. Treatment materials

During the treatment sessions, students completed picture description tasks. In the first treatment session, students were given written instructions (Appendix B), and then they were shown a set of 14 pictures (Appendix C). The researchers had a set of 14 pictures similar to students' (Appendix D), but those pictures did not contain some information included in the students' pictures. Eight pictures targeted i-adjectives and six pictures targeted na-adjectives. The list of adjectives targeted in the treatment sessions is presented in Table 4.

Table 4

List of Targeted Adjectives in Treatment Sessions

i-adjective	na-adjective
isogashii busy	*kirei(na)* clean
akarui bright	*benri(na)* convenient
omoshiroi interesting	*genki(na)* well/active/healthy
kurai dark	*shizuka(na)* quiet
tanoshii fun	*taihenn(na)* though
oishii delicious	*nigiyaka(na)* lively
semai cramped	
yasui inexpensive	

The task was a one-way task (Mackey & Gass, 2005). In one-way interaction tasks, one person holds all the information necessary to complete the task. In this study, the students held all information and the researchers asked the students to provide information not included in their pictures. This created a context in which the students had to produce the target structures in order to provide the necessary information. The treatment session lasted from about 5 to about 15 minutes. The duration of treatment session varied because the time spent to complete tasks was different for each participant.

In the second treatment session, the students had the same task, but with different picture sets (Appendix E). Targeted items were the same as those used in the first treatment session, but they were presented in a different order. Also, the pictures were different from those used in the first treatment session. The researchers had a set of similar pictures (Appendix F) without some of the information contained students' picture sets. The second treatment session lasted from about 5 to about15 minutes.

3.2.6.2. Testing materials

In this study, students took a pre-test, an immediate post-test, and a delayed post-test. All the tests used in this study consisted of a picture description task. The tests were one-way information tasks, and the students were provided necessary information using the target structure.

At the beginning of the test sessions, the students had a short practice period to become familiar with the task. They were given written instructions (Appendix G) and then they were shown a set of three pictures (Appendix H). The researchers had a set of similar pictures

(Appendix I) without some of the information included in the students' pictures. The students were asked to provide the information; to do so, they needed to produce the target structure.

After the practice period, the students were shown a set of 32 pictures (Appendix J) in the pre-test. The researchers had a set of 32 corresponding pictures (Appendix K). Nineteen pictures targeted i-adjectives, eight pictures targeted na-adjectives, and five pictures were distracters. Table 5 shows the list of targeted items used in all the tests.

Table 5

List of Targeted Adjectives in Pre-test, Immediate post-test, and Delayed post-test

i-adjective		na-adjective
hiroi big	*aoi* blue	*kirei(na)* clean
isogashii busy	*akarui* bright	*benri(na)* convenient
omoshiroi interesting	*chairoi* brown	*genki(na)* well/active/healthy
kurai dark	*tanoshii* fun	*yuumei(na)* famous
hiroi spacious	*takai* expensive	*hima(na)* free/unscheduled
shiroi white	*furui* old	*shizuka(na)* quiet
hayai fast	*semai* cramped	*taihenn(na)* though
chiisai small	*yasui* cheap	*nigiyaka(na)* lively
oishii delicious	*tsumaranai* boring	
muzukashii difficult		

The number of i-adjectives is two times as the number of na-adjectives in the tests. Since the participants were novice and intermediate learners, the number of adjectives they had already learned was limited when they participated in the study. This is why the number of i-adjectives and na-adjectives were not the same in the tests.

Students had the same task to perform in the immediate post-test (Appendix L and Appendix M) and the delayed post-test (Appendix N and Appendix O). The targeted items were the same, but they were arranged in a different order in each test. The pictures in each test were similar, but slightly different. Each test session lasted from about 5 to about 15 minutes.

3.2.6.3. Exit questionnaire

An exit questionnaire (Appendix P) asked students to provide information about their exposure to the target item outside the study's treatment sessions. It also asked their overall opinion about the experiment.

3.2.7. Stimulated recall sessions

Students in all the groups had stimulated recall sessions with a researcher. The stimulated recall sessions were conducted in English. Although English was not a first language for 24 students (62%), it was not their target language, either. All the students were taking content courses at an English-language university, and they used English as a means to learn other subject matter, such as biology, psychology and history. Their level of English was high enough to produce verbal reports about their cognitive processes.

The procedure of stimulated recall sessions was created on the basis of the outline reported by Gass and Mackey (2000). At the beginning of the stimulated recall session, written

instructions were shown to the students (Appendix Q). Then, a researcher played the video-clip of the previous treatment session. After a corrective feedback episode, the researcher stopped the video-clip and asked a question such as "What were you thinking at this point?" The researchers were instructed not to ask questions such as "Can you explain why ~?" This is because asking the students to provide an explanation might result in invalid verbal reports (Ericsson & Simon, 1993; Gass & Mackey, 2000). Once the student finished providing a verbal report, the video-clip was resumed. The stimulated recall session lasted from about 5 to about 20 minutes.

Two issues emerged in relation to the implementation of the stimulated recall sessions in this study. The first issue was the timing. In the current study, the stimulated recall sessions were conducted before the immediate and delayed post-tests. Since they were conducted before the post-tests, there was the possibility that the stimulated recall might affect the students' performance on the post-tests. An alternative timing to avoid this issue would have been to implement recall sessions after the post-tests. However, if recall sessions were conducted after the post-tests, there would be a long time lag between the treatment session and the stimulated recall session. As discussed earlier, it is very important to make the time difference between the event and the stimulated recall sessions as short as possible in order to avoid memory decay. Thus, the stimulated recall sessions were implemented before the immediate post-test in this study.

Another issue regarding the stimulated recall sessions was the participants' training. In the current study, the students did not receive training before producing their verbal reports. Gass and Mackey (2000) suggest that participants need to be trained only when it is necessary. According to Færch and Kasper (1987), participants are usually able to produce verbal reports

without training in stimulated recall, since cognition and verbalization are temporally separated. In the light of this information, participant training was not implemented in this study.

3.2.8. Data collection procedure

The experiment was conducted over five weeks. There were a total of four sessions in the study. The first three sessions occurred at one week intervals and the last session took place two weeks after the third session. The students were randomly assigned to one of three groups (a recast group, a prompt group, and a control group). They met with the same researcher in all four sessions, and the sessions were conducted in a one-on-one format.

In Week 1, the students first filled out the informed consent form (Appendix R). Then, they answered a background questionnaire (Appendix S) and took a pre-test. All the test sessions in this study were audio-recorded for later analyses.

In Week 2, the students had their first treatment session with a researcher. During the treatment session, the students were shown a set of pictures and they described those pictures in Japanese. When a student in the prompt group or the recast group made a mistake with a polite past adjective, the researcher provided oral corrective feedback. The control group did not receive any corrective feedback. All treatment sessions were videotaped. After completing the picture description task, the students had a stimulated recall session with the same researcher. All the stimulated recall sessions were audio-recorded.

In Week 3, students had a second treatment session. The procedure for the second treatment session was the same as for the first treatment session, with the exception that the students were shown a different set of pictures. Immediately after the second treatment session, the students took the immediate post-test. There was one week break after Week 3. In week 5,

the students took a delayed post-test. After taking the delayed post-test, the students answered an exit-questionnaire. Then, they received the compensation for their participation in the study. The experimental procedure is illustrated in Figure 4.

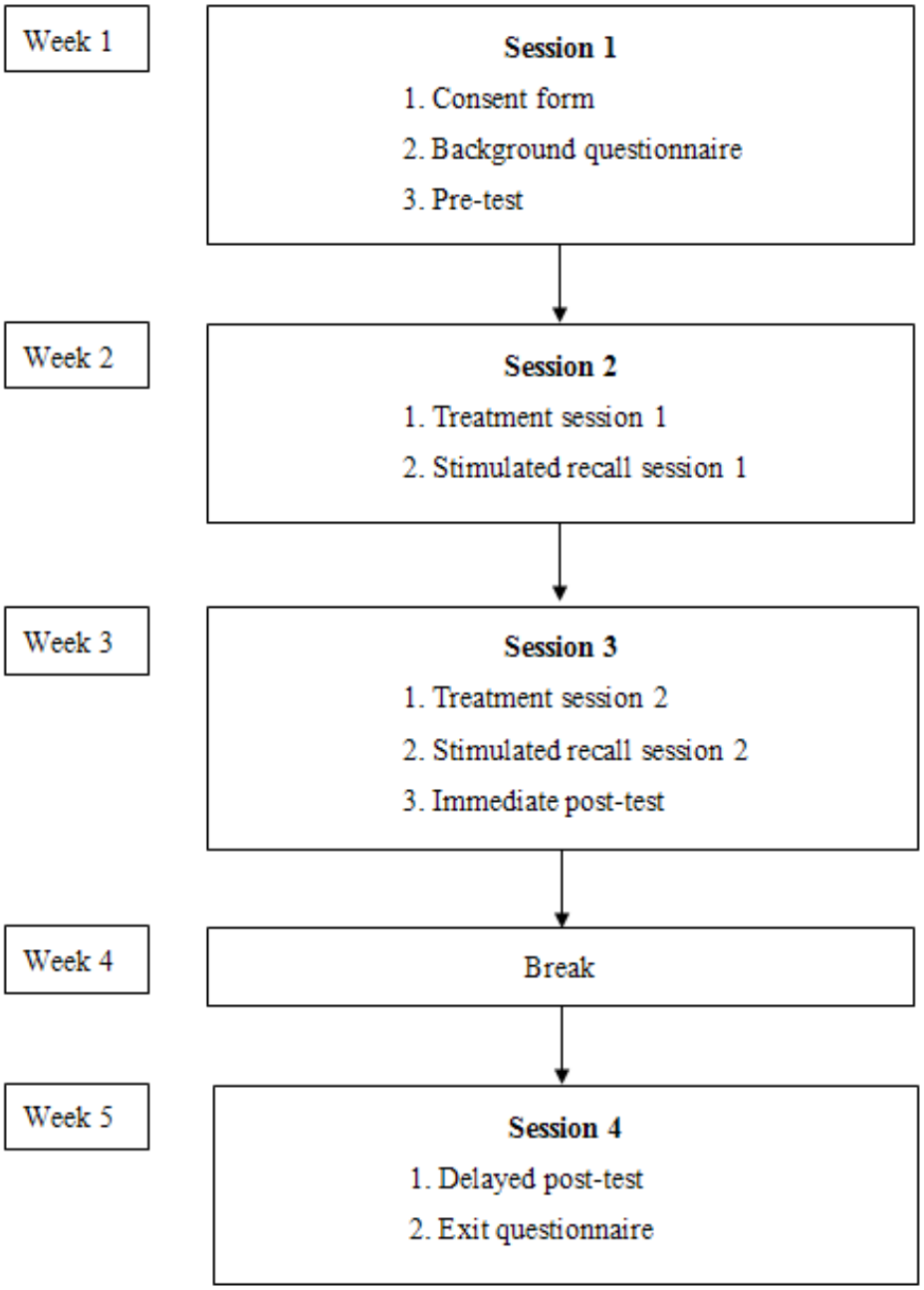

Figure 4. Sequence of the experimental procedures.

3.3. Data Analyses

3.3.1. Treatment sessions data

The investigator transcribed all video-recordings of the treatment sessions of the prompt and recast groups. There were a total of 56 treatment sessions, and the total length of video-recordings was about 6.5 hours.

3.3.2. Quantitative data

The investigator scored all the pre-test, immediate post-test, and delayed post-test. One point was given for a correct form of polite past adjectives in these tests. There were 27 test items in each test, and a perfect score was 27. When the students made multiple utterances in the test, only the first complete utterance was given one point. When self-repair occurred before the utterance was fully articulated, one point was given. A correct target form using a wrong adjective was given zero points.

After the test scores were obtained, two procedures were conducted. The first procedure was to create subgroups of the prompt and recast groups based on the students' test scores with the immediate post-test and the delayed post-test. This procedure is considered a typology development (Dörnyei, 2007) used in mixed methods studies. The following quotation gives an explanation of 'typology development':

> In 'typology/category development' we analyse one data type and establish some substantive categories or themes. These categories are then applied in the analysis of the other type of data. We can use the categories to divide the samples into subsamples, that is, classify individuals into different types, which would be a case of 'typology development'. (Dörnyei, 2007, p. 272)

With respect to the immediate post-test, the students in the prompt and recast groups were categorized into two subgroups: those who had a higher score and those who had a lower score. First, the immediate post-test scores of students in the prompt group were ranked from the highest to the lowest. Then, the students above midpoint were assigned to the High group, while the students below midpoint were assigned to the Low group. The students in the High group had successful learning outcomes while the students in the Low group had less successful learning outcomes in short-term. The same procedure was used for the delayed post-test scores. The students in the recast group were also assigned to subgroups using the same procedure. As a result, four sets of subgroups were created (see Table 6). These subgroups were utilized in the data integration, which will be discussed later.

Table 6

Four Sets of High and Low Subgroups

	Immediate post-test	Delayed post-test
Prompts	High	High
	Low	Low
Recasts	High	High
	Low	Low

The second procedure was to run statistical analyses on the test scores across the three groups (prompts, recasts, and control). All statistical analyses in this study were conducted using SPSS version 11.

3.3.3. Qualitative data

Four steps were taken to analyze the verbal reports: transcription of verbal reports, identification of relevant cognitive processes to code, classification of similar codes into categories, and creation of cognitive maps. The first step was to transcribe the verbal reports. The investigator transcribed all recordings of the stimulated recall sessions in the prompt and the recast group. There were 56 sessions in total, and the combined length of all sessions was about 6.5 hours.

The second step was to identify relevant cognitive processes to code. The investigator performed structural coding (MacQueen, McLellan-Lemal, Bartholow, & Milstein, 2008; Saldaña, 2013) on the transcription of the verbal reports. Structural coding "applies a content-based or conceptual phrase to a segment of data that relates to a specific research question to both code and categorize the data corpus" (Saldaña, 2013, p. 267). By performing structural coding, a researcher is able to access data effectively that are associated with a particular question from a larger data set (Namey, Guest, Thairu, & Johnson, 2008). Structural coding was chosen in this study because it enables the investigator to focus on the information relevant to the study, which is cognitive processes triggered by oral corrective feedback.

The investigator first read all the transcriptions of the recall sessions of the prompts group. Then, segments that described students' cognitive processes triggered by the prompts were identified and coded. The following is a transcript of participant 40; it demonstrates how a segment reflecting the learner's cognitive process triggered by corrective feedback was identified.

> So, when I first learned that word "shizuka", to remember the word, I, I try to associate it with something that I could easily remember, and there was this anime I watched, with

> this character called “suzuka”, so that’s how I remember that word, but then a couple of month later, I, I only remembered the name instead of the right word, then after it came back (retrieve the word)

The underlined part is coded as retrieve the word, which describes a cognitive process triggered by oral corrective feedback. In the initial part of the verbal report, the participant described a strategy he used to memorize the adjective when he learned it. This information is not a cognitive processes triggered by prompts, and the segment referring to the strategy was not coded.

Twenty-five percent of all the segments were also coded by a second coder to establish inter-coder reliability. The second coder was an advanced learner of Japanese, and she was familiar with the target structure. She received training from the investigator before coding. The investigator first explained the goal of the study. Then, the investigator showed the list of codes with examples to the second coder. After reading the code lists, the second coder had a practice session, in which she coded some segments similar to the actual segments reported by the students. Then, the second coder coded a random subsample of the data comprising 25% of the entire set of segments in the prompt group. The simple agreement was 100%. The same steps were taken to code the verbal reports of the recast group. The same second coder coded randomly selected subsample consisting of 25% of the entire set of segments produced by the recast group. The simple agreement was again 100%.

The third step of the qualitative analysis was to group similar codes into categories. In this process, the investigator closely compared codes in relation to their characteristics. Then,

codes that share similar characteristics were combined and put in the same category (Lewins & Silver, 2007; Saldaña, 2013).

After the categories were obtained, the investigator created cognitive maps. A cognitive map is a detailed visual representation and presentation of a cognitive process (Saldaña, 2013). A visual map helps to understand what is going through a person's mind as he/she experiences an action (Miles, Huberman, & Saldaña, 2014). The cognitive map in this study is a visual presentation of the processes triggered by oral corrective feedback in a flow chart format. Two types of cognitive maps, a group map and individual maps, were created in this study. A group map is collective and represents cognitive processes reported by a group of students (Northcutt & McCoy, 2004). Individual maps represent cognitive processes reported by specific individuals. A group map was created first, and then several students' individual cognitive maps were created for the prompt and recast groups.

3.4. Data Integration

Data integration is the stage in which qualitative and quantitative data are combined (Creswell, 2015). In this study, quantitative data (subgroups created on the basis of immediate-post-test and delayed post-test scores) and qualitative data (categories of cognitive processes) were integrated at this stage. The investigator checked the frequency of reports about a category in each subgroup. Then, the investigator examined if there were similarities or differences with respect to the frequencies of reports across the subgroups. Since there are four sets of subgroups, this procedure was followed four times.

3.5. Summary

This chapter presented the research design used in this study and described the three phases of the study: data collection, data elicitation, and data integration. The study employed a mixed embedded design in which a stimulated recall method was embedded in an experimental design. This design enabled the investigator to explore learners' cognitive processes triggered by oral corrective feedback and to examine the relationship of these processes with the outcome of second language learning. Categories of cognitive processes were obtained through coding. Four sets of subgroups were created on the basis of immediate and delayed post-test scores. These two types of data were mixed in the final phase of the study.

The next chapter will report the interaction data from the corrective feedback episodes, the results of the statistical analyses of test scores as well as findings that will answer research questions 1 and 2.

Chapter 4: Results

This chapter will first report the interaction data observed in the treatment sessions. Then, it will report descriptive statistics of pre-test, immediate post-test, and delayed post-test, and the results of inferential statistics. After the results of statistical analyses are reported, the chapter will present the results of analyses that answer research questions 1 and 2.

4.1. Interaction Data

4.1.1. Corrective feedback episodes

In the current study, a corrective feedback episode refers to a sequence which starts with a student's erroneous utterance followed by the researcher's oral corrective feedback. There were three types of error in relation to the target structure in this study: conjugation errors, phonological errors, and lexical errors. Conjugation errors refer to students' utterances that contain an adjective with the wrong conjugation. The following example illustrates a conjugation error.

Example 20 (Student 16, Treatment Session 1)

S:	**Hanbaagaa wa yasuideshita.*	(**Conjugation error**)
	The hamburger was inexpensive.	
R:	*Yasukattadesu.*	(Recast)
	Was inexpensive	

The correct form of adjective in this episode is y*asukattadesu*. The source of the error is the mistake with the conjugation rule, so the error in this episode is regarded as a conjugation error.

Phonological errors refer to students' utterances with the correct polite past form of adjectives involving a pronunciation problem. The following example demonstrates a phonological error.

Example 21 (Student 15, Treatment Session 1)

S:	**Kyureedeshita.*	(**Phonological error**)
	(The department store) was clean.	
R:	*Moo ichido ittekudasai.*	(Clarification request)
	Please say it again.	

The target-like utterance in this episode is *kireedeshita*. The student mispronounced the adjective *kiree* as *kyuree,* producing a phonological error.

Lexical errors refer to students' utterances using the correct polite past form of adjectives with correct pronunciation, but with a non-target adjective. The following example illustrates a lexical error.

Example 22 (Student 26, Treatment Session 1)

S:	**Tomodachi no ryoo wa, aa, kurokattadesu.*	(**Lexical error**)
	The friend's house, ah, was black.	
R:	*Kurakattadesu.*	(Recast)
	Was dark.	

The conjugation and pronunciation of the adjective in this episode are correct, but the student produced the utterance using the wrong adjective *kuroi* (black), instead of *kurai* (dark). The source of this error is the use of a wrong adjective, and it is considered a lexical error.

There were 67 corrective feedback episodes in the two treatment sessions in the prompt group. Fifty-four episodes (80.6%) involved conjugation errors, seven episodes (10.4%) contained phonological errors, and six episodes (9%) involved lexical errors.

Corrective feedback was provided a total of 121 times. The breakdown of the type of feedback is as follows: clarification requests 67 times, repetitions 33 times, elicitations 16 times, and metalinguistic feedback 5 times. The types of feedback used in the prompt group is presented graphically in the Figure 5.

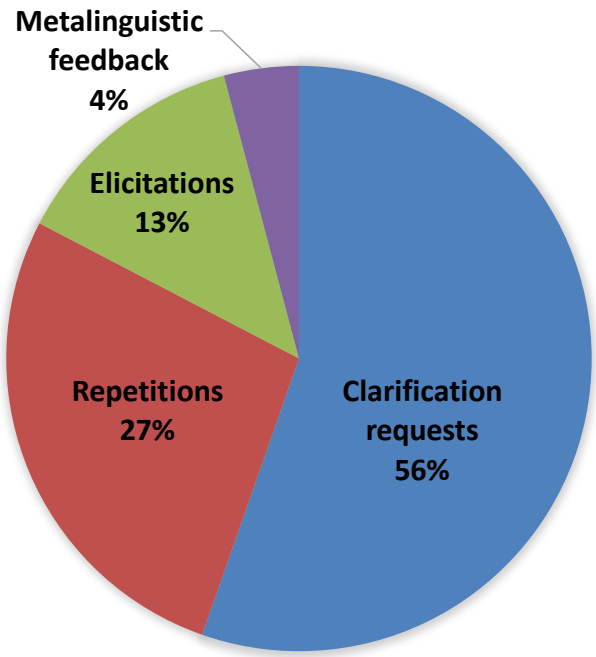

Figure 5. The types of feedback used in the prompt group.

There were 52 corrective feedback episodes in the two treatment sessions in the recast group. Forty-one episodes (78.8%) involved a conjugation error and ten episodes (19.2%) contained a lexical error. One episode (1.9%) involved both conjugation and lexical errors. No episode involved a phonological error. Recasts were provided 55 times. In some corrective feedback episodes, the researcher provided recasts twice; thus the number of recasts is larger than the number of corrective feedback episodes.

4.1.2. Uptake

4.1.2.1. The prompt group

Uptake is defined as "a student's utterance that immediately follows the teacher's feedback and that constitutes a reaction in some way to the teacher's intention to draw attention to some aspect of the student's initial utterance" (Lyster & Ranta, 1997, p. 49). Uptake in the prompt group was first categorized into successful repair and needs repair (Lyster & Ranta, 1997; Sheen, 2011). Successful repair is a repair in which the student successfully corrects the original error. Needs repair is a student's uptake move in which the student does not produce the correct target structure and further repair is needed. Needs repair was categorized into three groups: needs repair modified, needs repair unmodified, needs repair without the target structure (Egi, 2010, Lyster & Ranta, 1997). Needs repair modified is an uptake move in which the student modifies the problematic form incorrectly. The following example illustrates needs repair modified.

Example 23 (Student 28, Treatment Session 2)

S: **Tenisu wa tanoshiideshita.* (Error)

Tennis was fun.

R: *Moo ichido ittekudasai.* (Clarification request)

Please say it again.

S: **Tenisu ga tanoshii, katta, tanoshiikattadesu.* **(Needs repair modified)**

Tennis, interesting, (was),

was interesting.

In the first line, the student produced an erroneous utterance. After receiving a clarification request, the student produced modified output. Although the student modified the problematic form, the error was not corrected and the modified utterance was still erroneous.

Needs repair unmodified is an uptake move in which the student repeats the original error without modifications (Egi, 2010). The following example demonstrates needs repair unmodified.

Example 24 (Student 20, Treatment Session 2)

S: ** Aisukuriimu wa yasuikattadesu.* (Error)

Ice cream was inexpensive.

R: *Moo ichido ittekudasai.* (Clarification request)

Please say it again.

S: **Aisukuriimu wa yasuikattadesu.* **(Needs repair unmodified)**

Ice cream was inexpensive.

In the first line, the student produced an erroneous form. Then, she received a clarification request from the researcher. In the next line, the student simply repeated the erroneous utterance.

Needs repair without target structure is students' uptake that includes students' response to prompts, but does not contain the target structure. When students produce acknowledgements such as *hai* (yes) or *wakarimashita* (I understood) but do not produce the target structure, these responses are viewed as needs repair without target structure. The following example illustrates needs repair without target structure.

Example 25 (Student 35, Treatment Session 1)

S:	**Uh, tomodachi no apaato wa akaruikattadesu?* Uh, friend's apartment was bright?	(Error)
R:	*Moo ichido ittekudasai.* Please say it again.	(Clarification request)
S:	**Akarui, kattadesu?* Was, bright?	(Needs repair unmodified)
R:	**Akaruikattadesu?* Was bright?	(Repetition)
S:	**Hai.* Yes.	**(Needs repair without target structure)**

In line four, the student received repetition from the researcher. In response, the student simply said "*hai*" (yes), and she did not produce a target structure. Figure 6 summarizes the classification of uptake observed in the prompt group.

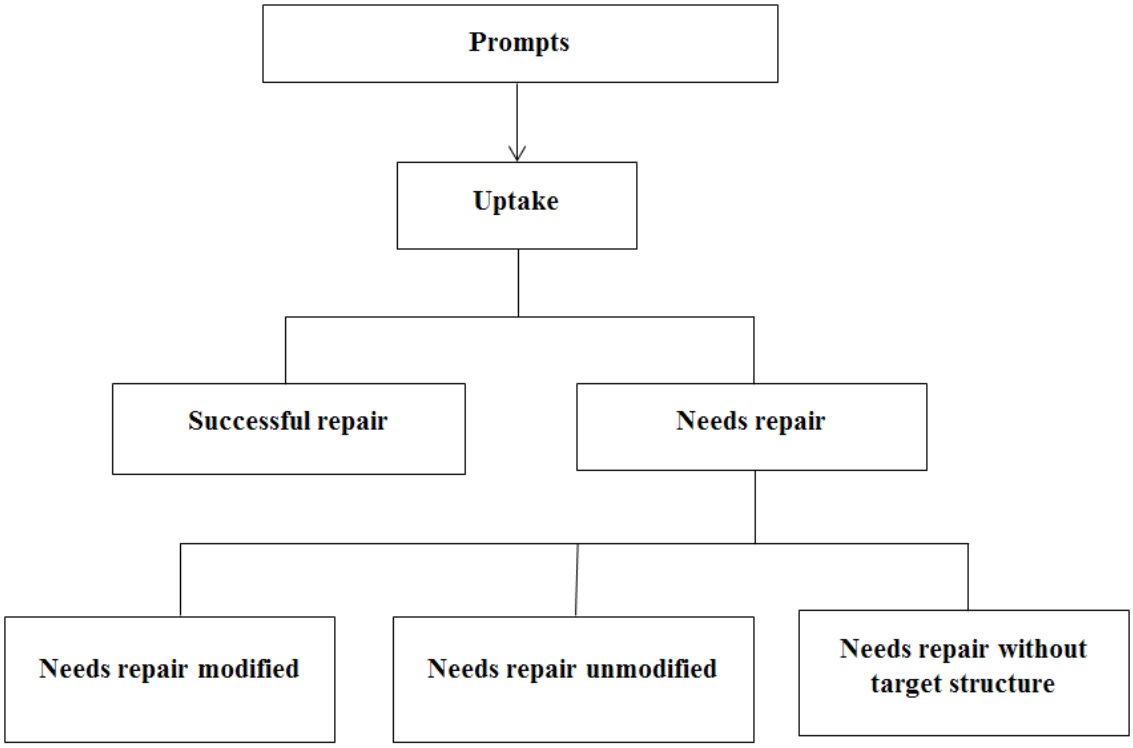

Figure 6. The classification of uptake observed in the prompt group.

A total of 121 uptake moves occurred during treatment sessions in the prompt group. Successful repair occurred 64 times and needs repair 57 times. Among needs repair, needs repair modified occurred 34 times, needs repair unmodified occurred 19 times, and needs repair without target structure occurred 4 times. Table 7 summarizes the number of each type of uptake in the prompt group. Figure 7 gives a graphic representation of the breakdown of uptake in the prompts group. Figure 8 provides a graphic presentation of the breakdown of needs repair.

Table 7

The Number of Each Type of Uptake in the Prompt Group

Uptake			
121			
Successful repair	Needs repair		
64	57		
	Needs repair modified	Needs repair unmodified	Needs repair without target structure
	34	19	4

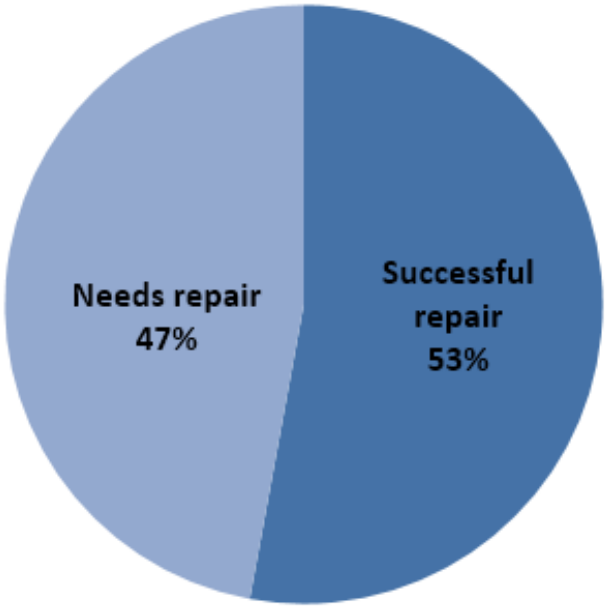

Figure 7. The breakdown of uptake in the prompt group.

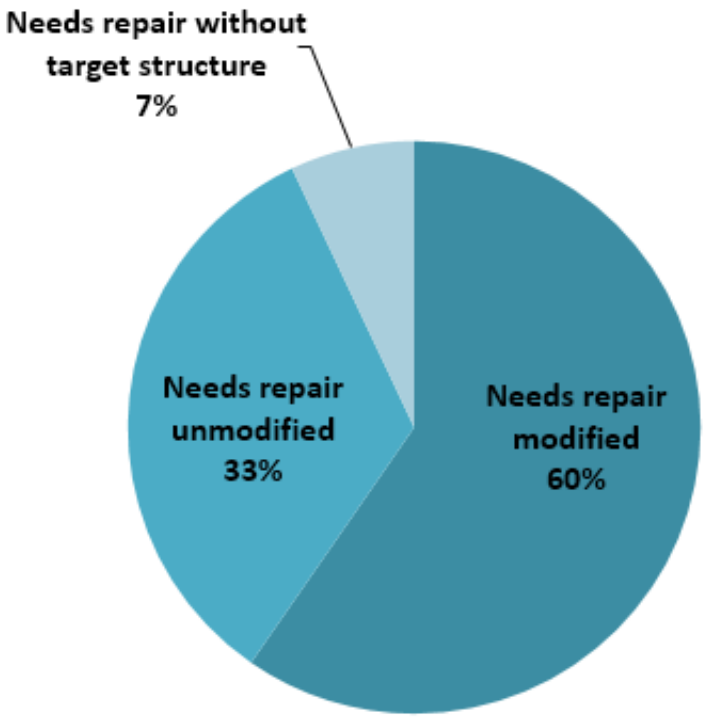

Figure 8. The breakdown of needs repair in the prompt group.

4.1.2.2. The recast group

Students' reactions to recasts were first categorized into two groups: uptake and no uptake. Lyster and Ranta (1997) explain that topic continuation initiated by the student or teacher follows the feedback when there is no uptake. In this study, there was only one episode in which no uptake occurred. What follows is the no uptake episode.

Example 26 (Student 41, Treatment Session 1)

S:	**Sa, sa…hai.*	(Error)
	Sa, sa…yes.	
R:	*Eeto, semakattadesu.*	(Recast)

Well, (was) cramped.

S: *Uun, hai, chotto…uun, kotoba o wasuremashita.* **(No uptake)**

Um, yes, ….um, I forgot the word.

In the first line, the student tried to produce the target structure, but he could not remember the right adjective. Then, the researcher provided a recast. In line 3, the student again mentioned that he has forgotten the word although it was provided in the previous turn. The student did not respond to the information provided in the recast and continued talking about the adjective which he could not remember. Uptake did not occur in this episode.

In all the other episodes, uptake occurred. Uptake in the recast group was first categorized into successful repair and needs repair. Successful repair is repair in which the student successfully corrects the original error. In the recast group, it is the student's repetition of the whole of the recast. The following example shows a successful repair.

Example 27 (Student 2, Treatment Session 1)

S: **Metoro wa benrinadeshita.* (Error)

Metro was convenient.

R: *Benrideshita.* (Recast)

Was convenient.

S: *Benrideshita.* **(Successful repair)**

Was convenient.

Needs repair is students' repair in which the student does not produce the correct target structure. Needs repair was categorized into two groups: needs repair with partial repetition and needs repair modified. Needs repair with partial repetition is repair in which the student repeats part of the recast. The following example illustrates needs repair with partial repetition.

Example 28 (Student 16, Treatment Session 2)

S:	**Aa, tomodachi no apaato wa totemo, semaideshitta.*	(Error)
	Uh, friend's apartment was very, cramped.	
R:	*Semakattadesu.*	(Recast)
	Was cramped.	
S:	*Semakatta.*	**(Needs repair with partial repetition)**
	Was cramped.	

In the first line, the student produced an erroneous form. Then, the researcher provided a recast "*semakattadesu*". In the third line, the student said "*semakatta*", which is only part of the recast provided by the researcher.

Needs repair modified is students' repair in which a student modifies the problematic form incorrectly. The following example illustrates needs repair modified.

Example 29 (Student 25, Treatment Session 2)

S:	**Dauntaun wa, ee, shizukana, shizu…*	(Error)
	Downtown, uh, quiet, quiet...	
R:	*Shizukadeshita.*	(Recast)

Was quiet.

S: **Shizukana, deshita.* **(Needs repair modified)**

Was quiet.

In the first line, the student tried to produce the polite past of *shizukana* (quiet), but she only said the adjective without conjugation and could not produce the target form. Then, the researcher provided a recast. In line three, the student produced modified output, but it was not correct. Figure 9 summarizes the classification of uptake observed in the recast group.

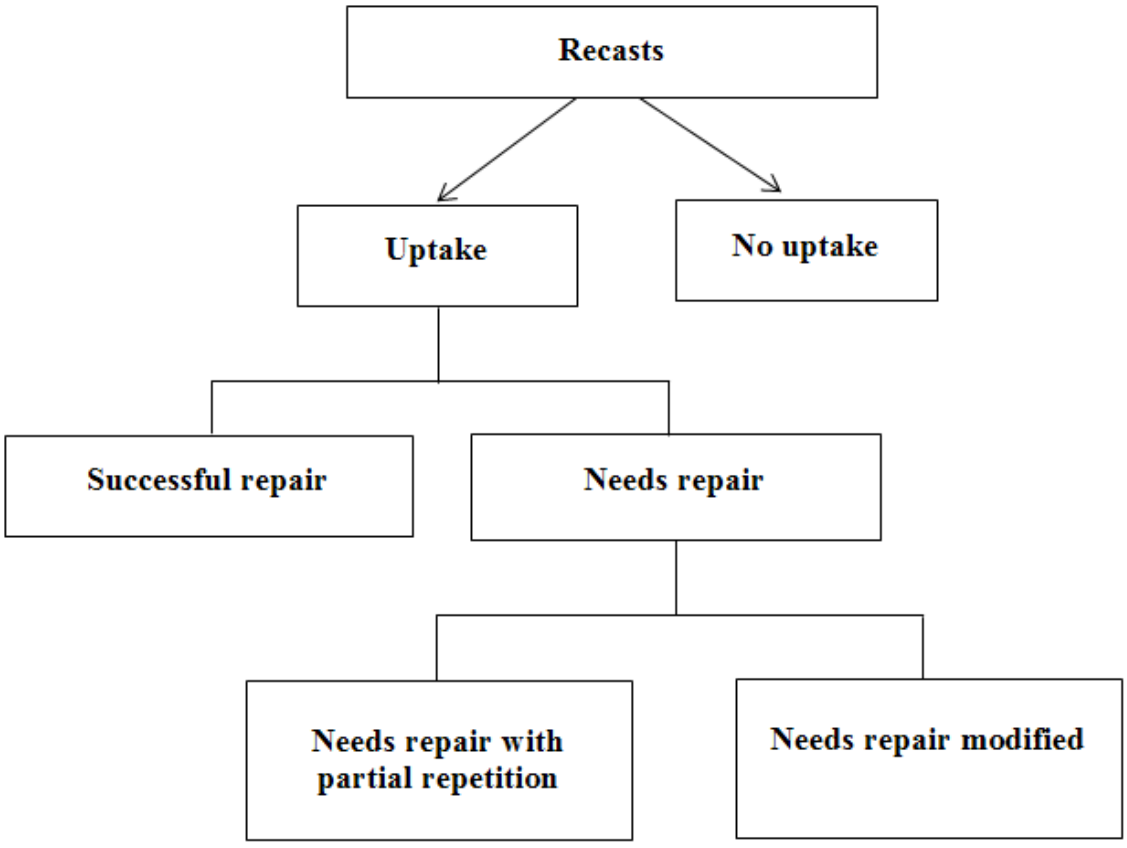

Figure 9. The classification of uptake observed in the recast group.

Uptake occurred 51 times in the recast group. Successful repair occurred 41 times and needs repair 10 times. Needs repair with partial repetition occurred 7 times and needs repair modified occurred 3 times. Table 8 summarizes the number of each type of uptake in the recast group. Figure 10 shows a graphic representation of the breakdown of uptake in the recast group. Figure 11 provides a graphic presentation of the breakdown of needs repair.

Table 8

The Number of Each Type of Uptake in the Recast Group

Uptake		
51		
Successful repair	Needs repair	
41	10	
	Needs repair with partial repetition	Needs repair modified
	7	3

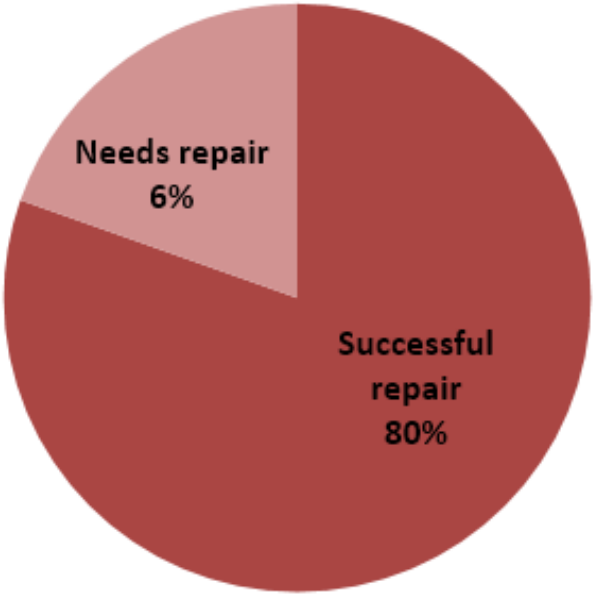

Figure 10. The breakdown of uptake in the recast group.

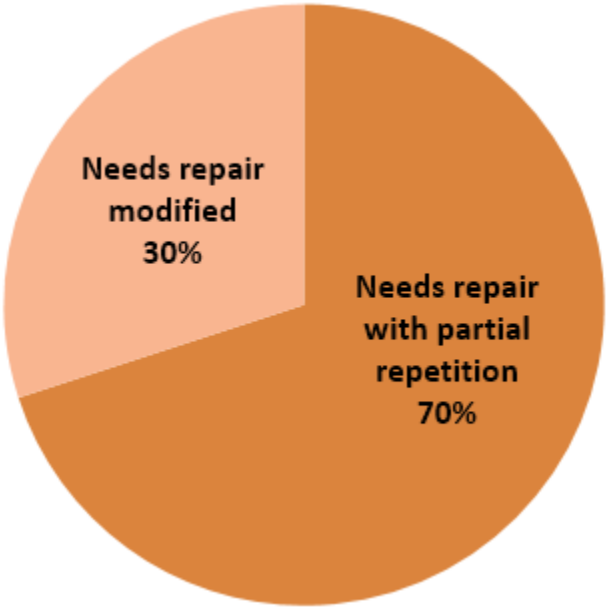

Figure 11. The breakdown of needs repair in the recast group.

The uptake rates were very high in both the prompt and the recast groups, suggesting that the participants recognized the target structure in the current study. The analyses of the exit survey show that the majority of participants noticed that the study focused on the polite past tense. The survey asked the participants whether they thought the study focused on a specific grammar item. Thirty-eight out of 39 participants (97%) answered "yes". The survey also asked participants to state the grammar item which they thought the study focused on. Participants' answers were categorized into five groups: past tense in general (4 participants), past tense of adjective (7 participants), polite past in general (17 participants), polite past adjective (9 participants), and not related to the target structure (1 participant).

The participants generally noticed that the study was about the past tense and the polite form. During the treatment sessions, the participants were expected to describe the pictures using the polite past of adjectives and verbs, although the corrective feedback targeted only to adjectives. Even though the participants had a general idea about the target structure in the study, only nine participants noticed that the exact target structure was polite past adjectives.

4.2. Test Score Statistics

4.2.1. Descriptive statistics

For the pre-test, the mean scores of the prompt group, the recast group, and the control group were 6.21, 11.00, and 10.45, respectively. The mean scores of the recast group and the control group were similar, but the mean score of the prompt group was noticeably lower than the other two groups.

Regarding the immediate post-test, the mean scores of the prompt group, the recast group, and the control group were 21.86, 20.79, and 20.18, respectively. The mean scores of all groups

were similar. The prompt group had the highest score among three groups, indicating that the increase from the pre-test to the immediate post-test was the largest. Although it was expected that the control group's immediate post-test score would remain similar to the pre-test score, it actually increased. The control group's unexpected high performance on the immediate post-test will be discussed in the next chapter.

As for the delayed post-test, the mean scores of the prompt group, the recast group, and the control group were 21.86, 21.07, and 21.00, respectively. The mean scores of all groups were similar. Although the prompt group had the highest score among three groups, the score remained the same as with the immediate post-test, while the scores of the recast group and the control group increased slightly from the immediate post-test.

The scores of pre-test, immediate post-test, and delayed post-test are summarized in Table 9. Figure 12 illustrates graphically the test scores of all the groups.

Table 9

Group Means and Standard Deviations of Pre-test, Immediate post-test, and Delayed post-test Scores

	Pre-test		Immediate-post-test		Delayed-post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*
Prompts (*n* = 14)	6.21	5.15	21.86	3.39	21.86	3.82
Recasts (*n* = 14)	11.00	9.09	20.79	6.13	21.07	6.64
Control (*n* = 11)	10.45	8.01	20.18	3.66	21.00	4.92

Figure 12. Group means of pre-test, immediate post-test, and delayed post-test scores.

4.2.2. Inferential statistics

A one-way analysis of covariance (ANCOVA), using the pre-test as covariate, was run separately for the immediate post-test scores and delayed post-test scores to examine the effects of recasts and prompts on second language learning. ANCOVA was chosen as a statistical test in this study because it controls for pre-test scores. First, the ANCOVA was conducted to determine differences between groups on the immediate post-test score controlling for the pre-test scores. The independent variable included three levels (prompt group, recast group, and control group). The dependent variable was the participants' immediate post-test scores and the covariate was

the participants' pre-test scores. All assumptions for the test were met[16]. The ANCOVA was significant: $F(2,35) = 4.72$, $p = 0.015$ (see Table 10).

Table 10

ANCOVA for Immediate post-test Scores by Group

Source	***df***	***SS***	***MS***	***F***	***p***
Pre-test	1	418.30	418.30	41.43	.000
Group	2	95.29	47.64	4.72	.015
Error	35	353.41	10.10		
Total	38	790.00			

[16] A one-way Analysis of Variance (ANOVA) was conducted to examine whether the prompt, recast, control groups, differed with respect to the pre-test scores. *Levene's F* test revealed that the homogeneity of variance assumption was not met ($p < .05$); therefore, *Welch's F* test was used. The one-way ANOVA was not statistically significant, *Welch's F*(2, 21.14) = 2.06, $p = .15$, indicating that there were no differences across the groups in relation to the pre-test scores.

The assumption of normality was tested via an examination of the Q-Q plot and histogram of the studentized residuals. The histogram of the studentized residuals indicated that the data contained, approximately, normally distributed residuals. The Q-Q plot of the studentized residuals showed that points were on or near the line drawn through the middle half of the points, suggesting that the assumption of normality was met.

The assumption that the covariate is linearly related to the dependent variable at each level of the independent variable was tested by analyzing the scatterplot of the immediate post-test scores and pre-test scores. The scatterplot showed parallel linear bands without obvious departures from linearity.

The assumption of homoscedasticity was tested by an analysis of the scatterplot of the studentized residuals against the predicted values. The scatterplot had a random display of points forming a rectangular shape, which suggests that the assumption of homoscedasticity was met.

An analysis evaluating the homogeneity of regression slopes indicated that there was no interaction between the pre-test scores and the groups, $F(2, 35) = .74$, $p = .48$, indicating that the assumption of the homogeneity of regression slopes was met.

LSD post-hoc tests were conducted to determine pairwise differences among adjusted means for the groups. The results revealed that the prompt group (M = 23.17) had significantly higher immediate post-test scores, controlling for the pre-test scores, than did the recast group (M = 19.94) or the control group (M = 19.58). There was no significant difference between the recast group and the control group. Table 11 summarizes the results of post-hoc tests. Figure 13 illustrates graphically the pre-test and immediate post-test mean scores of all the groups.

Table 11

LSD Post-hoc Tests for Immediate post-test Scores

Group	Mean	Adjusted Mean	Adjusted Mean Differences		
			Prompts	Recasts	Control
Prompts	21.86	23.17	__	3.23*	3.59*
Recasts	20.79	19.94		__	0.36
Control	20.18	19.58			__

*$p <$ 0.05

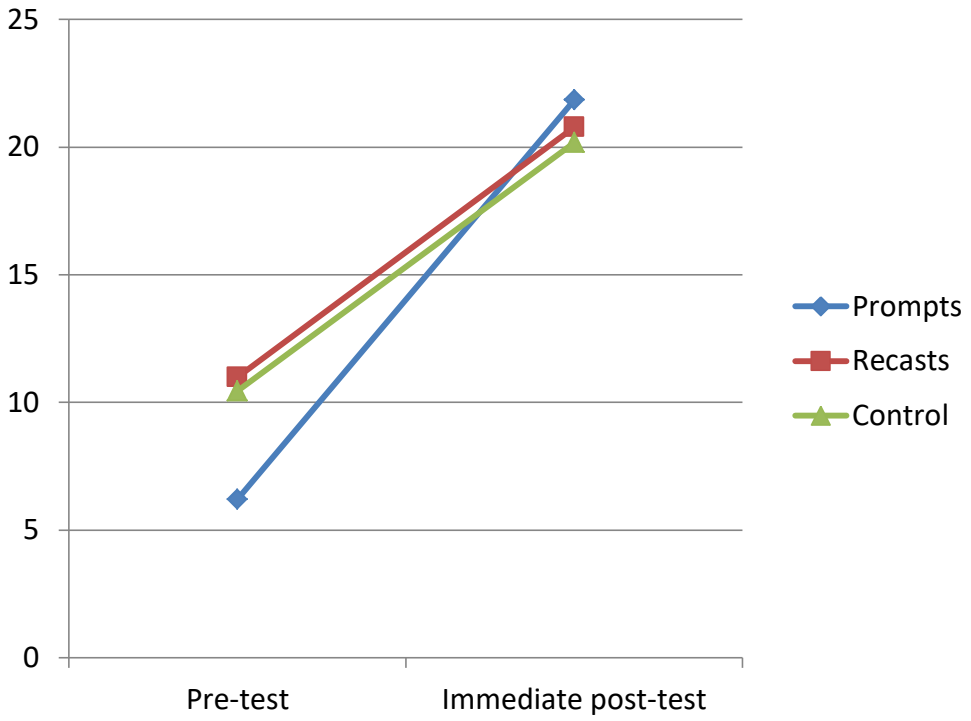

Figure 13. Pre-test and immediate post-test mean scores of all the groups.

An ANCOVA was also run to determine differences across groups on the delayed post-test scores controlling for pre-test scores. The independent variables were the three groups and the dependent variable was the participants' delayed post-test scores. The covariate was the participants' scores on the pre-test. All assumptions for the tests were met[17]. The ANCOVA was

[17] The assumption of normality was tested via an examination of the Q-Q plot and histogram of the studentized residuals. The examinations suggest that the assumption of normality was met.

The assumption that the covariate is linearly related to the dependent variable at each level of the independent variable was tested by analyzing the scatterplot of the immediate post-test scores and pre-test scores. The scatterplot showed parallel linear bands without obvious departures from linearity.

The assumption of homoscedasticity was tested by an analysis of the scatterplot of the studentized residuals against the predicted values. The analysis suggests that the assumption of homoscedasticity was met.

An analysis evaluating the homogeneity of regression slopes indicated that there was no interaction between the pre-test scores and the groups, $F(2, 35) = .38$, $p = .69$, indicating that the assumption of the homogeneity of regression slopes was met.

not significant: $F(2,35) = 1.77$, $p = 0.186$ (see Table 12). Figure 14 illustrates graphically the pre-test and delayed post-test mean scores of all groups.

Table 12

ANCOVA for Delayed post-test Scores by Groups

Source	***df***	***SS***	***MS***	***F***	***p***
Pre-test	1	378.66	378.66	21.17	.000
Group	2	63.08	31.54	1.76	.186
Error	35	625.99	17.89		
Total	38	1010.67			

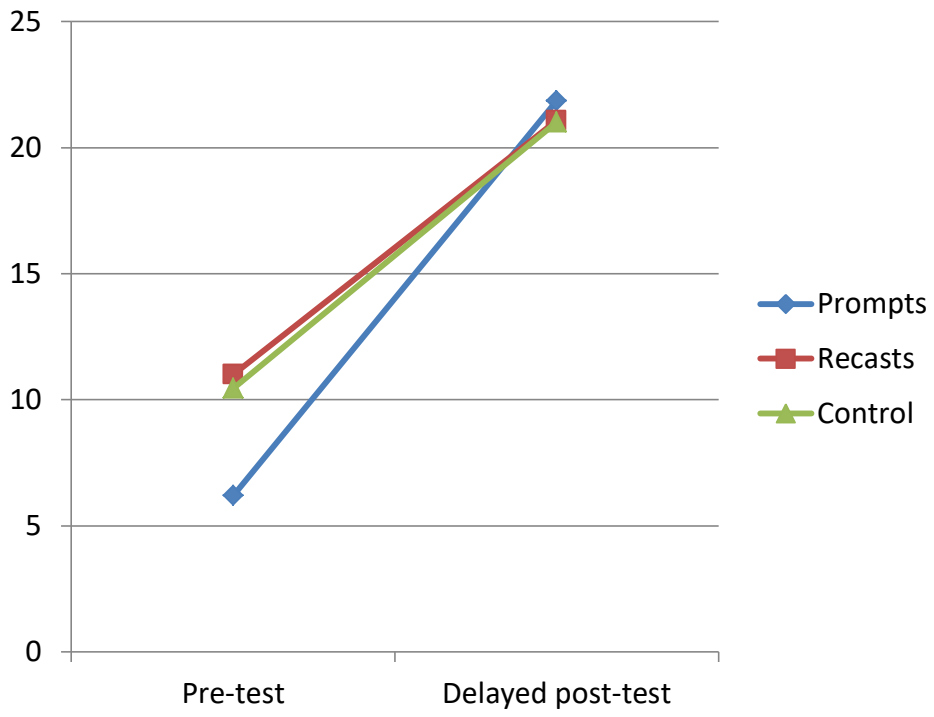

Figure 14. Pre-test and delayed post-test mean scores of all the groups.

To sum up, significant differences were found between the prompt and the recast groups as well as between the prompt and the control groups with respect to the immediate post-test. There were no significant differences across groups with the delayed post-test. There results indicate that prompts were significantly more effective than recasts or no feedback on the acquisition of polite past adjectives, but this significant difference was not maintained two weeks later, when all groups performed similarly.

4.3. Research Question1

Research question 1 asks what kinds of cognitive processes are triggered by different types of oral corrective feedback (recasts and prompts). The following section will report the cognitive processes identified in the prompt group and the recast group.

4.3.1. The prompt group

4.3.1.1. Codes and categories

There were 65 verbal reports in total that described participants' cognitive processes triggered by prompts. Seventeen codes were identified from these reports. The code names, their descriptions, and sample segments of participants' verbal reports are presented in Table 13. These 17 codes were then grouped under seven categories: recognition, no recognition, knowledge search, knowledge retrieval, no knowledge retrieval, incorrect knowledge application, and correct knowledge application. Codes that belong to the same category and their shared characteristics are presented in Table 14.

Table 13

Code Names, Descriptions, and Sample Segments of the Participants' Verbal Reports in the Prompt Group

Code name	Description	Sample segments of verbal reports	Number of segments
1. Recognition that error occurred	Participants are aware that an error occurred, but they do not know what kind of error occurred.	• Student 17, Recall Session 1 "I just made a mistake." • Student 11, Recall Session 1 "I felt this was wrong. "	5
2. Attempt at identifying problem	Participants are aware that their previous utterance was problematic and they try to identify the source of the problem.	• Student 14, Recall Session 1 "I was thinking what I did wrong." • Student 18, Recall Session 1 "I was trying to think what I did wrong, what I said was wrong."	6

Code name	Description	Sample segments of verbal reports	Number of segments
3. Recognition of problem	Participants are aware what kind of error occurred in their previous utterance.	• Student 4, Recall Session 1 "…once I said *semaideshita* I know that it's wrong, I remember the correct one should be *semakattadesu*." • Student 36, Recall Session 1 "I just realized that *shizukana* is na-adjective, so the past tense is different from the i-adjective."	9
4. Failure to pay attention to problem	Participants are not aware of the source of the problem in their previous erroneous utterance.	• Student 35, Recall Session 1 "I was more focusing on the pronunciation, not so much on the conjugation."	7
5. Reflection on conjugation rule	Participants reflect on conjugation rule of polite past adjective.	• Student 5, Recall Session 1 "I was thinking about the i-adjective, the past tense of that…"	3

Code name	Description	Sample segments of verbal reports	Number of segments
6. Confusion with another word	Participants are confused or mixed up with two similar vocabularies.	• Student 17, Recall Session 1 "I got mixed up with black and dark *kuroi* and *kurai*." • Student 28, Recall Session 1 "I just got confused between *yasui* and *yasai*."	3
7. Rule search	Participants try to remember or recall conjugation rule.	• Student 18, Recall Session 1 "I was basically trying to remember the polite, polite past tense." • Student 36, Recall Session 1 "I tried to recall the knowledge, we have learned previously."	3
8. Search for well-formed sentence	Participants search for a correct sentence.	• Student 11, Recall Session 1 "I was kind of scanning of my head for the sentences like I know."	1

Code name	Description	Sample segments of verbal reports	Number of segments
9. Word search	Participants search for a word .	• Student 11, Recall Session 1 "I was just like scanning the vocabulary." • Student 40, Recall Session 2 "…in my head, it was something like *yaka* at the end."	1
10. Search for adjective type	Participants try to recall the adjective type.	• Student 17, Recall Session 1 "I was searching what, what kind of adjective it is…" • Student 14, Recall Session 2 "I thought…if it was na-adjective or i-adjective."	3
11. Retrieval of correct conjugation rule	Participants remember the correct conjugation rule.	• Student 10, Recall Session 1 "I just remember how to change the form." • Student 4, Recall Session 1 "I remember the correct one should be *semakattadesu*."	3

Code name	Description	Sample segments of verbal reports	Number of segments
12. Retrieval of adjective type	Participants remember the adjective type.	• Student 17, Recall Session 1 "I remembered when you questioned." • Participant 14, Recall Session 2 "I realized that it is i-adjective."	2
13. Retrieval of correct word	Participants remember the correct word.	• Student 10, Recall Session 2 "I remembered that bright….should be *akarui*."	3
14. No recall of conjugation rule	Participants do not remember the conjugation rule.	• Student 10, Recall Session 1 "I forgot the past tense of i-adjective." • Student 36, Recall Session 1 "I forgot the form of the na-adjective, their past tense."	4

Code name	Description	Sample segments of verbal reports	Number of segments
15. Confusion about conjugation rule	Participants confuse the correct conjugation rule and wrong conjugation rule.	• Student 4, Recall Session 1 "…then I get mixed up…" • Student 36, Recall Session 1 "I am not quite sure I should say *tanoshikattadesu* or *tanoshikattadeshita*…I got confused."	3
16. Application of incorrect conjugation rule	Participants have incorrect conjugation rule in their mind and apply it to produce an utterance.	• Student 4, Recall Session 1 "I thought it's just with the same form with other, like the na-adjectives." • Student 5, Recall Session 1 "I thought i-adjective usually changes into "ku", so I, I thought that should be the past tense."	4

Code name	Description	Sample segments of verbal reports	Number of segments
17. Application of correct conjugation rule	Participants have correct conjugation rule in their mind and apply it to produce an utterance.	• Student 40, Recall Session 1 "then I remembered when you use the past tense, you have to remove the *i*, so it was like, "oh, wait, is it *yasukatta*?"… and I said *yasukatta*." • Student 5, Recall Session 2 "…thinking about what you just said, um, you have to drop *i* and add *kattadesu* to be applied the past tense."	5

Table 14

Codes Regrouped Under the Same Category and Their Shared Characteristics

Category	Codes	Shared characteristics
1. Recognition	• Recognition that error occurred • Attempt at identifying problem • Recognition of problem	They are related to the recognition of the problem in the participants' erroneous utterance
2. No recognition	• Failure to pay attention to problem	
3. Knowledge search	• Reflection on conjugation rule • Confusion with another word • Rule search • Search for well-formed sentence • Word search • Search for adjective type	They are related to the participants' efforts in order to retrieve knowledge necessary for self-repair

Category	Codes	Shared characteristics
4. Knowledge retrieval	• Retrieval of correct conjugation rule • Retrieval of adjective type • Retrieval of correct word	They are related to the retrieval of correct knowledge necessary for self-repair
5. No knowledge retrieval	• No recall of conjugation rule • Confusion about conjugation rule	They are related to the unsuccessful retrieval of correct information necessary for self-repair
6. Incorrect knowledge application	• Application of incorrect conjugation rule	
7. Correct knowledge application	• Application of correct conjugation rule	

4.3.1.2. Group cognitive map

The model in Figure 15 presents a cognitive map of the prompt group. It is collective and represents cognitive processes reported by the participants in the prompt group. Although it would be ideal to present which cognitive process occurred after receiving which corrective feedback technique (repetition, elicitation, and metalinguistic feedback), it was not possible to provide this information from the data obtained in this study. The participants' verbal reports were not precise statements of their thought processes following an exact timeline, and it was not identifiable exactly which process occurred after which corrective feedback technique. This issue will be further discussed in the next chapter.

The beginning of the sequence is the reception of initial corrective feedback, which is a clarification request. The last part of the sequence is successful repair or final needs repair. The three cognitive processes in the green ovals show essential processes necessary for a successful self-repair. The four cognitive processes in the orange ovals show additional processes that can be skipped when they are not necessary.

After receiving the clarification request, the learners either recognize the problem or do not recognize the problem. If the learners do not recognize the problem, they receive another feedback. If they still do not recognize the problem, they again receive feedback, which leads to recognition of the problem.

After they recognize the problem, the learners either retrieve knowledge or search for knowledge. In the case of searching for knowledge, the learners reflect on the knowledge necessary for self-repair rather than retrieving it instantaneously. Then, they either retrieve the knowledge or do not retrieve the knowledge. When they do not retrieve the knowledge, they receive another feedback and then retrieve the knowledge.

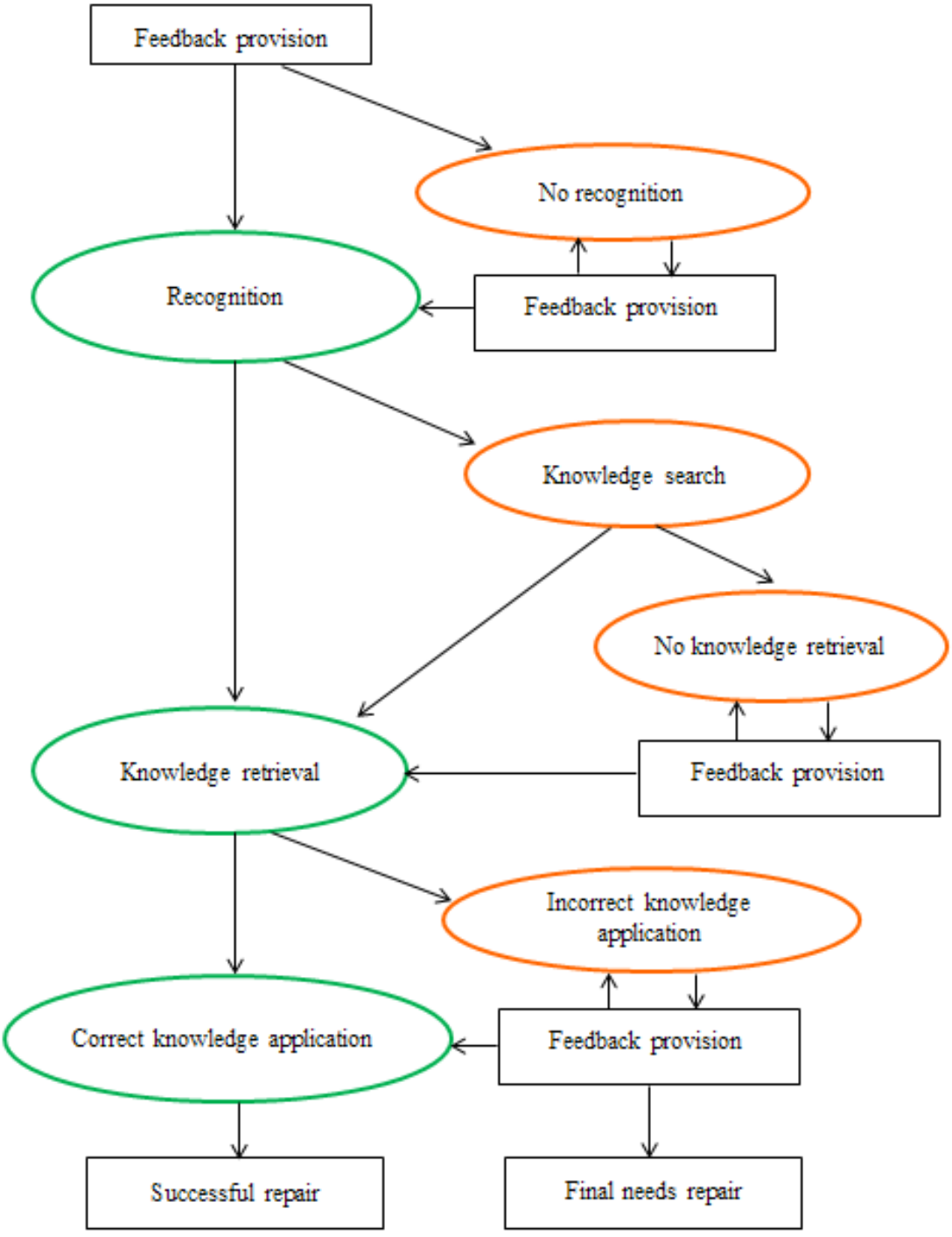

Figure 15. A cognitive map of the prompt group.

After retrieving knowledge, the learners either apply the correct knowledge and produce a successful repair or they apply the incorrect knowledge. When the learners apply the incorrect knowledge, they receive another feedback. If they apply the incorrect knowledge again, they receive another feedback. Then, they apply the correct knowledge and produce a successful repair or a final needs repair.

4.3.1.3. Individual cognitive maps

This section will present the cognitive maps of three participants. These participants were chosen because their verbal reports were more complete than other participants' reports. Providing retrospective verbal reports of cognitive processes that followed an exact timeline was not easy for participants. Compared to those of other participants, these three participants' verbal reports contained more complete information which describes a series of cognitive processes triggered by prompts. The first map shows that the participants processed only essential processes, while the latter two maps show that they also had additional processes.

Student 40.

Below is a corrective feedback episode involving student 40.

Example 30 (Student 40, Treatment Session 1)

S:	**Hanbaagaa wa yasuikattadesu.*	(Error)
	The hamburger was inexpensive.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	

S: *Yasukattadesu.* (Successful repair)

Was inexpensive.

The student first said "*yasuikattadesu*", which is a non-target-like form. After receiving a clarification request, he produced a successful repair. The following transcript of his verbal report shows his cognitive processes in this episode.

> At that time, I said "*yasuikatta*" but then I remembered when you use the past tense, you have to remove the "*i*" , so it was like, "oh, wait, is it *yasukatta*?", and then you asked me, and I was like, I thought "*yasuikatta*" was probably wrong, [recognition of problem] and I said "*yasukatta*" [application of correct conjugation rule].

In the beginning, the student remembered the correct conjugation rule and suspected that his previous utterance was erroneous. After receiving a clarification request, he recognized that "*yasuikatta*" was wrong. Then, he applied the correct rule and produced a successful repair, "*yasukatta*". Figure 16 shows a cognitive map of this corrective feedback episode. Knowledge retrieval is not included in this map because the participant retrieved the correct conjugation rule before receiving a clarification request. The student exhibited only the essential processes in this episode.

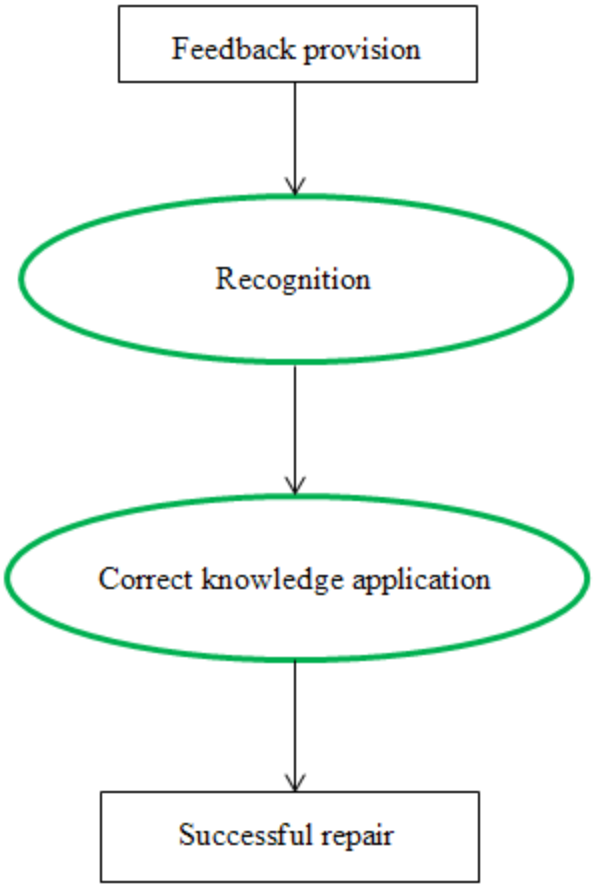

Figure 16. A cognitive map involving student 40.

Student 35.

What follows is the transcript of a corrective feedback episode involving student 35.

Example 31 (Student 35, Treatment Session 1)

S:	**Hanbaagaa wa yasukattadeshita.*	(Error)
	The hamburger was inexpensive.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	

S:	**Hanbaagaa wa yasukattadeshita?*	(Needs repair)
	The hamburger was inexpensive?	
R:	** Yasukattadeshita?*	**(Repetition)**
	Was inexpensive?	
S:	*A, desu, yasukattadesu.*	(Successful repair)
	Oh, was inexpensive.	

In the first line, the participant produced a non-target-like form "*yasukattadeshita*". After receiving a clarification request, she produced the same erroneous form, "*yasukattadeshita*". Then, she received feedback in the form of repetition. After hearing a repetition of her error, she produced a successful repair. The following is the transcript of her verbal report:

> I think, because I had made a mistake with the pronunciation before, at that point I was more focusing on the pronunciation not so much on the conjugation [failure to pay attention to problem], so I, I forgot it should be *desu* instead of *deshita*.

After receiving a clarification request, the student was not paying attention to the conjugation, which is the actual source of the problem. She was not aware at that moment that the ending of the form should be "*desu*". Figure 17 shows a cognitive map of this corrective feedback episode.

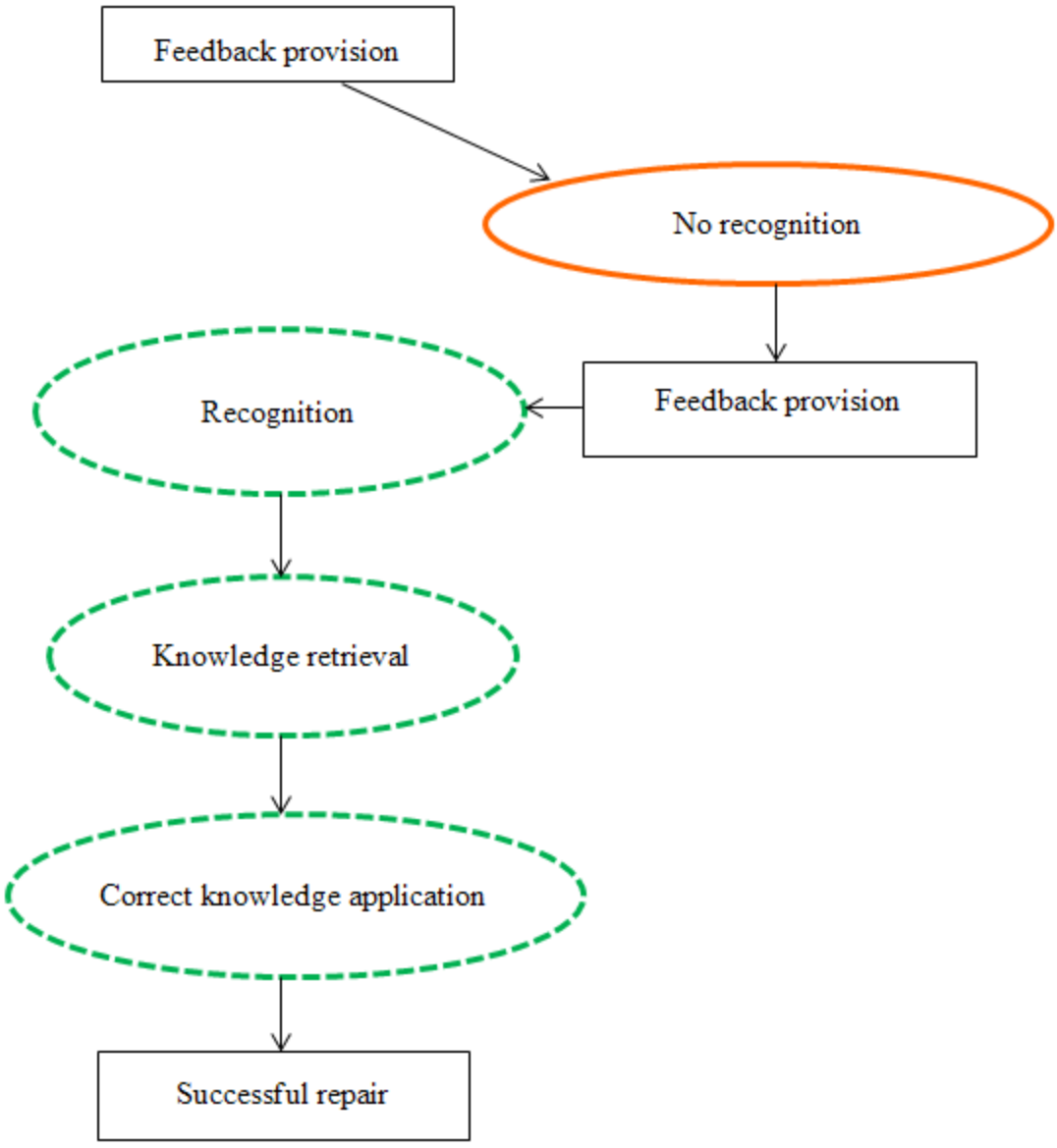

Figure 17. A cognitive map involving student 35.

After receiving the initial corrective feedback, the student did not recognize the problem and received additional feedback. The three subsequent cognitive processes are presented in ovals with dotted lines since they are not clearly stated in the participant's verbal reports. Although it is not explicit, the student's successful repair "*A, desu, yasukattadesu*" (oh, was

inexpensive) suggests that she recognized the problem, retrieved the correct knowledge, and applied that rule to produce the successful repair.

Student 35's cognitive map contains an additional cognitive process. It is different from the cognitive map of student 40, which does not include additional processes. This difference indicates that the sequences of cognitive processes vary individually.

Student 5.

The following demonstrates a corrective feedback episode of student 5.

Example 32 (Student 5, Treatment Session 1)

S:	**Tanoshi…tenisu o tanoshiikukattadesu.*	(Error)
	Fun…tennis was fun.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	**Tenisu, tenisu wa tanoshikukattadesu.*	(Needs repair)
	Tennis, tennis was fun.	
R:	**Tanoshikukattadesu?*	**(Repetition)**
	Was fun?	
S:	**Tanoshikukatta?*	(Needs repair)
	Was fun?	
R:	*Tanoshi*_____.	**(Elicitation)**
	_____(was)____fun.	
S:	**Tanoshi…tanoshiidesu.*	(Needs repair)

	Fun…is fun.	
R:	*Tanoshii* is *i*-adjective, so you need to drop *i* and you need to add *kattadesu*.	**(Metalinguistic feedback)**
S:	*A, tanoshikattadesu*. Oh, was fun.	(Successful repair)

In this episode, the student needed all four types of corrective feedback in the form of prompts. After she received a clarification request, she modified her output, but it was still erroneous. Then she received a repetition and an elicitation, but she still produced a non-target-like form. After receiving metalinguistic feedback, she produced a successful repair. The following is the participant's verbal report about this episode:

> Uh…I, I was thinking about the i-adjective, the past tense of that [reflection on conjugation rule] , uh…and I wasn't quite sure about that one, and I thought i-adjective usually changes into "*ku*", so I , I thought that should be the past tense [application of incorrect conjugation rule], and after you, you mentioned, or remind me of what it should be, I, I remember what it should be, should be like, "*oishikattadesu"*, not "*oishiku"* [retrieval of correct conjugation rule] [application of correct conjugation rule].

In the beginning, she reflected on the conjugation rule of the polite past adjective. Then, she retrieved an incorrect conjugation rule and applied it. Finally, she retrieved the correct conjugation rule and then applied it to produce the correct form. Figure 18 shows the cognitive map of student 5 in this episode.

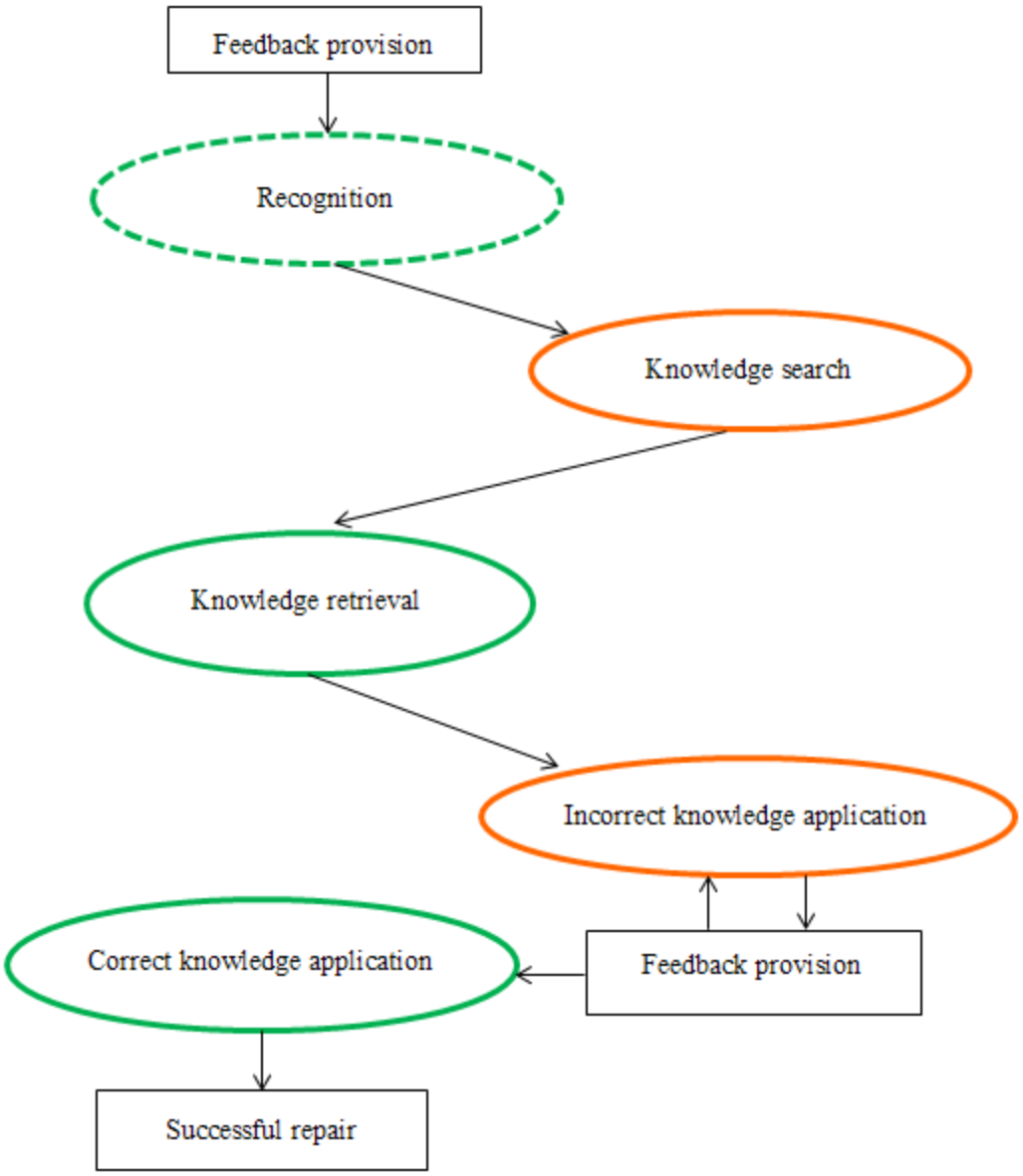

Figure 18. A cognitive map involving student 5.

The first cognitive process is recognition. This cognitive process is presented in an oval with a dotted line since it was not stated in the verbal report. Although it is not explicit, it is clear that she was aware of the problem, since she produced the modified output in relation to a polite past adjective after receiving a clarification request. Then, she searched her knowledge. After that, she retrieved an incorrect conjugation rule and applied the incorrect knowledge. Then, she

received another instance of feedback. This part was cyclic, and she applied incorrect rules and received feedback three times. After receiving a metalinguistic feedback, she applied the correct knowledge and produced the correct form.

The cognitive map of student 5 is different from the other cognitive maps presented earlier in this section. The first map has no additional processes and the previous cognitive map has only one additional process while this map has two. These differences indicate that there are individual variations regarding the sequence of cognitive processes. It also shows that some students skip additional processes while other students engage in more additional processes during self-repair.

4.3.2. The recast group

4.3.2.1. Codes and categories

There were only 23 verbal reports describing the learners' cognitive processes triggered by recasts in this study. This number of reports is small, considering the fact that there were 51 corrective feedback episodes in the recasts group. There were many reports describing the learners' cognitive processes during initial utterance production rather than after receiving recasts. This issue will be discussed in more detail in the next chapter.

Six codes were identified from verbal reports in the recast group. The code names, their descriptions, and sample segments of the participants' verbal reports are presented in Table 15. After the codes were obtained, they were grouped into four categories: recognition of problem, recognition of recasts as corrective feedback, recognition of recasts as correct utterance, and awareness of correct conjugation rule. Codes that belong to a specific category and shared characteristics are presented in Table 16.

Table 15

Code Names, Descriptions, and Sample Segments of Participants' Verbal Reports in the Recast Group

Code name	**Description**	**Sample segments of verbal reports**	**Number of segments**
1. Recognition that error occurred	Participants acknowledge that an error occurred, but do not refer to the kind of error that occurred.	• Student 38, Recall Session1 "…I realized that I was wrong…"	1
2. Recognition of problem	Participants acknowledge the kind of error that occurred in their previous utterance.	• Student 38, Recall Session 1 "…I just forgot that it's *deshita*." • Student 22, Recall Session 2 "…I forgot to take off the *i*."	7
3. Recognition of recasts as corrective feedback	Participants acknowledge that a recast was provided as corrective feedback.	• Student 25, Recall Session 1 "…when I heard the correction…" • Student 39, Recall Session 1 "When I heard what you said, um, I assumed it was to correct me…"	6

Code name	Description	Sample segments of verbal reports	Number of segments
4. Recognition of recasts as correct utterance	Participants acknowledge that a recast was provided as a correct form.	• Student 16, Recall Session 1 "I got the correct answer."	5
5. Awareness of correct conjugation rule	Participants refer to the correct conjugation rule of polite past adjectives.	• Student 22, Recall Session 1 "Oh, right, I have to use *kattadesu* instead of, um, *deshita*." • Participant 39, Recall Session 1 "…and then you reminded me, that was the na-adjective, *deshita*."	2
6. Recall of correct conjugation rule	Participants recall the correct conjugation rule of polite past adjectives.	• Student 25, Recall Session 1 "I remembered that i-adjective, you have to change to *katta* at the end." • Student 25, Recall Session 1 "…then I remembered, oh, I have to omit *na* and continue with *deshita*, yeah."	2

Table 16

Codes Belonging to the Same Category and Their Shared Characteristics

Category	Codes	Shared characteristics
Recognition of problem	• Recognition that error occurred • Recognition of problem	They are related to the recognition of the problem in participants' erroneous utterance
Recognition of recasts as corrective feedback	• Recognition of recasts as corrective feedback	
Recognition of recasts as correct utterance	• Recognition of recasts as correct utterance	
Awareness of correct conjugation rule	• Awareness of correct conjugation rule • Recall of correct conjugation rule	They are related to the recognition of correct conjugation rule

4.3.2.2. Group cognitive map

Figure 19 presents a cognitive map of the recast group. It is collective and represents cognitive processes reported by a group of participants. As mentioned earlier, the number of verbal reports in the recast group was relatively small. Thus, this map represents cognitive processes of participants who produced relevant verbal reports.

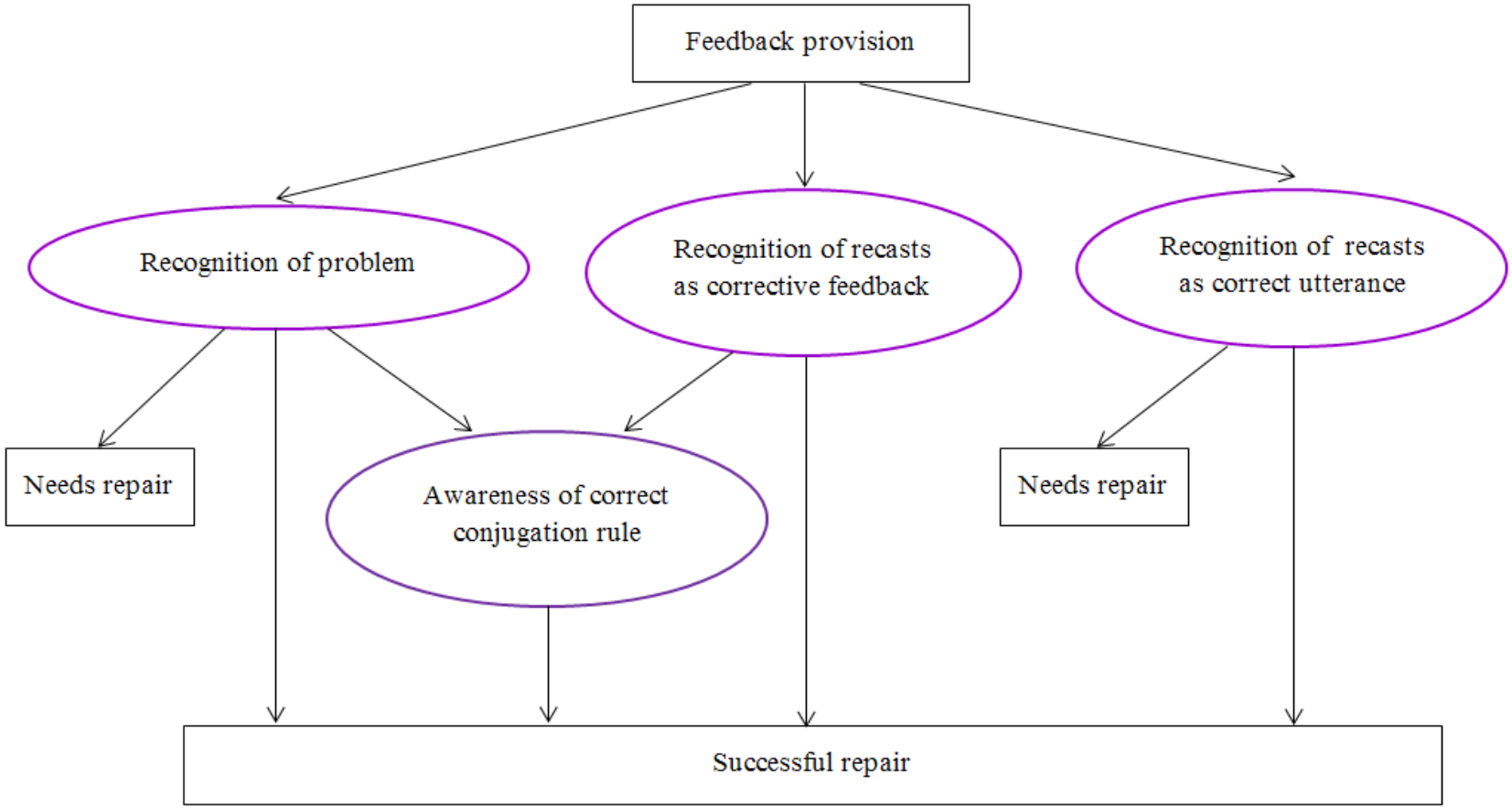

Figure 19. A cognitive map of the recast group.

All cognitive processes are presented in the purple ovals. After receiving a recast, learners reported one of three cognitive processes: recognition of problem, recognition of recasts as corrective feedback, or recognition of recasts as the correct utterance. After recognizing the problem, the learners produced successful repair/needs repair or became aware of the correct conjugation rule. Following awareness of correct conjugation rule, learners produced a successful repair.

After recognizing recasts as corrective feedback, the learners produced a successful repair or became aware of the correct conjugation rule. When they became aware of the correct conjugation rule, they produced a successful repair. After recognizing recasts as correct utterance, the learners produced a needs repair or successful repair.

4.3.2.3. Individual cognitive maps

Each individual cognitive map presented in this section represents a series of cognitive processes reported by a participant. In this section, cognitive maps of three participants are reported. These participants were chosen because they reported their cognitive processes triggered by recasts and their verbal reports were more complete than those of other participants'.

Student 16.

The following is an example of a corrective feedback episode involving student 16.

Example 33 (Student 16, Treatment Session 1)

S: **Aa, Shimizu-san wa genkikattadesu.* (Error)

Uh, Shimizu-san was energetic/healthy.

R:	*Genkideshita.*	**(Recast)**
	Was energetic.	
S:	*Genkideshita.*	(Successful repair)
	Was energetic.	

In the first line, the student used an erroneous form. After receiving a recast, she produced a successful repair. The following is an excerpt from her verbal report.

> Yeah, I got the correct answer [recognition of recasts as correct utterance].

The student was aware that she received the correct utterance from the researcher. Figure 20 is the cognitive map of student 16. After receiving a recast, she recognized the recast as a correct utterance.

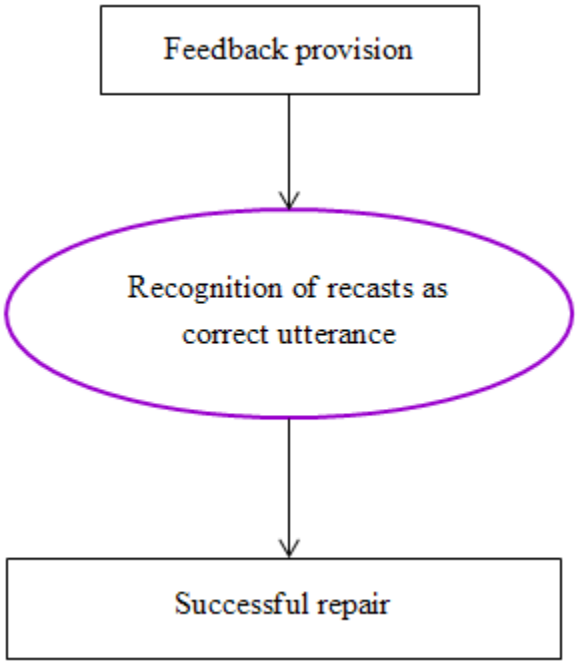

Figure 20. A cognitive map involving student 16.

Student 22.

What follows is the transcript of a corrective feedback episode of student 22.

Example 34 (Student 22, Treatment Session 2)

S:	**Aa, omoshiroikattadesu.*	(Error)
	Uh, was interesting.	
R:	*Omoshirokattadesu.*	**(Recast)**
	Was interesting.	
S:	Oh, *omoshirokattadesu.*	(Successful repair)
	Was interesting.	

In the first line, the student produced a non-target-like form. After receiving a recast, he produced a successful repair. The following is the transcript of his verbal report about this episode.

Um…I think, all right, I forgot to take off the "i" [recognition of problem].

The student became aware of the kind of problem he had in the previous utterance. Figure 21 is the cognitive map of student 22.

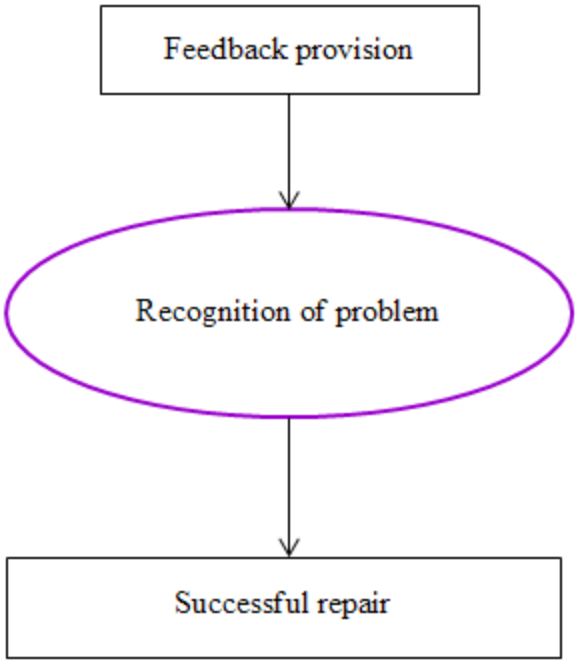

Figure 21. A cognitive map involving student 22.

After receiving a recast, the student recognized the problem. Then, he produced a successful repair. The cognitive map of student 22 is different from student16's. In student 22's map, recognition of problem occurred after receiving a recast whereas recognition of recasts as correct utterance occurred in student 16's map. This difference suggests that a cognitive process triggered by a recast differs depending upon the individual.

Student 25.

The following is the transcript of a corrective feedback episode involving student 25.

Example 35, Student 25, Treatment Session 1

S: **Ee, tenisu wa tanoshiideshita.* (Error)

	Um, tennis was fun.	
R:	*Tanoshikattadesu.*	**(Recast)**
	Was fun.	
S:	*A, tanoshikattadesu.*	(Successful repair)
	Oh, was fun.	

In the first line, the student produced an erroneous utterance. After receiving a recast, she produced a successful repair. The following is her verbal report of this episode:

> …um, when I heard the correction [recognition of recasts as corrective feedback], I was like oh, yeah, I, remembered that i-adjective, you have to change to "*katta*" at the end [recall of correct conjugation rule].

The student was aware that the recast was a correction. Then, she recalled the correct conjugation rule. Figure 22 shows the cognitive map of student 25.

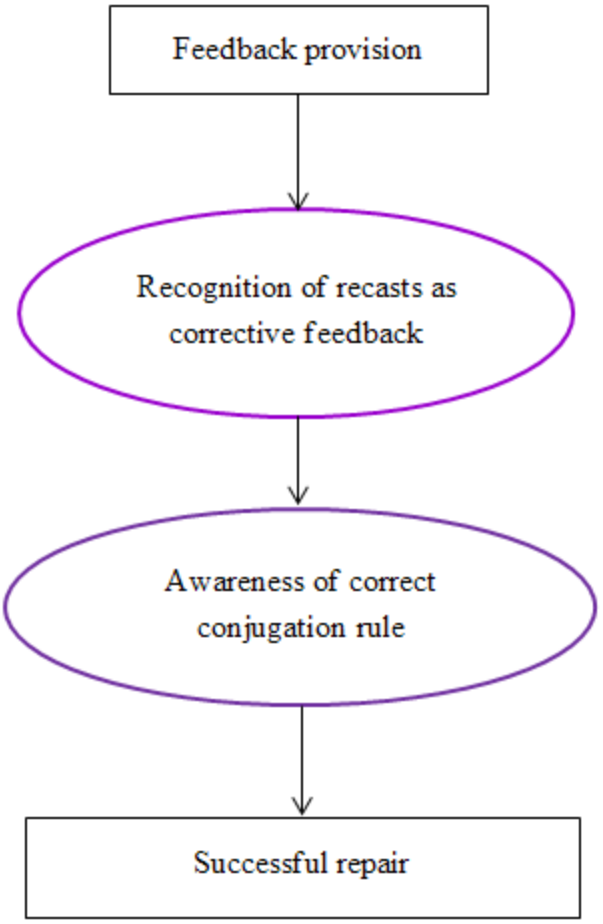

Figure 22. A cognitive map involving student 25.

After receiving a recast, she recognized it as a correction and then became aware of the correct conjugation rule. The cognitive map of student 25 is different from the other two cognitive maps presented earlier in this section. Those maps have only one cognitive process while the student 25's map has two. These differences indicate that there are individual variations regarding cognitive processes triggered by recasts.

4.4. Research Question 2

Research question 2 asks what the relationships are (if any) between these different types of cognitive processes and the outcomes of second language learning. To answer this research

question, the number of reports under the same category in the High group and the Low group[18] was counted. Although it would be ideal to run inferential statistics to examine whether the frequency of reports is different across groups, it was not possible to do so because of the small number of reports. Hence, the investigator compared frequencies in each group and analyzed whether these frequencies were similar or different across groups using the following criteria. When the number of reports in one group was more than double that of the other group, the frequency was determined to be different. For instance, if the number of reports in the High group was 3 and the number of reports in the Low group was 11, the frequency was determined to be different (the number of reports in the Low group was more than double that of the High group). When the number of reports in one group was less than double that of the other group, the frequency of reports was determined to be similar. For example, if the number of reports in the High group was 4 and the number of reports in the Low group was 6, the frequency of reports was similar (the number of reports in the Low group was less than double of reports in the High group). The following section will first report the results of the analysis of the frequency of reports in the prompt group, and then it will report the results in the recast group.

4.4.1. The prompt group

4.4.1.1. Immediate post-test

The total number of reports in the High group was 22 and the total number of reports in the Low group was 43. The summary of the frequency of reports in relation to the immediate post-test scores is shown in Table 17.

[18] The High and the Low groups were created based on the immediate post-test and the delayed post-test scores. As for the immediate post-test of the prompt group, those above midpoint were assigned to the High group, while those below midpoint were assigned to the Low group. The same procedure was taken for delayed post-test. The students in the recast group were also assigned to subgroups using the same procedure.

Table 17

Number of Reports by Subgroups with High and Low Immediate Post-test Scores (Prompts)

Category	**Number of reports**			**Frequency of reports in High/Low group**
1. Recognition	H	L	Total	Similar
	9	11	20	
2. No recognition	0	7	7	Different → associated more with Low group
3. Knowledge search	3	11	14	Different → associated more with Low group
4. Knowledge retrieval	5	3	8	Similar
5. No knowledge retrieval	1	6	7	Different → associated more with Low group
6. Incorrect knowledge application	1	3	4	Different → associated more with Low group
7. Correct knowledge application	3	2	5	Similar
Total	22	43	65	

Note. H = High group (n = 7), L = Low group (n = 7)

In three categories (recognition, knowledge retrieval, and correct knowledge application), the frequency of reports was similar across groups. The findings suggest that these categories are associated with both High and Low groups to the same degree. In four categories (no recognition, knowledge search, no knowledge retrieval, and incorrect knowledge application), the frequency of reports was different across groups, and they are thus associated more with the Low group.

After these results were obtained, further analyses were conducted to examine the characteristics of the students in the Low group (the Low group consisted of students below the mid-point in relation to the immediate post-test scores). The analyses revealed that the students in the Low group also had lower scores in the pre-test. The pre-test mean score of the Low group (M = 3.86) was lower than the pre-test mean score of the High group (M = 8.57). Those who experienced additional processes were less ready to master the target structure at the point of the pre-test.

The analyses also revealed that the students in the Low group received more corrective feedback than students in the High group during the first treatment session. In addition, students in the Low group received corrective feedback with greater informativeness in order to produce a successful repair. "Informativeness" is defined as "how much information is provided about the blame of the ungrammaticality" (Ortega, 2009, p. 75).[19] The four types of corrective feedback used in this study have different degrees of informativeness. Clarification requests are least informative, since they merely indicate to learners that their previous utterance was not well understood or was problematic. Repetitions provide more information by repeating the erroneous form produced by a student. Elicitations used in this study (e.g., *Akaru*_____.) are more informative, since they help a student to find the exact problematic part in the erroneous

[19] While informativeness is related to the information about the problem in the learner's utterance, the explicitness is about the indication of corrective intent of the corrective feedback (Ortega, 2009, p.75).

form. Metalinguistic feedback is the most informative because it provides information about correct conjugation rules. Figure 23 graphically presents the informativeness of corrective feedback techniques used in this study. Table 18 presents the amount of corrective feedback techniques (clarification requests, elicitations, repetitions, and metalinguistic feedback) and the type of corrective feedback that a student received during the first treatment session.

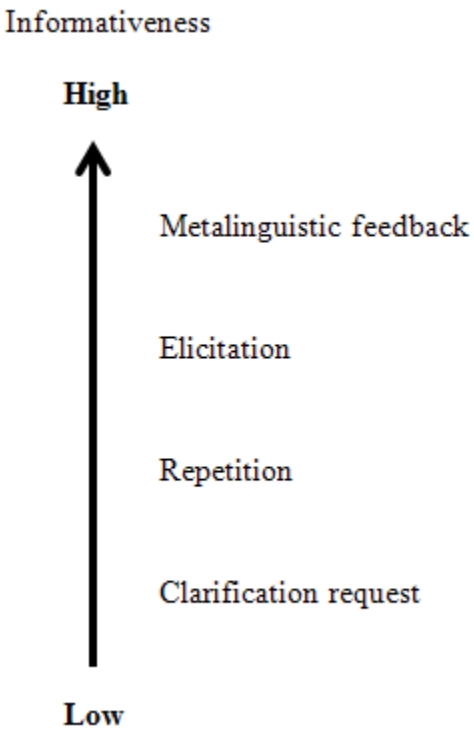

Figure 23. Informativeness of corrective feedback techniques in the form of prompts.

Table 18

The amount and the type of corrective feedback provided during the first treatment session

	Amount of CF types	Types of CF
The High group in the immediate post-test scores		
S 14	1	CR
S 10	3	CR, Rep, Eli
S 15	1	CR
S 40	1	CR
S 18	8	CR, Rep
S 28	2	CR
S 1	3	CR, Rep, Eli
The Low group in the immediate-post test scores		
S 4	9	CR, Rep, Eli, MF
S 36	6	CR, Rep, Eli, MF
S 5	7	CR, Rep, Eli, MF
S 35	11	CR, Rep, Eli
S 11	8	CR, Rep, Eli, MF
S 17	9	CR, Rep, Eli
S 20	8	CR, Rep, Eli, MF

CR = Clarification request, Rep = Repetition, Eli = Elicitation, MF = Metalinguistic feedback

The students in the Low group received many more instances of corrective feedback (M = 8.28) than the students in the High group (M = 2.21). All the students in the Low group received corrective feedback at least six times, but only one student (14%) in the High group received

corrective feedback more than six times. The other six students (85.7%) in the High group received corrective feedback less than three times. As for the types of corrective feedback technique, five out of seven students (71%) in the Low group received metalinguistic feedback to produce a successful repair. Two students (26%) in the Low group received clarification requests, repetitions and elicitations. In contrast, no students in the High group received metalinguistic feedback to produce a successful repair. Four students (57%) in the High group received only clarification requests to self-repair. One student (14%) received clarification requests and repetitions. Two students (26%) were provided with clarification requests, repetitions and elicitations. These findings suggest that the amount and the quality of corrective feedback that the students in each group received were different. The students in the Low group received greater amount of corrective feedback, and they needed corrective feedback that provided additional information to help them self-repair.

4.4.1.2. Delayed post-test

The total number of reports in the High group was 28, and the total number of reports in the Low group was 37. The summary of the number of reports in relation to the delayed post-test scores is shown in Table 19.

Table 19

Number of Reports by Subgroups with High and Low Delayed Post-test Scores (Prompts)

Category	Number of reports			Frequency of reports in High/Low group
1. Recognition	**H**	**L**	**Total**	Similar
	11	9	20	
2. No recognition	3	4	7	Similar
3. Knowledge search	2	12	14	Different → associated more with Low group
4. Knowledge retrieval	4	4	8	Similar
5. No knowledge retrieval	3	4	7	Similar
6. Incorrect knowledge application	3	1	4	Different → associated more with High group
7. Correct knowledge application	2	3	5	Similar
Total	28	37	65	

Note. H = High group (n = 7), L = Low group (n = 7)

In five categories (recognition, no recognition, knowledge retrieval, no knowledge retrieval, and correct knowledge application), the frequency of reports was similar across groups, suggesting that those categories are associated with both High and Low groups to the same degree. In two categories (knowledge search and incorrect knowledge application), the frequency of reports was different. Knowledge search was associated more with the Low group and incorrect knowledge application was associated more with the High group.

In relation to the association between a category and a High/Low group, there were some differences between the immediate post-test and the delayed post-test. Two categories (no recognition and no knowledge retrieval) were associated more with the Low group in immediate post-test scores, but they were associated with both the Low and High groups to the same degree in delayed post-test scores. Incorrect knowledge application was associated more with the Low group in immediate post-test scores, but it was associated more with the High group in delayed post-test scores. These changes may be attributable to the presence of some learners who reported these cognitive processes and improved their test scores between the immediate and delayed post-tests (they were in the Low group at the time of the immediate post-test, but they progressed to the High group in the delayed post-test). This may suggest that the benefits gained from engaging in additional cognitive processes take some time to take effect, but have more enduring effects with some learners.

Overall, four categories (no recognition, knowledge search, no knowledge retrieval, and incorrect knowledge application) were associated more with the Low group in either the immediate post-test scores or the delayed post-test scores, which suggests that these four categories occurred more often with learners who had a less successful outcome in second language learning.

4.4.2. The recast group

As discussed earlier, the total number of verbal reports in the recast group was only 23. Since the number of reports was relatively small, the results of the frequency counts in the High and the Low groups need to be interpreted with caution.

4.4.2.1. Immediate post-test

The total number of reports in the High group was eight and in the Low group was 15. The summary of the frequency of reports in each group is shown in Table 20.

Table 20

Number of Reports by Subgroups with High and Low Immediate Post-test Scores (Recasts)

Category	**Number of reports**			**Frequency of reports in High/Low group**
1. Recognition of problem	H	L	Total	Similar
	5	3	8	
2. Recognition of recasts as corrective feedback	0	6	6	Different → associated more with Low group
3. Recognition of recasts as correct utterance	2	3	5	Similar
4. Awareness of correct conjugation rule	1	3	4	Different →associated more with Low group
Total	8	15	23	

Note. H = High group (*n* = 7), L = Low group (*n* = 7)

In two categories (recognition of problem and recognition of recasts as correct utterance), the frequency of reports was similar across groups. These categories were associated with both the High and the Low groups to the same degree. In the other two categories (recognition of recasts as corrective feedback and awareness of correct conjugation rule), the frequency of reports was different, and both of them were associated more with the Low group.

4.4.2.2. Delayed post-test

The total number of reports in the High group was eight, and it was 15 in the Low group. The summary of the frequency of reports in each group is shown in Table 21.

Table 21

Number of Reports by Subgroups with High and Low Delayed Post-test Scores (Recasts)

Category	**Number of reports**			**Frequency of reports in High/Low group**
1. Recognition of problem	H	L	Total	
	3	5	8	Similar
2. Recognition of recasts as corrective feedback	0	6	6	Different → associated more with Low group
3. Recognition of recasts as correct utterance	2	3	5	Similar
4. Awareness of correct conjugation rule	1	3	4	Different → associated more with Low group
Total	8	15	23	

Note. H = High group (*n* = 7), L = Low group (*n* = 7)

In two categories (recognition of problem and recognition of recasts as correct utterance), the frequency of reports was similar across groups. They were associated with both the High and the Low groups to the same degree. In the other two categories (recognition of recasts as corrective feedback and awareness of correct conjugation rule), the frequency of reports was different. These categories were associated more with the Low group.

The frequency patterns were the same between the delayed post-test and the immediate post-test. The results indicate that two categories of cognitive processes (recognition of recasts as corrective feedback and awareness of correct conjugation rule) are associated more with the less successful outcomes of second language learning. However, the results are not conclusive because of the limited number of verbal reports in the recast group.

4.5. Summary

This chapter has reported the interaction data from corrective feedback episodes, the results of statistical analyses of test scores, and the results that provide answers to research questions 1 and 2. As for the statistical analyses of the immediate post-test scores, the results show that the prompt group significantly outperformed the other two groups. The descriptive results also show gains in scores of the recast group, but there were no significant differences between the recast group and the control group. There were no significant differences across groups in relation to delayed post-test scores.

In regard to research question 1, the results of the prompt group show that there are three essential categories of cognitive processes that occur as a learner self-repairs and four additional categories that occur for some learners. The analyses also show that there are considerable individual variations in the sequence of cognitive processes after receiving prompts. As for

recasts, four categories of cognitive processes were observed. Individual differences in relation to the cognitive processes triggered by recasts were found.

With respect to research question 2, the results of the prompt group show that three categories (recognition, knowledge retrieval, and correct knowledge application) were associated with both the High and the Low groups to the same degree, while four categories (no recognition, knowledge search, no knowledge retrieval, and incorrect knowledge application) were associated more with the Low group in immediate post-test scores. The results suggest that these four categories are related to the learners who had less successful outcomes.

The results also show that five categories (recognition, no recognition, knowledge retrieval, no knowledge retrieval, and correct knowledge application) were associated with both the High and the Low groups to the same degree in delayed post-test scores. Knowledge search was associated more with the Low group, and incorrect knowledge application was associated more with the High group. The different frequency patterns that emerged in reports for the immediate and delayed poste-tests may indicate that, for those who experienced additional processes, prompts took time to be effective, but the effectiveness lasted longer.

As for recasts, two categories (recognition of problem and recognition of recasts as correct utterance) were associated with both the High and the Low groups to the same degree, while the other two categories (recognition of recasts as corrective feedback and awareness of correct conjugation rule) were associated more with the Low group in the immediate post-test scores. This pattern was same for the delayed post-test. Although the results indicate that learners who reported recognizing recasts as corrective feedback and recognizing correct conjugation rules did not necessarily improve their learning outcomes, they are not conclusive because of the limited number of verbal reports in the recast group.

Chapter 5: Discussion and Conclusion

5.1. Discussion

This chapter will discuss the results of the study and address pedagogical implications and future studies. First, it will provide explanations for the high uptake rates of prompts and recasts during treatment sessions. Then, it will discuss the results of the statistical analyses regarding the effectiveness of recasts and prompts as well as the findings answering research questions 1 and 2. The chapter will then address the significance and limitations of the study. The chapter will make some suggestions about future studies and pedagogical implications; the conclusion will follow.

5.1.1. Learners' uptake in corrective feedback episodes

In this study, uptake rates were very high in both the prompt group and the recast group. With respect to the prompt group, the students always responded to the researchers' prompts and the uptake rate was 100%. The students engaged in dyadic interaction with a researcher in a lab setting in this study. Because prompts impel learners to produce modified output, it becomes apparent to learners that they are expected to self-repair in a context of dyadic interaction. This may have helped learners to respond to prompts.

In regard to the recast group, the uptake rate was 98%. This high uptake rate may be attributed to three factors. First, this study was conducted in a lab setting in which individual students interacted with a researcher. This interaction helped the students to be sensitive to the researchers' reactions. When a researcher provided a recast, it was easier than in classroom settings for the students to recognize that the recast was provided as a response to their erroneous utterance.

Second, the focus of the interaction was more form-oriented than meaning-oriented in this study, and this helped the students to respond to recasts. It has been suggested that the uptake rate of recasts is influenced by the focus of the task (form-oriented or meaning-oriented) (Egi, 2007a). If the task is form-oriented, learners tend to produce uptake after recasts. If the task is meaning-oriented, there is less uptake following recasts (Ellis & Sheen, 2006; Nicholas et al., 2001; Sheen, 2004). In the current study, the students engaged in a one-way information gap task to describe a picture, whereas it has been suggested that one-way tasks produce less negotiation of meaning than two-way tasks (Mackey, 2012; Pica & Doughty, 1985). Because the students had complete information about the picture, there were not many opportunities for negotiation of meaning between student and researcher. These limited opportunities for negotiation of meaning may have led students to focus on the accuracy of their utterance. This form-oriented interaction made the students pay extra attention to the researchers' recast.

Third, the intensive provision of recasts may have helped students to respond to recasts. Researchers (Ellis, 2010; Han, 2002; Sheen, 2007) suggest that recasts are more facilitative when they intensively target a single linguistic feature. In the current study, the researchers provided recasts every time a participant produced an erroneous form of the polite past adjective. This consistent and intensive provision of recasts made it clear to the students that recasts were a reaction to their erroneous utterance rather than to other aspects of the interaction.

Ellis and Sheen (2006) suggest that the illocutionary force of recasts as correction becomes quite transparent under certain circumstances. The recasts used in the current study were short and involved only one reformulation, which is characteristic of recasts that are more salient to learners (Egi, 2010; Loewen & Philp, 2006; Sheen, 2010). In addition, intensive

provision of recasts in a laboratory setting, which creates a form-focused interaction, made recasts more salient, resulting in a high uptake rate of recasts.

5.1.2. Effectiveness of oral corrective feedback

With respect to the immediate post-test, the prompt group significantly outperformed the recast group as well as the control group. This suggests that prompts were effective in the acquisition of Japanese polite past adjectives in the short term, thus supporting the effectiveness of prompts reported in previous studies (Ammar, 2008; Ammar & Spada, 2006; Lyster, 2004; Yang & Lyster, 2010). Although this study provides some evidence for the effectiveness of prompts, it is necessary to take the amount of corrective feedback provided in the prompt group into consideration. In this study, the prompt group received multiple prompts consisting of four types of corrective feedback techniques. The prompt group received 121 corrective feedback techniques in 67 corrective feedback episodes while the recast group received 55 recasts in 52 corrective feedback episodes. Receiving a larger amount of corrective feedback is likely to have contributed to the superior performance of the prompt group. However, the primary purpose of the present study, as made apparent in its two research questions, was not to assess the effectiveness of different types of corrective feedback but rather to identify different cognitive processes triggered by different types of corrective feedback and the relationship between these processes and learning outcomes.

Whereas the prompt group significantly outperformed the recast and the control groups, there was no significant difference between the recast group and the control group. This result was unexpected since the effectiveness of recasts had been reported in previous studies (Han, 2002; Mackey & Philp, 1998). The descriptive statistics show that the recast group's mean score

increased considerably from the pre-test (M = 11) to the immediate post-test (M = 20.79), but so did the control group's (from 10.45 to 20.18). There are two factors that may explain why the control group's score improved in the immediate post-test. First, engaging in the task during treatment sessions may have helped the participants to raise their awareness of the target structure. Participants were expected to describe pictures using the polite past during the treatment sessions; thus, the participants figured out that the study was about the polite form of the past tense. All the participants were taking a Japanese language class at the time of data collection, and it is perhaps possible that the participants had been exposed to polite past adjectives in class. Participants in the control group benefitted from working on the task, thus improving their ability to produce polite past adjectives without receiving corrective feedback.

Second, it is possible that engaging in stimulated recall also helped the participants to acquire polite past adjectives. Swain (2006) claims that stimulated recalls involve "a process of comprehending and reshaping—they are part of what constitutes development and learning" (p. 110). This claim is supported by the findings of Nabei's (2002) EFL classroom study in which she separated the effects of recasts from those of stimulated recall. She reported that the average correct score in a post-test was higher on items with stimulated recall than on items without stimulated recall. Nabei and Swain (2010) suggest that verbalization of thoughts about language use plays a facilitative role in second language learning. In the current study, because stimulated recall sessions were conducted before the post-tests, it is possible that stimulated recall helped the participants to acquire polite past adjectives and resulted in the good performance of the control group.

In regard to the delayed post-test, there were no significant differences across groups. There have been studies that reported the effectiveness of prompts for both the short-term and

the long-term on the acquisition of certain linguistic targets (Ammar & Spada, 2006; Yang & Lyster, 2010). However, the results of the current study did not provide evidence that shows long-term effects of prompts on the acquisition of polite past adjectives. The descriptive statistics show that all the groups (prompts, recasts, and control) increased their scores from the pre-test (M = 6.21, M = 11, M = 10.45, respectively) to the delayed post-test (M = 21.86, M = 21.07, M = 21, respectively). The prompt group increased their mean score the most (15.65 points), followed by the control group (10.45 points) and the recast group (10.07 points). However, the differences were not significant. The two factors discussed above (the effects of the task and stimulated recall) may also have affected the performance on the delayed post-test.

5.1.3. Research question 1

5.1.3.1. Prompts

Research question 1 asked what kinds of cognitive processes are triggered by different types of oral corrective feedback (recasts and prompts). For prompts, 17 codes were identified and seven categories of cognitive processes were found. Three categories (recognition, knowledge retrieval, and correct knowledge application) are essential processes which occur as a learner self-repairs, whereas four categories (no recognition, knowledge search, no knowledge retrieval, and incorrect knowledge application) are additional processes skipped by some learners. The results provide evidence of cognitive processes that occur after prompts are provided.

The cognitive processes observed in this study are similar to the findings of Swain and Lapkin's (1995) study. They analyzed strategies used by learners to solve language problems and reported that learners used the following strategies: noticing, applying existing knowledge, generating and testing hypothesis, and applying new knowledge. The participants in both Swain

and Lapkin's study and the current study worked on solving language problems to produce a target-like utterance. According to Swain (1995, 2005), processes involved in producing pushed output are part of second language learning. The cognitive processes observed in this study are considered to mediate prompts and second language development.

Recognition observed in this study shows that learners realize that their previous utterance is problematic, or they recognize the problem in their previous utterance after receiving prompts. This indicates that prompts provide negative evidence to learners. This finding lends empirical support to the claim that prompts provide negative evidence beneficial in second language learning (Lyster et al., 2013).

Knowledge retrieval and correct knowledge application show that learners actively seek internal resources necessary for self-repair and apply it to produce an utterance. According to Lyster and Izquierdo (2009), prompts allow processing that entails both retrieval and production mechanisms, and the findings of this study provide evidence for this claim. Cognitive processes involved in producing pushed modified output will be discussed later in this section.

The above discussion referred to essential processes observed in this study. While the essential processes lead to successful repair, the additional processes are usually followed by a needs repair and they are extra steps to produce a correct form. A question raised here is whether or not these additional processes are also part of second language learning. Gass (2015) suggests that the mere fact of modifying one's output, regardless of outcome, plays a significant role in learning. The following example shows how additional processes can be part of the learning process.

Example 36 (Participant 14, Treatment Session 2)

S:	**Tomodachino apaato wa semaideshita.*	(Error)
	Friend's apartment was cramped.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	**Aa, semaideshita.*	(Needs repair)
	Um…was cramped.	
R:	**Semaideshita?*	**(Repetition)**
	Was cramped?	
S:	*Semakatt(a)…a, semakattadesu.*	(Successful repair)
	(Was) cramped…ah, was cramped.	

Verbal report of student 14, Recall Session 2

> I thought, uh, I was confused, if it was, um, uh, if it was na-adjective or i-adjective, so I thought it was na-adjective, so I did the conjugation for that [application of incorrect conjugation rule], yeah. So, I realized that it is i-adjective [retrieval of adjective type], so I changed, like, the conjugation [application of correct conjugation rule].

The student's verbal report shows that she first applied the conjugation rule for na-adjective, which was incorrect. Then, she received additional feedback. The repetition of her error made her realize that her previous hypothesis was wrong and pushed her to retrieve the correct knowledge and to apply it. What happened in this episode is that an additional process, incorrect knowledge application, was a precursor of the essential processes knowledge retrieval and

correct knowledge application. As Gass (2015) posits, “it is through the cycle of utterance, feedback, noticing of feedback, and modification that learning takes place” (p. 185). This cycle can be repeated until a learner produces a successful repair. Additional processes may be part of these repeated cycles, which eventually lead to production of successful repair and the restructuring of second language knowledge.

On the basis of the processes observed in this study, the internal mechanism in which prompts facilitate second language learning is described as follows. Prompts first made learners recognize that their utterance was problematic by providing negative evidence. Then, prompts pushed learners to identify the source of problem in their utterance and to explore their internal resources for possible solutions. Once the knowledge necessary for self-repair was retrieved, learners produced modified output by applying the knowledge they had retrieved. These processes occurred after receiving a single prompt or multiple prompts, leading to a restructuring of their second language knowledge.

The findings of the current study also reveal that cognitive processes triggered by prompts differ depending on the individual. For instance, some learners experienced essential processes and produced successful repair after receiving a clarification request while some learners experienced additional processes and produced an utterance still in need of repair. Individual variations in cognitive processes have not received attention in previous corrective feedback studies using the introspective method (Ammar & Kartchava, 2014; Egi, 2010). The current study points out the importance of taking individual variations into consideration in the analyses of cognitive processes triggered by oral corrective feedback.

In addition to individual variations in cognitive processes, the analyses also indicate the possibility that individual cognitive processes change over time. The analyses show that some

learners experience more additional processes at the beginning of the treatment, but these additional processes decrease as they complete more tasks. The following example shows the change of the cognitive processes involving student 4.

Example 37 (Student 4, Treatment Session 1)

S:	**Tomodachino apaato wa akaruideshita.*	(Error)
	Friend's apartment was bright.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	**Akaruideshita?*	(Needs repair)
	Was bright?	
R:	**Akaruideshita?*	**(Repetition)**
	Was bright?	
S:	**Aka ruku datta? Etto, uh…*	(Needs repair)
	Was bright? Well, uh…	
R:	*Akaru*_____.	**(Elicitation)**
	(was) ____ bright.	
S:	**Akaruidatta?*	(Needs repair)
	Was bright?	
R:	*Akarui* is *i*-adjective, so you need to drop	**(Metalinguistic feedback)**
	i and you need to add *kattadesu*.	
S:	*Akaru kattadesu*.	(Successful repair)
	Was bright.	

Verbal report of student 4, Recall Session 1

> I said "*akaruideshita*", right? Yeah, because I guess, I thought it's just with the same form with other, like the na-adjectives [application of incorrect conjugation rule], and, yeah, because at first, if I was not thinking, I can just say it out, but if I started to think about it, then, I don't really remember that well [no recall of conjugation rule], so if I don't think about it, maybe I can just say it, but if I started thinking about, then I get mixed up [confusion about conjugation rule].

This corrective feedback episode occurred when the student was describing the third picture during the first treatment session. She needed all four types of corrective feedback techniques before she was able to produce a successful repair, and she experienced three additional processes in this episode.

The following illustrates this same student's corrective feedback episode when she was describing the eleventh picture in the same treatment session.

Example 38 (Student 4, Treatment Session 1)

S:	**Tomodachino ie wa semaideshita.*	(Error)
	Friend's house was cramped.	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	*Semakatttadesu.*	(Successful repair)
	Was cramped.	

Student 4's verbal report, Recall Session 1

> At this point, I started to actually remember what they are, once I said "*semaideshita*" I know that it's wrong [recognition of problem], and I remember the correct one should be "*semakattadesu*" [retrieval of correct conjugation rule].

In this corrective feedback episode, she received only a clarification request. Essential processes occurred after receiving a clarification request, and she produced a successful repair. Additional processes did not occur in this episode, thus showing a change in student 4's previous cognitive processes that had involved additional processes.

The examples discussed above indicate the likelihood that additional processes decrease as learners engage in more tasks. However, there were not enough data to support this claim. Student 4's verbal reports are the only data which clearly indicate that additional processes decrease. More data are needed to make the claim that individual cognitive processes change as they complete further tasks.

The cognitive processes discussed so far were about learners' thought processes to produce modified output. The students in the current study reported their cognitive processes involved in producing modified output, but they rarely mentioned perception of prompts. Even when they mentioned prompts in their verbal report, the mention was very vague. The following example illustrates a corrective feedback episode involving student 17, who refers, in his verbal report, to a repetition provided by the researcher.

Example 39 (Student 17, Treatment Session 1)

S:	**Isogashiideshita.*	(Error)
	Was busy.	
R:	*Moo ichido ittekudasai.*	(**Clarification request**)
	Please say it again.	
S:	**Isogashiideshita?*	(Needs repair unmodified)
	Was busy?	
R:	**Isogashiideshita?*	(**Repetition**)
	Was busy?	
S:	*Isogashii, oh, isogashikattadesu*	**(Successful repair)**
	Busy, oh, was busy.	

Student 17's verbal report, Recall Session 1

> I was searching, <u>because you questioned me</u>, so, yeah, I was searching, which one is it [search for adjective type].

The underlined part in the verbal report is the student's reference to a prompt. In this corrective feedback episode, the student received a clarification request and a repetition. It is likely that the student's reference was about the repetition, because a repetition was provided with rising intonation and the student said "you questioned me." The student was aware that a researcher was prompting him to self-repair, but may not have paid attention to what the researcher actually said. The students in the prompt group may have been aware that a researcher was pushing them

to produce modified output, but they may not have paid attention to prompts per se, and they did not report their perceptions about prompts.

5.1.3.2. Recasts

Before discussing the cognitive processes triggered by recasts, it is necessary to explain why the number of verbal reports was so small in this study. During the stimulated recall session, the video recording was stopped after the students received a recast in a treatment session. The students were then asked to describe what they were thinking at that moment. Although it was expected that the students would report their cognitive processes after receiving a recast, they actually reported their cognitive processes during the initial utterance production, which took place before they received a recast. The example below illustrates how student 2 reported his cognitive processes during the initial utterance production.

Example 40 (Participant 2, Treatment Session 1)

S:	**Dauntaun wa, shizuka…shizukana… shizukanadeshita.*	(Error)
	Downtown, quiet…quiet…was quiet.	
R:	*Shizukadeshita.*	**(Recast)**
	Was quiet.	
S:	**Syuzukadeshita.*	(Needs repair)
	Was quiet.	
R:	*Shizukadeshita.*	**(Recast)**
	Was quiet.	

Excerpt of student 2's verbal report, Recall Session 1

> Yeah, O.K., cause, to me, quiet and kind are very similar in the way they are written, one is *shizukana*, and one is um…wow… *shi*, *shisetsu*…, *shinsetsuna*, to me, they are extremely similar, so I wanted to make sure first, which one is which, make sure I said the right thing.

In the first line in the treatment session, the student repeated an adjective "*shizukana*" several times. Then, he produced the polite past adjective, but it was grammatically incorrect. In the second line, the researcher provided a recast, but the student mispronounced it. Then, the researcher provided a recast again.

The student reported that he was trying to make sure that he used the correct adjective. This description matches his repetition of the adjective "*shizukana*" in the first line in the treatment session. He was verbalizing the word to figure out whether "*shizukana*" might be the correct word. This happened before the recast was provided and his verbal report describes his thought processes before receiving a recast. As this example shows, students often described the series of their thought processes as they were trying to produce an initial utterance rather than reporting cognitive processes that occurred after receiving a recast. It may be possible that the students were more cognitively engaged during the initial utterance production than after hearing a recast.

Although cognitive processes triggered by recasts were not reported by many participants, this does not mean that no processes occurred after receiving recasts. Egi (2010) and Mackey (2006) suggest that it is possible that learners notice some aspects of feedback, but they do not

fully report their cognitive processes during a recall session. In the current study, the uptake rate of recasts was very high, and it is likely that some cognitive processes may actually have occurred after receiving recasts. However, those processes were not reported by the participants during recall sessions.

The analyses revealed four categories of cognitive processes triggered by recasts: recognition of recasts as corrective feedback, recognition of recasts as correct utterance, recognition of problem, and awareness of correct conjugation rule. Recognition of recasts as corrective feedback indicates that learners are aware of the corrective intent of recasts. As discussed earlier, because students were engaging in dyadic interaction with a researcher in a one-on-one format, this interaction helped students to recognize the corrective intent of recasts.

Recognition of recasts as a correct utterance and recognition of a problem were reported in Egi's (2007a) lab study. In her study, recognition of recasts as a correct utterance was coded as positive evidence and recognition of a problem was coded as negative evidence. The findings of this study provide additional evidence showing that recasts provide both kinds of evidence.

Participants reported noticing a gap between their erroneous utterance and the correct form after receiving recasts in Egi's (2007a) study. In the current study, the students reported both recognition of the problem and recognition of correct form, but they did not report noticing a gap. As discussed earlier, the students' verbal reports were limited in this study. Hence, it is possible that the learners actually noticed the gap but they did not report it during recall sessions.

Awareness of the correct conjugation rule is a cognitive process which has not been reported in previous corrective feedback studies. Previous studies, focusing mainly on examining learners' noticing, which is conscious registration of the occurrence of some event (Schmidt, 1995, 2001), did not provide information about awareness of a general principle or rule. In

contrast, the findings of this study reveal that some learners not only noticed recasts as correct utterances but also became aware of the grammatical rule used to produce the target structure. After hearing a recast, some learners analyzed the correct form in the input and they understood or remembered the conjugation rule used to create the correct form.

5.1.3.3. Differences in cognitive processes triggered by prompts and recasts

There are several differences among the cognitive processes triggered by prompts and recasts. The results show that both prompts and recasts provided negative evidence. However, the way these two types of corrective feedback helped learners to notice the problem in their interlanguage is different. While recasts helped learners recognize the problem by providing the correct form, prompts pushed learners to find the problem by themselves. According to de Bot (1992, 1996), making a comparison between what is produced and what is correct on one's own is effective for learning. As noted by Izumi (2003), when learners monitor their use of specific rules to produce an utterance that is correct rather than incorrect, they are paying more attention to the problem. This focused attention stimulates the development of connections in memory, and this facilitates the transition from controlled processing to automated processing (de Bot, 1996).

Another difference is that prompts trigger knowledge retrieval and knowledge application. Since the correct form is not provided by prompts, learners need to seek the knowledge actively and apply it to see if their hypotheses about the target structure are correct. When this deeper level of processing occurs, it leads to stronger and longer-lasting traces in memory and it improves retention (Izumi, 2002).

Cognitive processes triggered by recasts include recognition of a correct form or awareness of correct conjugation rules. These processes are derived from the positive evidence

provided by recasts. It has been suggested that the effectiveness of recasts in second language learning is attributable to positive evidence rather than to negative evidence (Leeman, 2003). In addition, Han (2002) argued that intensive recasts facilitate second language learning because they repeatedly provide positive evidence to learners. Learners can benefit from recasts by inferring negative evidence, but the particular cognitive processes triggered by recasts come from positive evidence. Thus, it is more likely that the benefits of recasts stem from the combination of positive and negative evidence or from positive evidence alone.

5.1.4. Research question 2

5.1.4.1. Prompts

Research question 2 asks what the relationships are (if any) between different types of cognitive processes and the outcome of second language learning. In regard to prompts, the results show that essential processes are associated with both the High and the Low groups[20], while additional processes are associated with the Low group in relation to the immediate post-test scores. The further analyses show that students in the Low group were less ready learners at the point of pre-test, and they received greater amount of corrective feedback with additional information to produce a successful repair.

These findings indicate that corrective feedback that triggers essential processes can differ, depending on each individual's readiness to master the target structure. It appears that essential processes are triggered when learners' readiness and the informativeness of corrective

[20] Students in the prompt group and the recast group were assigned to subgroups (the Low group or the High group) on the basis of the test scores in the immediate post-test or the delayed post-test. The students above the midpoint were assigned to the High group, while the students below the midpoint were assigned to the Low group.

feedback match. In other words, essential processes occur when learners receive a type of feedback that offers a clue that they need in order to solve a language problem.

The findings of this study also suggest the possibility that multiple prompts are more beneficial than a single prompt. A single prompt is the provision of one type of corrective feedback, such as clarification requests, and multiple prompts are the provision of corrective feedback types in combination, such as clarification requests and repetitions. Although a single prompt can push learners to produce modified output, it is not always the case that essential processes are triggered after receiving one type of corrective feedback. This is illustrated in the following example involving student 35.

Example 41 (Student 35, Treatment Session 1)

S:	**Uh, tomodachi no apaato wa akaruikattadesu?*	(Error)
	Uh, friend's apartment was bright?	
R:	*Moo ichido ittekudasai.*	**(Clarification request)**
	Please say it again.	
S:	**Akaruikattadesu?*	(Needs repair unmodified)
	Was bright?	
R:	**Akaruikattadesu?*	**(Repetition)**
	Was bright?	
S:	**Hai.*	(Needs repair unmodified)
	Yes.	
R:	*Akaru*_____.	**(Elicitation)**
	____(was)_____ bright.	

S: *Akaru, katta, desu.* (Successful repair)

Was, bright.

Student 35's verbal report, Recall Session 2

> Uh…I think it's same thing (student 35 had previously mentioned that she always forgot to drop "i" when "*katta*" is added). I think, once I was told, or it was pointed out that I was pronouncing it wrong, I thought more about the pronunciation [recognition of problem], but at the time, less pronunciation more the conjugation, was what I was thinking about.

In the second line of this episode, the researcher provided a clarification request. Then, the student produced unmodified output. Since a clarification request either signals that the previous utterance was not understood or encourages a student to produce modified output, the student may not have been sure whether the conversation partner wanted to hear the previous utterance again or was pushing her to self-repair. Then, she repeated the non-target-like utterance. In the fourth line, the researcher provided a repetition, after which the student simply said "*hai* (yes)". Up to that point, the student did not recognize the problem in her non-target-like utterance. Her verbal report shows that she was thinking about conjugation, whether the conjugation should be "*kattadesu*" or "*deshita*", while the actual problem was not dropping "i" after "*akaru*". A clarification request and a repetition did not help her recognize the problem. In other words, these corrective feedback techniques did not trigger essential processes necessary for self-repair. In the fifth line, the researcher provided an elicitation move to indicate that the student needed to pay attention to what was supposed to follow "*akaru*". This information helped the student

narrow down the problem she was facing. Then, the student realized that she had to drop "i" after "*akaru*". Essential processes occurred after the student received an elicitation. If the student had received only a clarification request or a repetition as a single prompt, the essential processes might not have occurred. This example illustrates that the combined use of a variety of corrective feedback techniques makes it possible for the students to produce a successful repair.

The Low group formed on the basis of delayed post-test scores[21] was associated with only one cognitive process (i.e., knowledge search) whereas the Low group formed on the basis of immediate post-test scores[22] was associated with four processes in addition to knowledge search, namely, no recognition, knowledge search, no retrieval of knowledge, and incorrect knowledge application. These different behaviors across Low groups may simply be attributable to the fact that Low groups did not necessarily comprise the same participants. For instance, student 4 and student 35 belonged to the Low group in the immediate post-test scores, but they moved up to the High group in the delayed post-test scores. The delayed post-test performance of these students suggests the possibility that it took some time for learning to occur with these students. Student 4 and student 35 were less ready to acquire the target structure at the time the treatment started. Kartchava and Ammar (2014) explain that thinking time may be needed before restructuring of second language knowledge occurs. Student 4 and student 35 may have needed this thinking time to integrate the new information about the target structure into their interlanguage.

[21] The Low group created on the basis of delayed post-test scores include students who had less successful learning outcomes in the long-term.

[22] The Low group created on the basis of immediate post-test scores include students who had less successful learning outcomes in the short-term.

5.1.4.2. Recasts

The results showed that recognition of recasts as corrective feedback is associated with less successful outcomes of second language learning in both the immediate post-test scores and the delayed post-test scores. However, the results must be interpreted with caution. It has been suggested that recasts are more effective when their corrective intent is clear (Nicholas et al., 2001; Loewen, 2012), but the current study shows that recognition of the corrective intent of recasts is not related to second language development. This mismatch is attributable to the limited number of verbal reports in this study. As discussed earlier, many students reported cognitive processes related to their initial utterance production, and there were not many verbal reports referring to cognitive processes triggered by recasts. Thus, verbal reports available for analysis were not representative of the whole recast group.

The results also show that awareness of the conjugation rule was associated with less successful outcomes of second language learning in both the immediate post-test scores and the delayed post-test scores. It is considered that being aware of the conjugation rule used to form the target structure may facilitate the ability to produce the target-like forms. However, the results showed that awareness of the conjugation rule was not associated with second language development. The results of the current study may have been caused by the limited number of verbal reports. More data on learners' cognitive processes triggered by recasts are necessary to examine the relationships between cognitive processes triggered by recasts and the outcome of second language learning.

5.2. Contributions of the Study

This study explored the cognitive processes triggered by recasts and prompts and their relationships with second language learning outcomes. With respect to prompts, the current study

first documented cognitive processes triggered by prompts. The findings provide empirical evidence for the claim that prompts provide negative evidence to learners and they trigger deep processing involving knowledge retrieval and production mechanisms (Lyster & Izquierdo, 2009), leading to a restructuring of second language knowledge. These findings help us to understand learners' internal mechanisms that enable prompts to affect second language learning.

The results also reveal that less ready learners tended to experience additional processes after receiving corrective feedback, and their learning outcomes were less successful compared to ready learners. Less ready learners needed to receive additional feedback with more information so that the essential processes could occur. These findings suggest that the optimal corrective feedback differs for each learner and that the combined use of a variety of corrective feedback techniques is a factor contributing to the effectiveness of prompts in second language learning.

In regard to recasts, the findings of this study provide additional empirical support for the claim that recasts provide both positive and negative evidence (Egi, 2010; Mackey, 2012). In addition, this study provides evidence showing that learners not only notice the target-like form in the input but also become aware of the grammatical rules used to produce the correct form.

Previous corrective feedback studies using the introspective method focused on learner perceptions of corrective feedback and noticing the gap between an erroneous utterance and the target-like form (Egi, 2010; Kartchava & Ammar, 2014; Kim & Han, 2007; Mackey, 2006; Moroishi, 2002). This study employed open coding to explore learners' cognitive processes and revealed processes other than perception of corrective feedback and noticing the gap. The findings of this study provide schemes of cognitive processes triggered by prompts and recasts. It would be valuable if these schemes were to be used in future oral corrective feedback studies.

For instance, these schemes can be used to examine if cognitive processes are similar or different in various second language learning contexts such as Japanese as a foreign language or French as a second language.

This study also sheds light on individual variations in terms of cognitive processes triggered by oral corrective feedback. Research shows that individual differences, such as proficiency level or phonological memory, affect the effectiveness of corrective feedback (Ammar & Spada, 2006; Mackey & Philp, 1998; Mackey et al., 2002; Trofimovich et al., 2007). However, not much attention has been paid to individual variations in cognitive processes triggered by oral corrective feedback. The study suggests that corrective feedback is beneficial when it provides information that individual learners need to produce a target-like form. The findings indicate the importance of considering individual variations in relation to learners' internal mechanisms that mediate oral corrective feedback and its effects on second language learning.

5.3. Limitations of the Study

Although the findings of this study provide important information about cognitive processes triggered by oral corrective feedback, there are some limitations in this study. First, the sample size of the current study was small. The prompt and the recast group each consisted of 14 participants, while the control group consisted of 11 participants. A larger sample size would increase the robustness of the results of the statistical analyses of the current study.

The small sample size may also have affected the answers to research question 2. Frequency counts of verbal reports in the High and Low subgroups were conducted to examine the relationships between a type of cognitive process and second language learning outcomes.

Increasing the sample size would provide more rigorous results regarding the associations between these two factors.

Second, the study was conducted in a controlled laboratory setting where the participants engaged in communicative tasks in a one-on-one format. This environment may have helped participants to notice the corrective intent of feedback. In actual second language classrooms, however, teachers interact with multiple students, and students may not receive individual attention as did the participants in this study. The learners' cognitive processes observed in this study may or may not be the same as those in second language classrooms.

Third, there may be effects of stimulated recall on the participants' test performance. As discussed earlier, stimulated recall was conducted before the post-tests and they may have had some impact on the acquisition of the target structure. This creates a confounding factor, which is the combination of corrective feedback and stimulated recall. However, it is likely that corrective feedback is the contributing factor for second language development, since the only difference between the control group and experimental groups was the provision of corrective feedback.

5.4. Future Research

It will be important to conduct future research identifying which cognitive process is triggered by which corrective feedback technique, because it will help us to better understand the necessary alignment between the informativeness of each corrective feedback technique and the learner's readiness to produce a target-like form. The findings of this study reveal a series of cognitive processes that occur between the initial corrective feedback technique (clarification requests) and successful repair. However, the results of this study did not reveal which cognitive

process occurred after receiving which corrective feedback technique. When the participants participated in stimulated recall, they narrated a general story of cognitive processes rather than giving a linear reconstruction of cognitive processes. As a result, it was not identifiable which cognitive process occurred after which corrective feedback technique. To identify the corrective feedback technique that triggers a specific cognitive process, it will be necessary to provide participant training before stimulated recall. In the current study, participants did not receive training for stimulated recall. According to Færch and Kasper (1987), learners can usually produce retrospective verbal reports without training since cognition and verbalization are temporally separated. However, it turned out that recalling thought processes following a linear timeline was not an easy task for the participants in the current study. Training will help future participants to produce more complete verbal reports.

It will also be valuable to conduct future research that examines the effects of a single prompt and multiple prompts in second language learning. The findings of this study indicate the benefits of multiple prompts. It has been suggested that prompts facilitate second language learning because they provide negative evidence and push learners to produce modified output (Lyster et al, 2013). Multiple prompts also provide tailored corrective feedback to individual learners and the provision of information each learner needs may contribute to second language learning. When a single prompt provides information that a learner needs to produce target-like form, it will be beneficial for the learner. However, when a single prompt does not provide the clue that the learner needs, it may not be the optimal corrective feedback. In contrast, multiple prompts provide additional information that an individual learner might need, since different types of corrective feedback with different types of information are provided in combination.

Examining single versus multiple prompts may help us to better understand their functions in contributing to second language development.

5.5. Pedagogical Implications

Corrective feedback studies can be useful for second language pedagogy (Sheen, 2011), simply because we know that corrective feedback contributes to second language learning. Language instructors are interested in how to incorporate corrective feedback in classroom instruction (Li, 2014), and information about the role of corrective feedback can provide them with valuable insights. The results of the current study indicate that (a) both recasts and prompts help learners to recognize that their previous utterance was wrong or to detect the problem in their non-target-like form, (b) recasts help learners to notice the correct form or become aware of the conjugation rule, (c) prompts trigger cognitive processes contributing to a restructuring of second language knowledge, and (d) each learner needs different types of corrective feedback techniques that provide information to enable him or her to produce successful repair. On the basis of these findings, it is recommended that using different types of corrective feedback is important. This concurs with Lyster's (2007) suggestion that teachers are encouraged "to orchestrate, in accordance with their students' language abilities and content familiarity, a wide range of feedback types befitting the instructional context" (p. 124). Prompts provide clues to students to retrieve correct knowledge from what they have already learned, and this retrieval of knowledge and the production of their own output contribute to the restructuring of second language knowledge. It is also recommended to provide different types of corrective feedback techniques in combination.

Just as prompts have positive impacts on second language development, recasts are also beneficial for second language learners. When learners encounter language issues which involve

second language knowledge they do not possess, recasts are useful because they provide positive evidence to the learners.

Yoshida (2008) reported that teachers choose to use prompts, such as elicitation or metalinguistic feedback, when they determine that learners are able to self-repair by themselves. Her report suggests that instructors have their own theory about oral corrective feedback derived from their own teaching experience. When language instructors are familiar with different types of corrective feedback and their roles in second language learning, they may be in the best position to decide how they are going to provide oral corrective feedback because they know their own students and the context in which they teach. I hope that the findings of this study will provide helpful information to language educators to decide how to incorporate oral corrective feedback into their own classrooms.

5.6. Conclusion

This study explored cognitive processes triggered by different types of oral corrective feedback and their relationships with second language learning outcomes. The analyses revealed seven categories of cognitive processes triggered by prompts. The findings provide empirical support for the claim that prompts provide negative evidence and induce deep processing that contributes to restructuring of second language knowledge. In addition, the findings revealed individual variations in relation to cognitive processes triggered by prompts, and they highlight the benefits of multiple prompts to provide information to enable learners to produce successful repair.

The analyses also revealed four categories of processes triggered by recasts. The findings lend additional support for the claim that recasts provide positive and negative evidence. In

addition, this study shows that recasts help learners to become aware of the conjugation rule governing the target-like form.

This study makes a central contribution to oral corrective feedback research by providing schemes of cognitive processes triggered by prompts or recasts. Further research needs to be pursued to achieve a better understanding of the mechanisms through which oral corrective feedback leads to second language acquisition.

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Appendix A
Instructions for stimulated recall (Researcher)

Instruction for research participants:

We are going to watch the video of the session we have just had. We are interested in what you were thinking **at the time** you were talking about the pictures. We would like to know what was in your mind **at the time** while describing the pictures.

When I have a question about what you were thinking, I will push pause. Then, I will ask you to talk what you were thinking in that part of the video.

Instruction for research associate collecting recall data:

Present the above instruction to research participants and ask them to read it silently. Then, play the video. When you see participants receiving oral corrective feedback, stop the video and ask questions such as:

What were you thinking at this point?
Can you tell me what you were thinking here?
I see you were thinking there. What were you thinking then?

You should NOT ask questions such as:

Why did you ~?
Can you explain why ~?

You should avoid these questions because these questions may alter the nature of participants' recall comments.

When participants make comments, you should NOT give concrete reactions to participants' response. Instead, you are expected to give general responses such as:

I see.
Uh-huh.

You are expected to let participants talk, instead of giving them extended responses.

If the participant says "I don't remember", accept the comment and resume the video.
If participants start making comments while the tape is playing, stop the tape and let them talk.

Appendix B

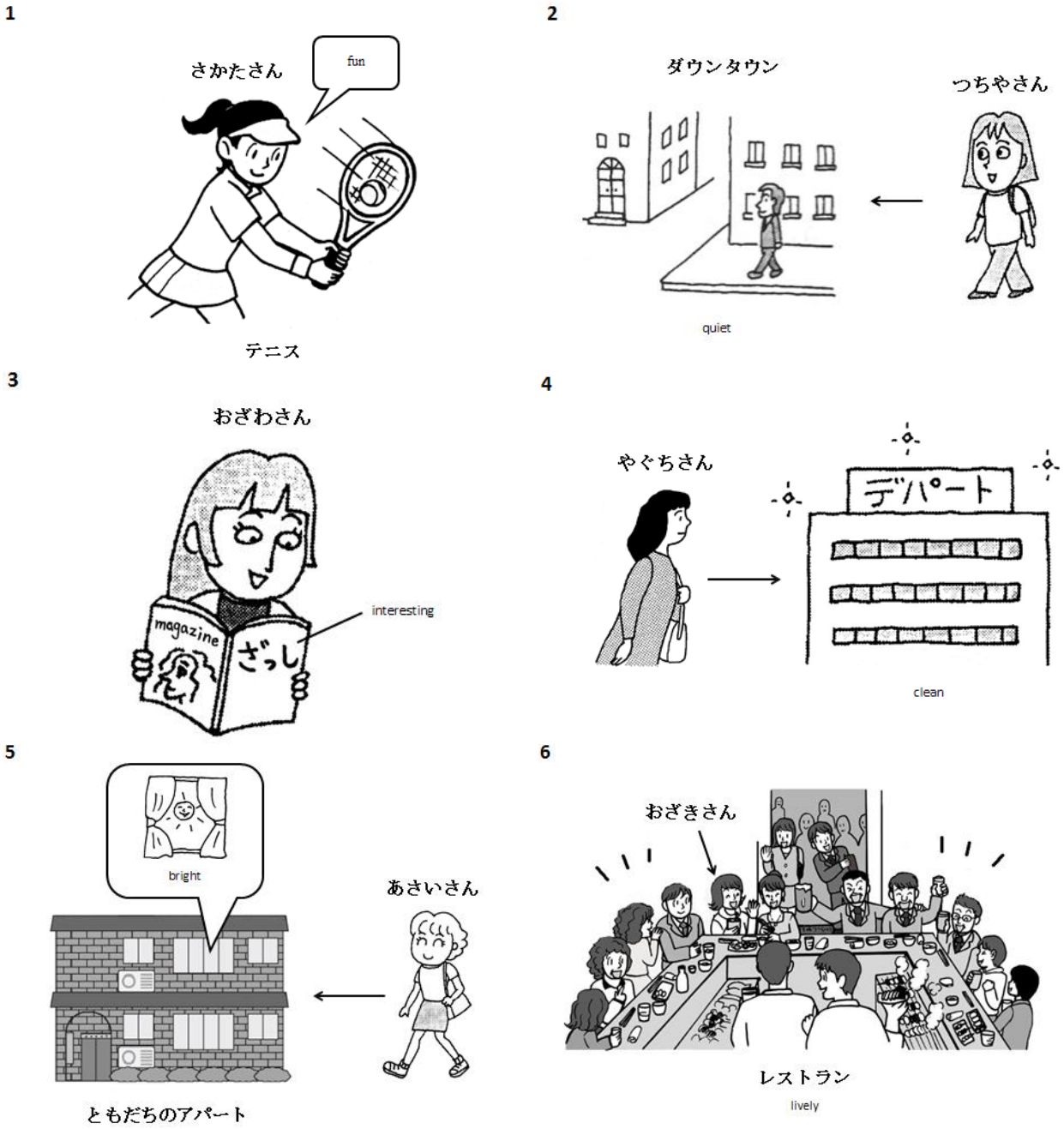
Instruction to participants (Treatment sessions)

Instruction to participants:

You are going to see a set of pictures. Each picture describes an activity that occurred **last week**. Your conversation partner has similar pictures, but those pictures are missing some information. Your conversation partner will ask you to give him/her missing information. Please look at the picture carefully and answer in Japanese.

Appendix C

A picture set for treatment session 1 (Participants)



Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

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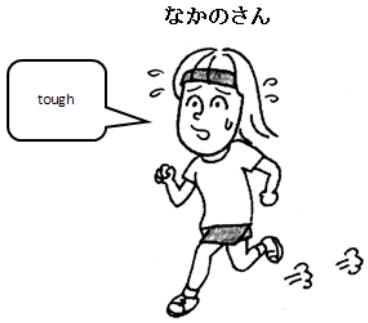

ジョギング

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アルバイト

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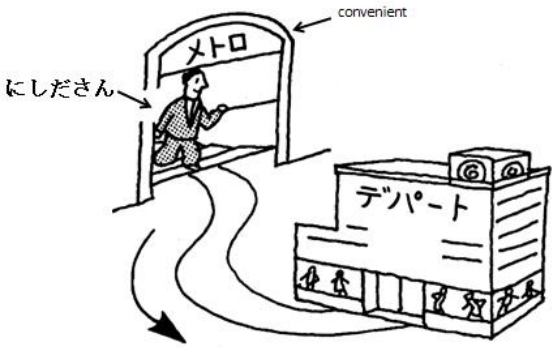

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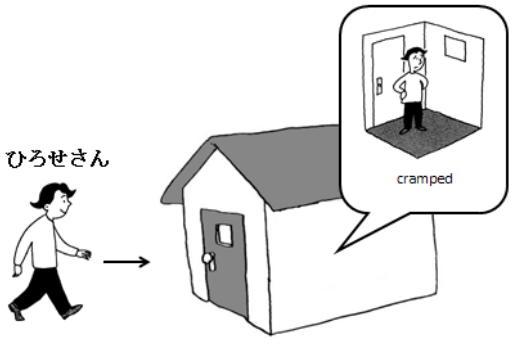

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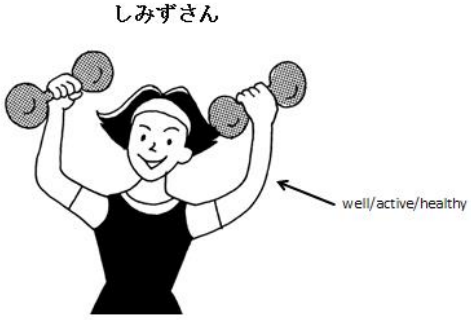
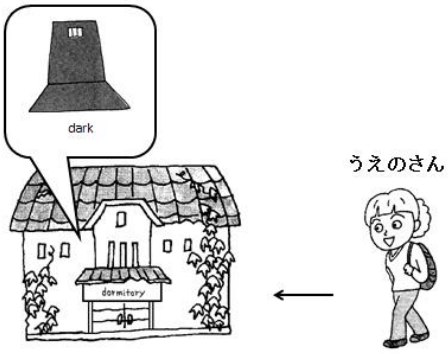


うんどう

13



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Appendix D

A picture set for treatment session 1 (Researchers)

Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

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ジョギング

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アルバイト

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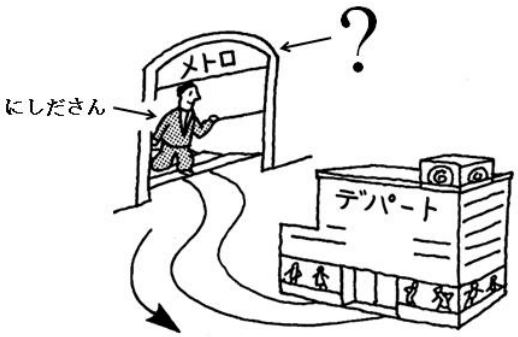

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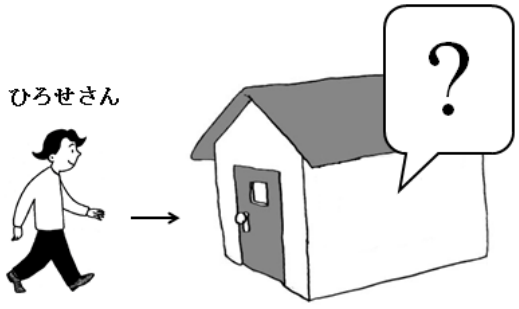

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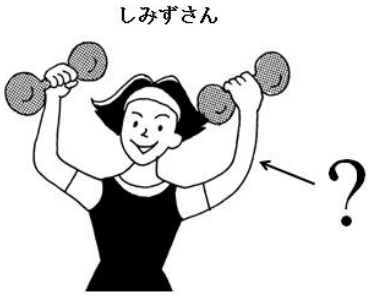

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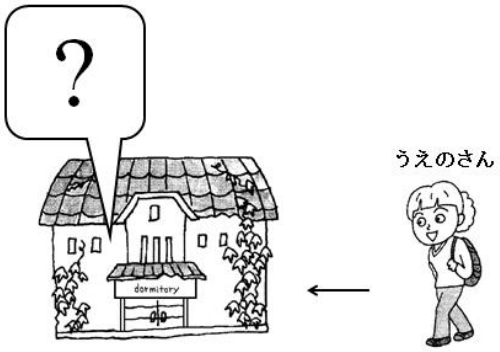

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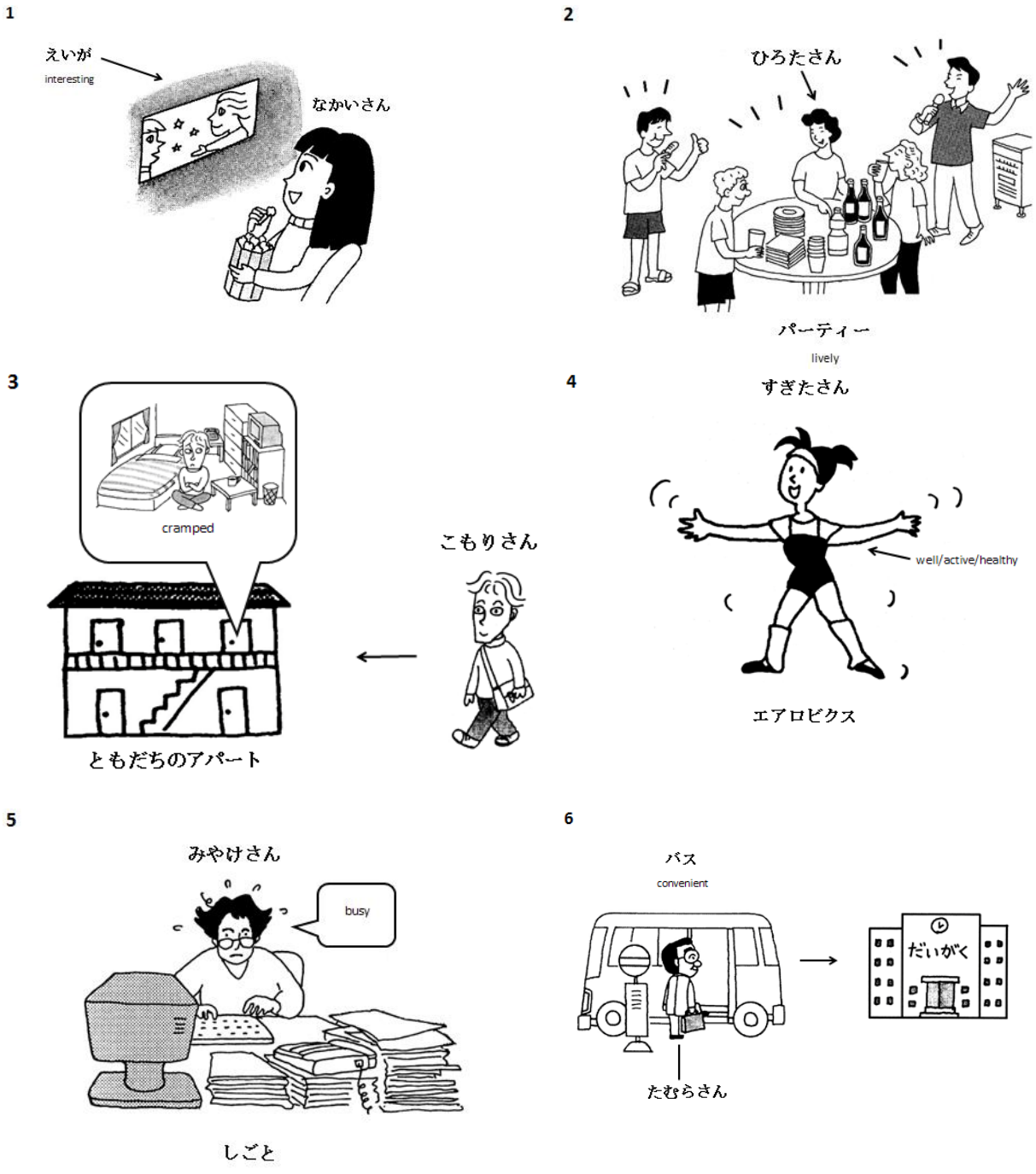
Appendix E

A picture set for treatment session 2 (Participants)



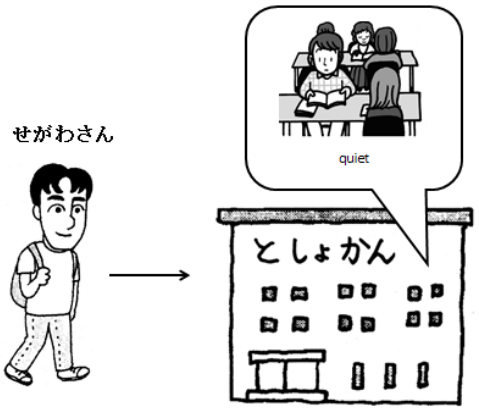
Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

7

えぐちさん

カレー

8



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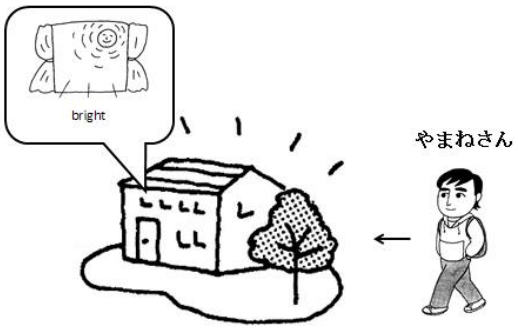

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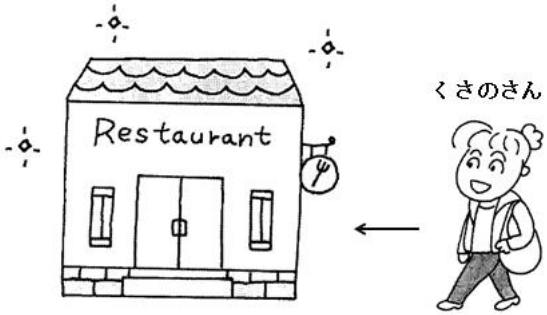


clean

11

おかださん

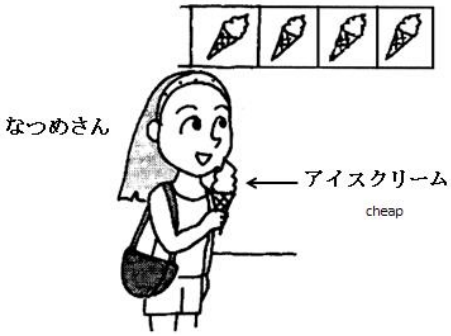
ゴルフ

12

たはらさん

しゅくだい

13



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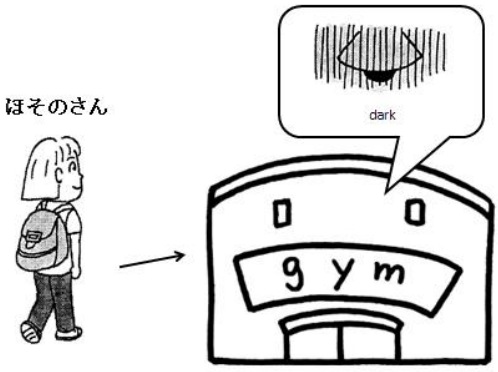

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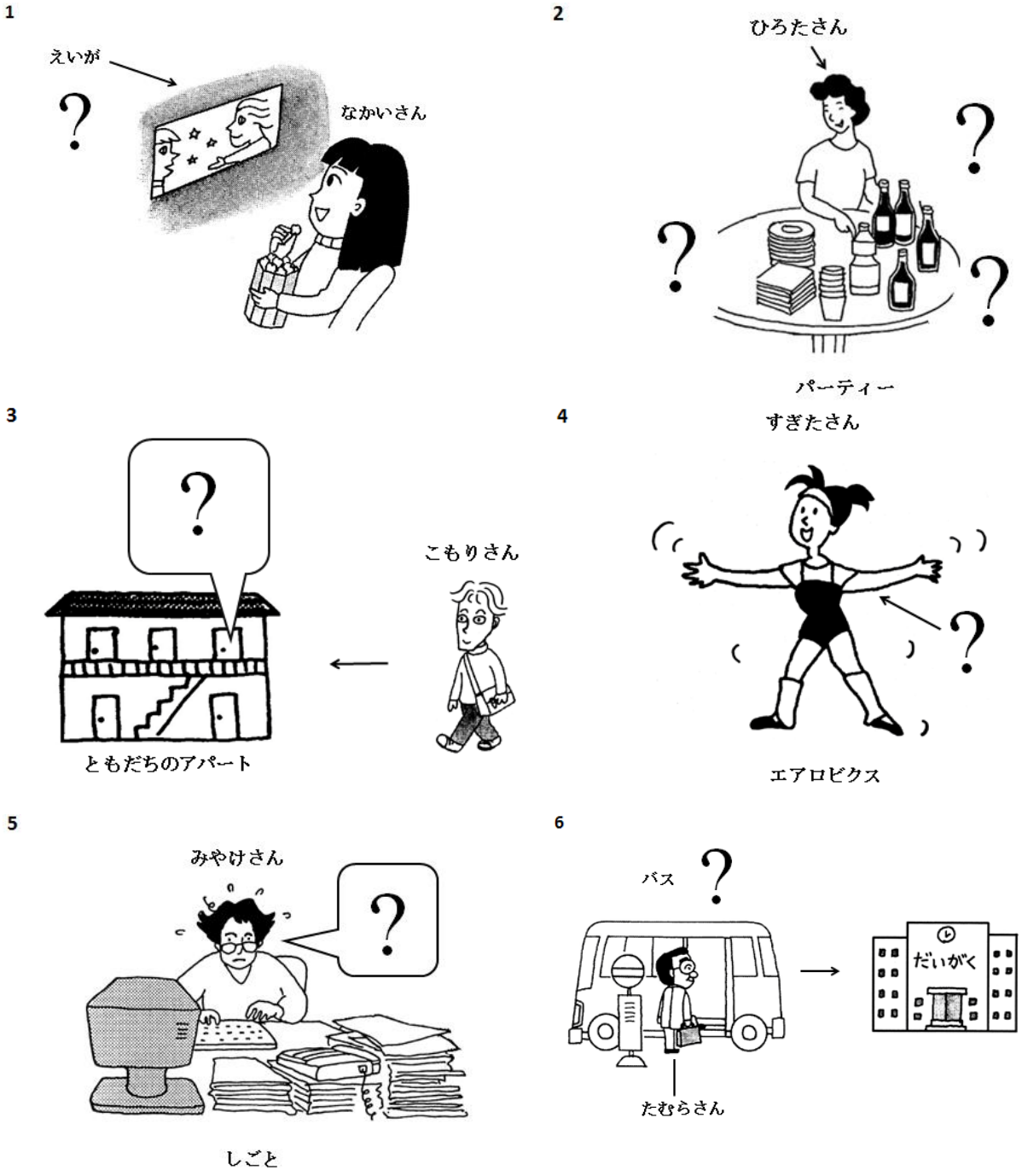
Appendix F

A picture set for treatment session 2 (Researchers)

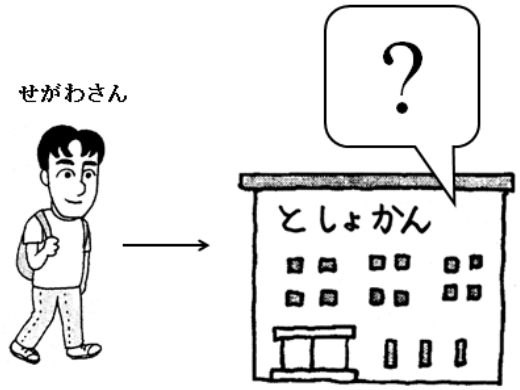


Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

7

カレー

8



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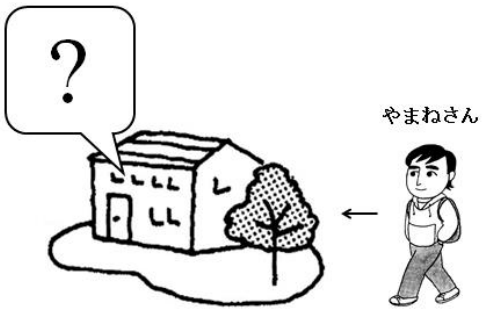

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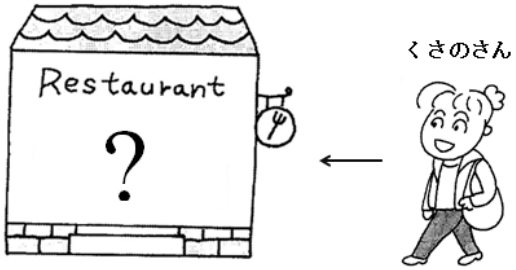

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ゴルフ

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しゅくだい

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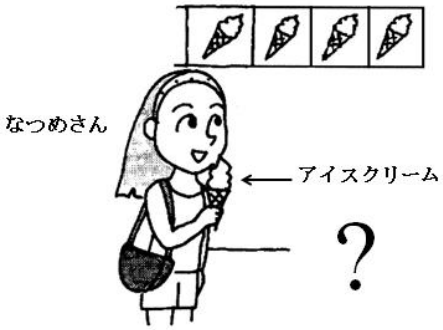

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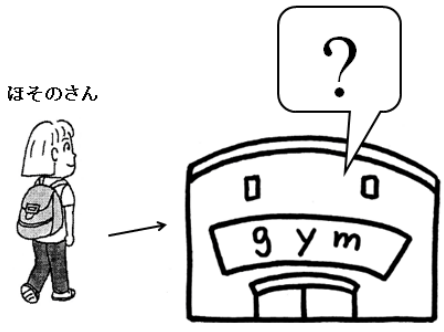

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Appendix G

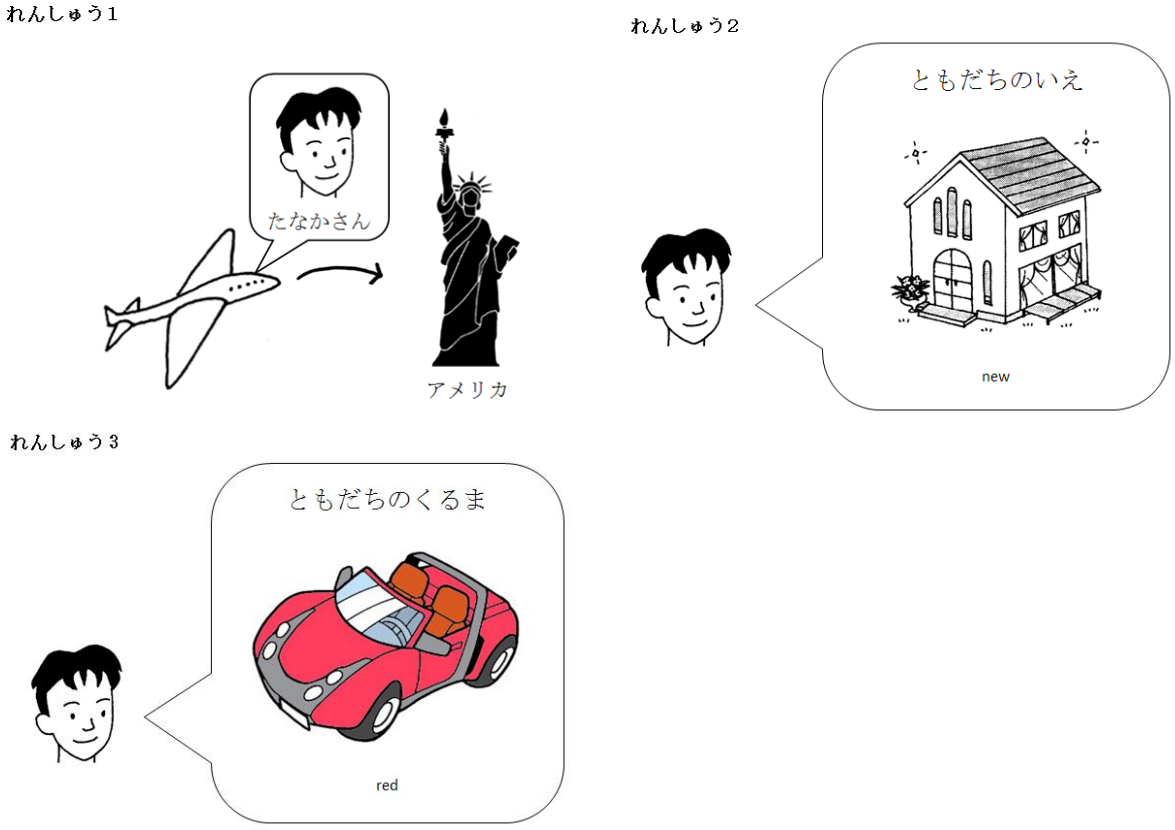
Instruction to participants (All tests)

Instruction to participants:

Six people visited their friend in a foreign country **last year**. You will see pictures that depict events or objects that they encountered during the trip. Your conversation partner has similar pictures, but their pictures are missing some information. Your conversation partner will ask you to give him/her missing information. Please look at the picture carefully and answer in Japanese.

Appendix H

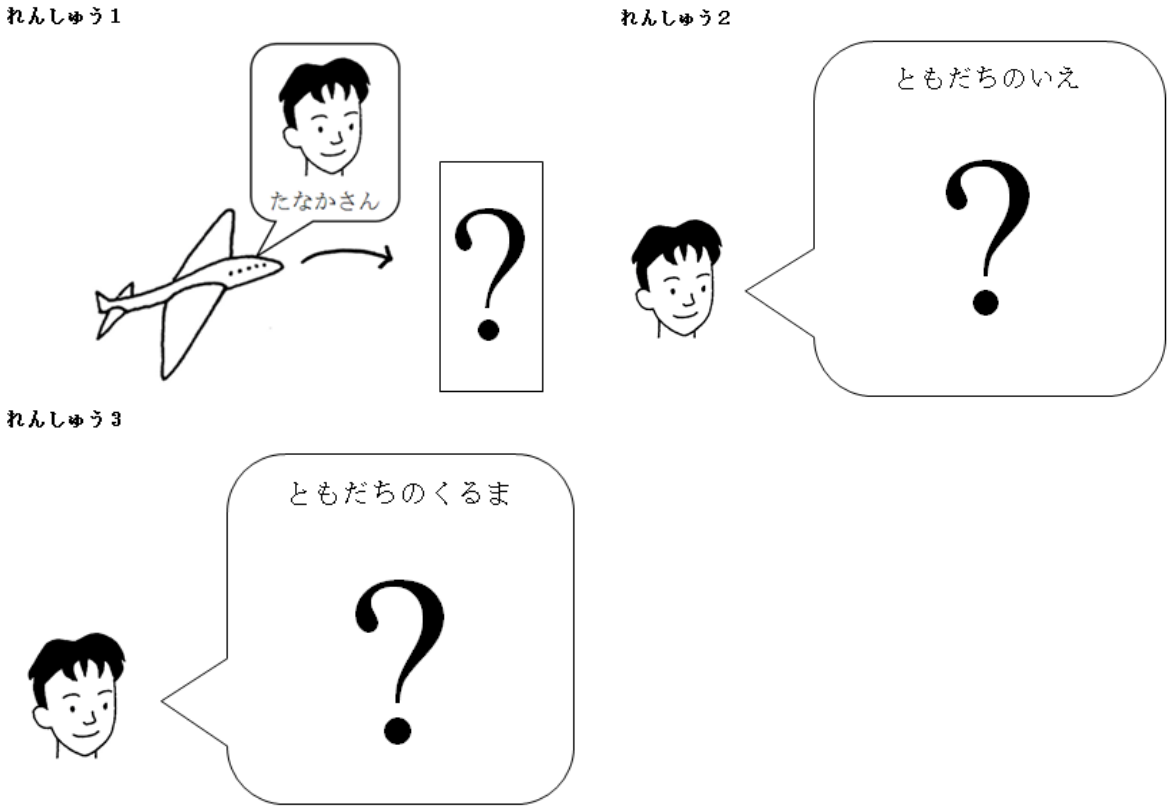
A picture set for practice session (Participants)



Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

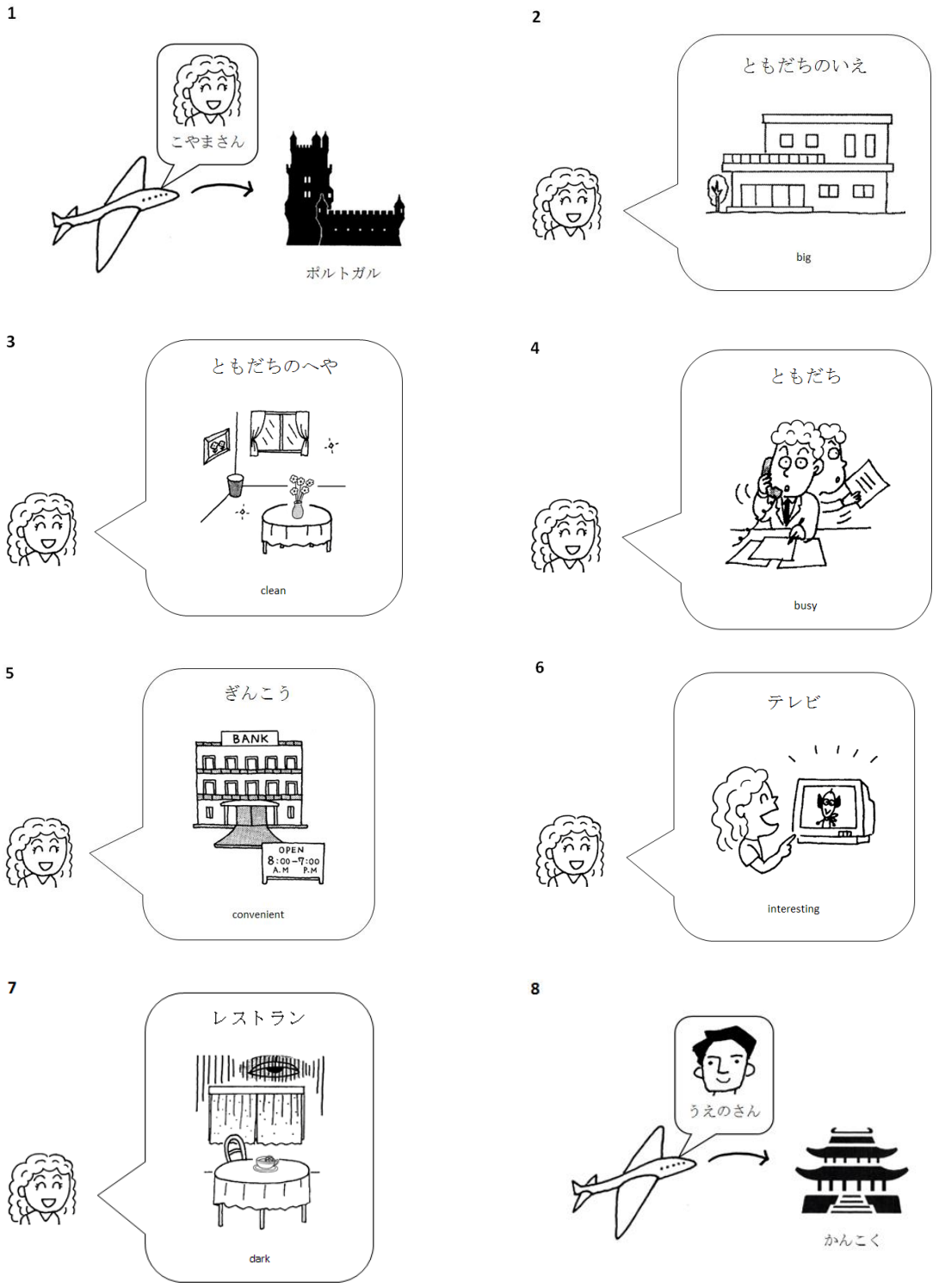
Appendix I

A picture set for practice session (Researchers)



Images are adopted from *E de masutaa nihongo kihon bunkei 85* (1996)

Appendix J
A picture set for pre-test (Participants)



Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

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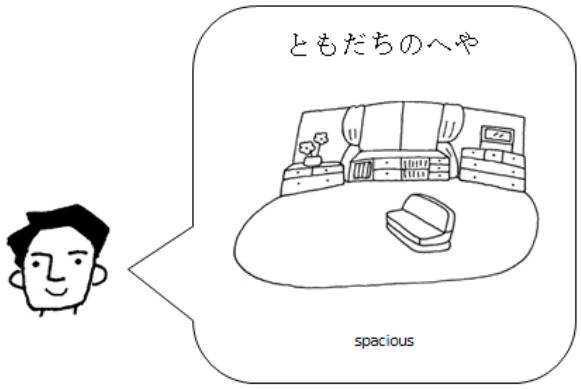

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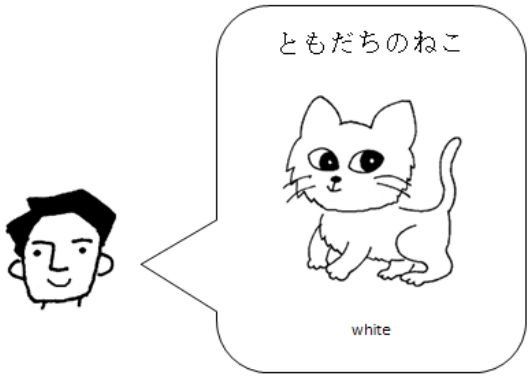

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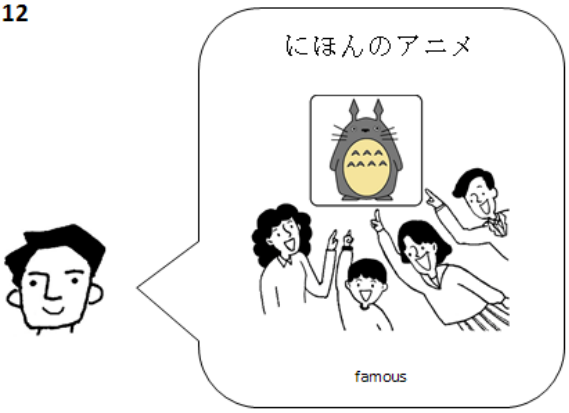

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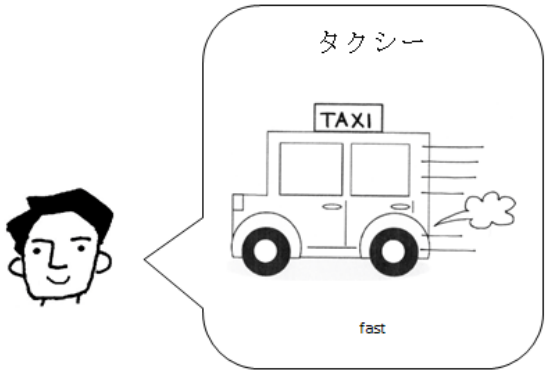

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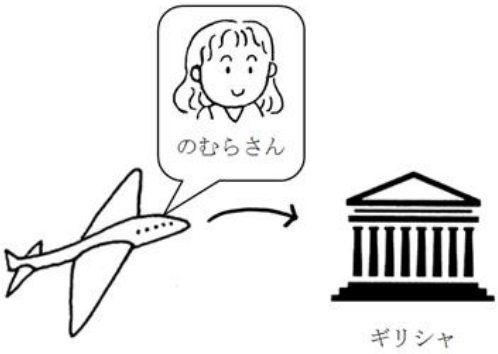

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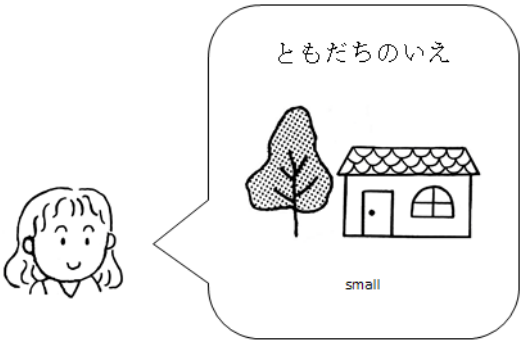

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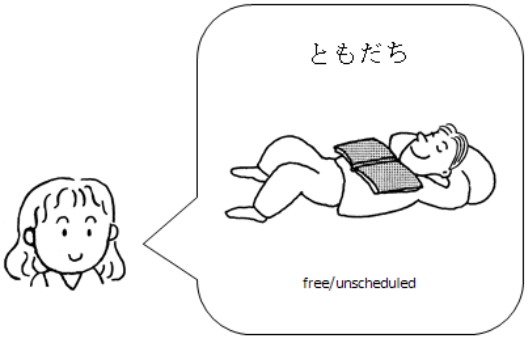

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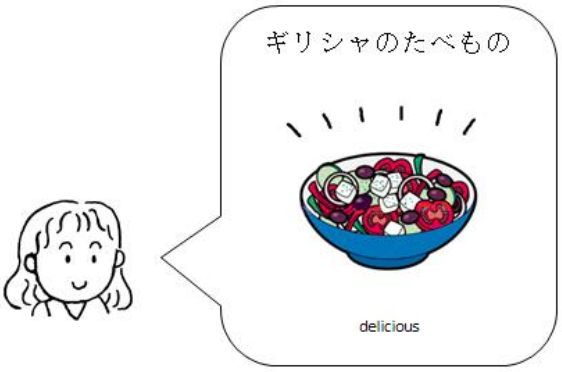

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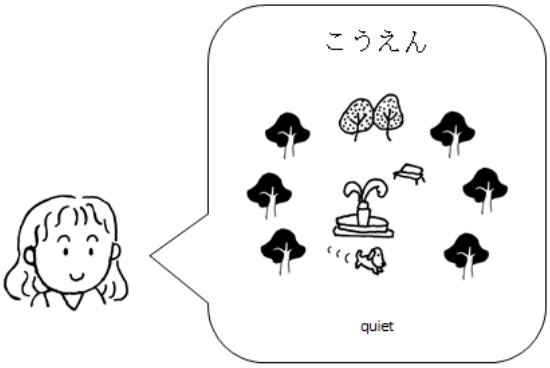

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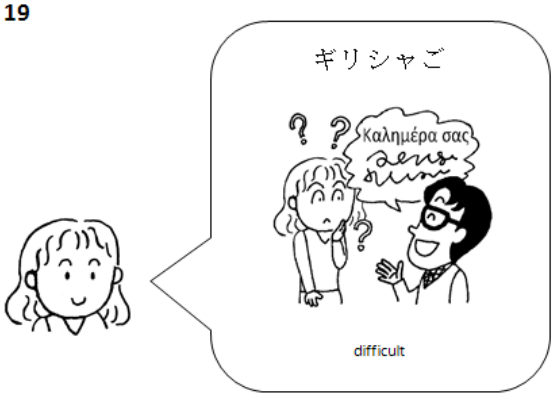

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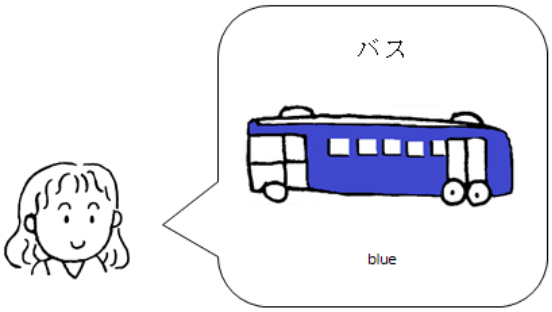

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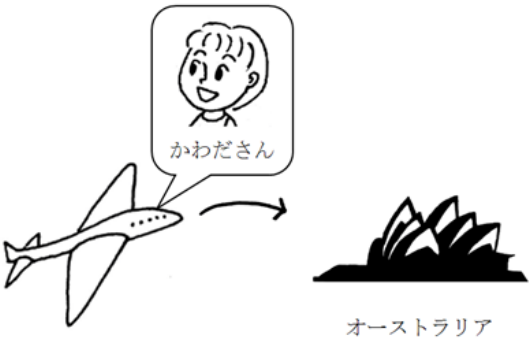

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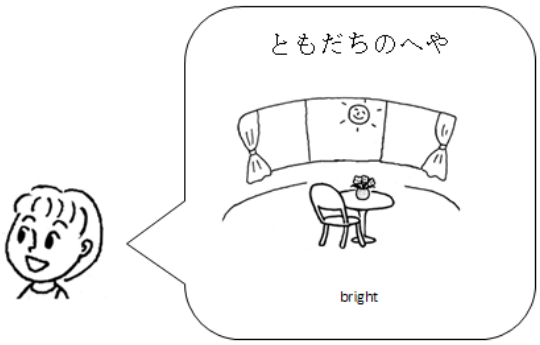

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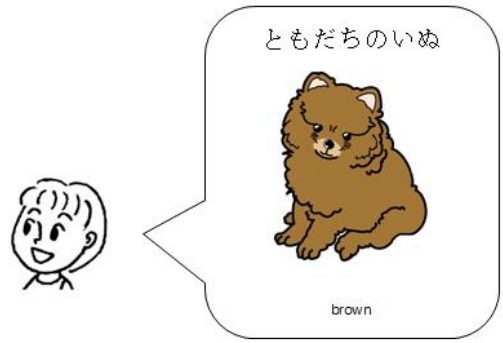

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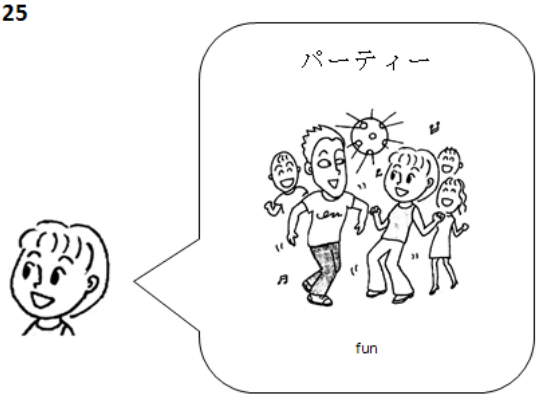

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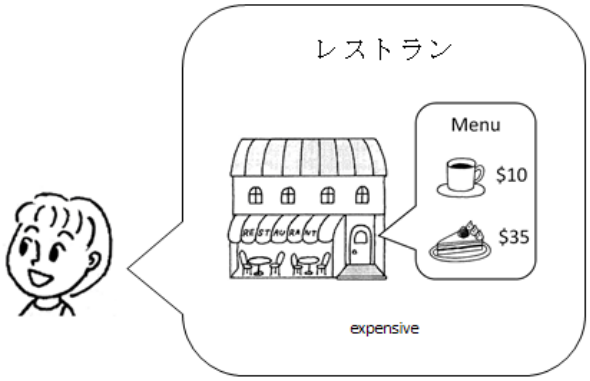

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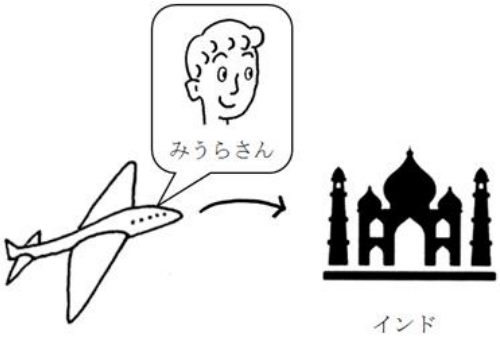

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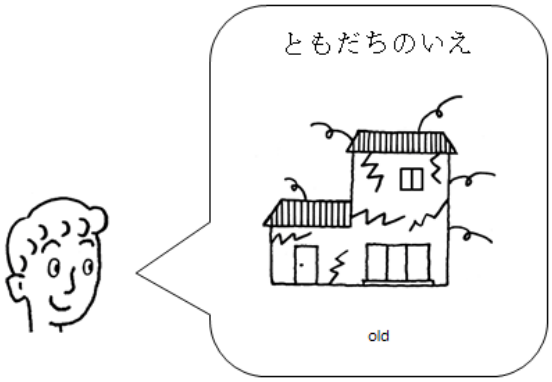

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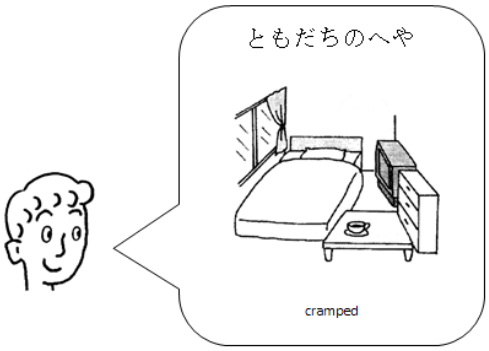

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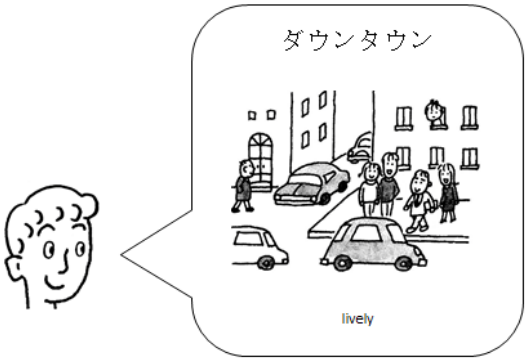

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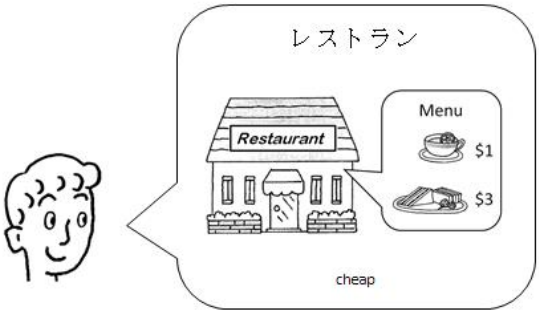

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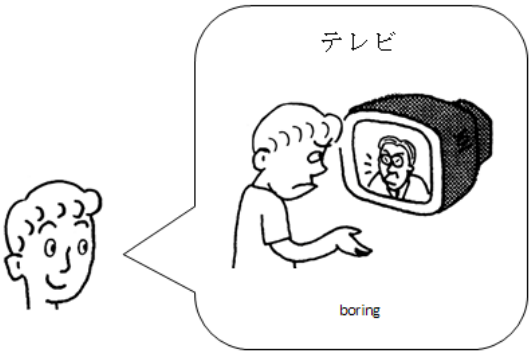
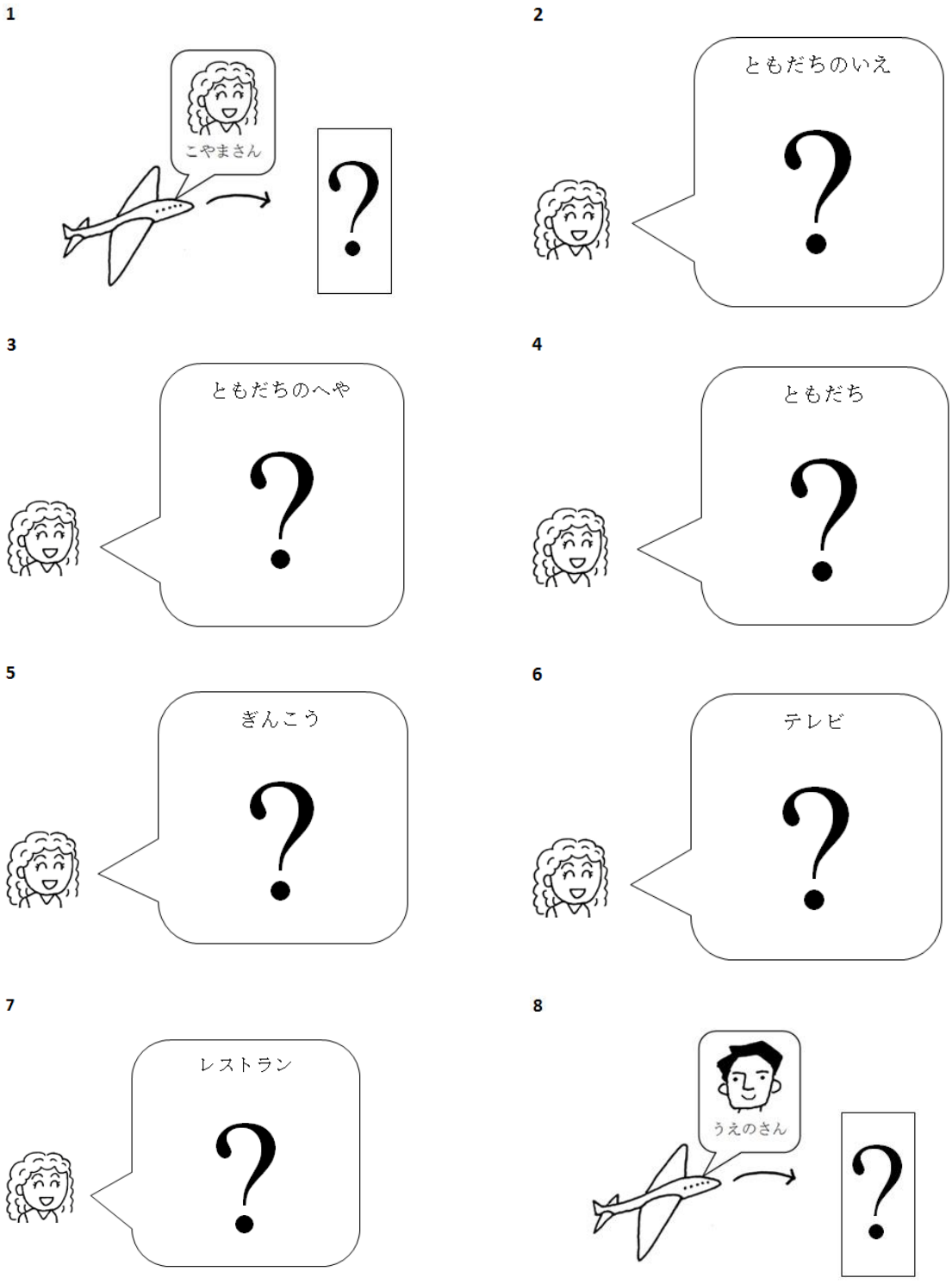
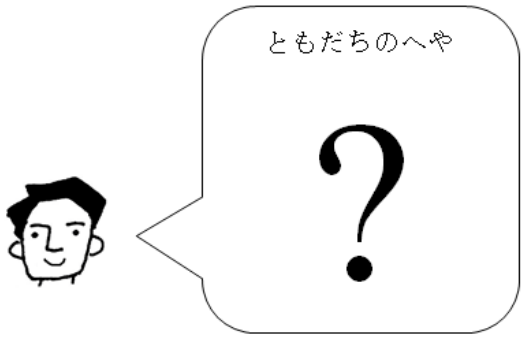


Appendix K
A picture set for pre-test (Researchers)



Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

9



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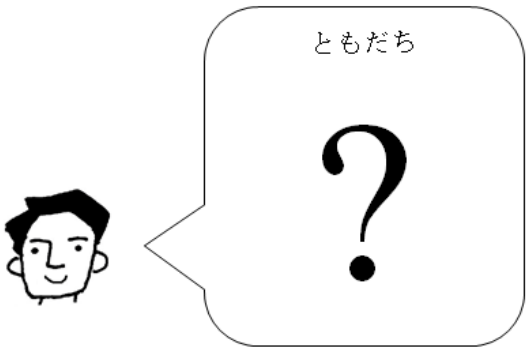

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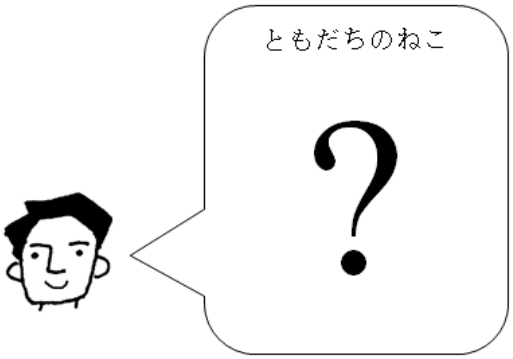

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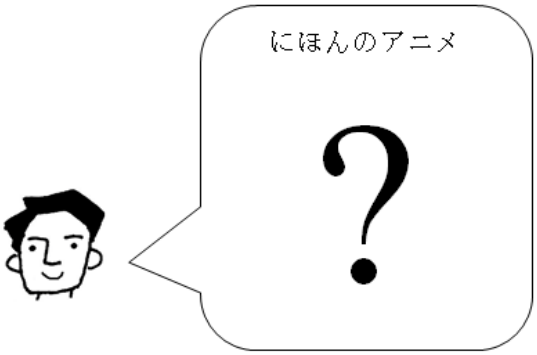

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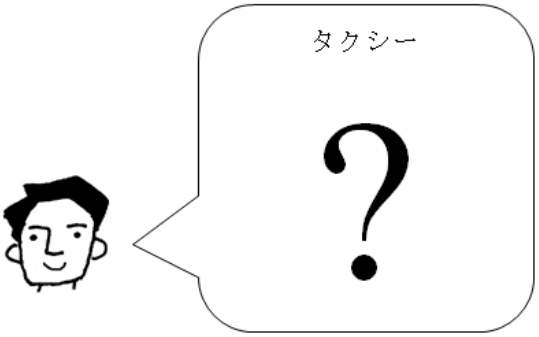

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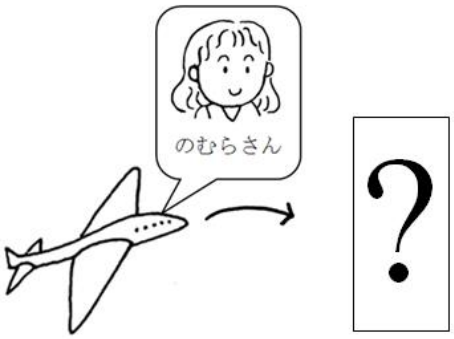

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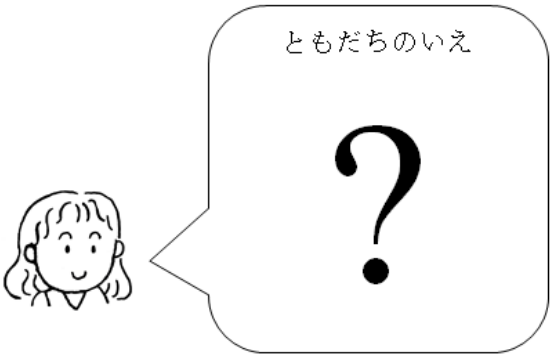

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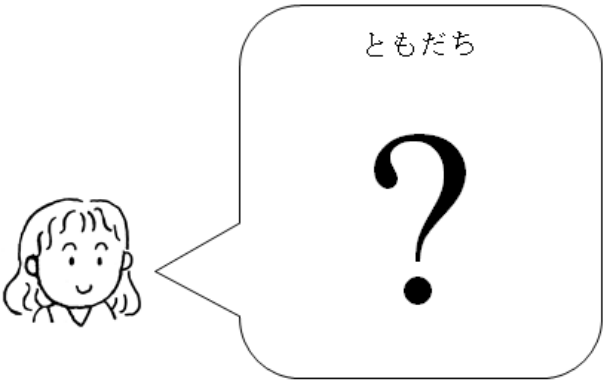

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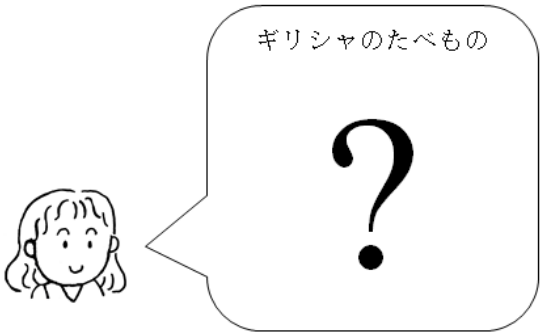

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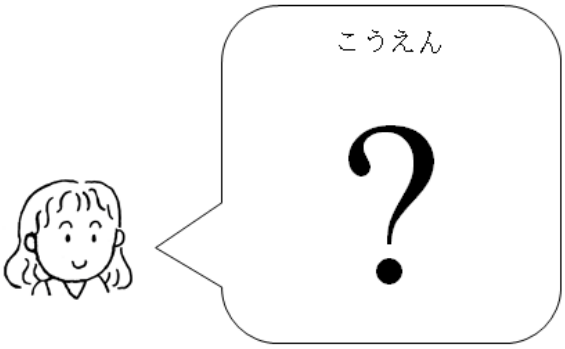

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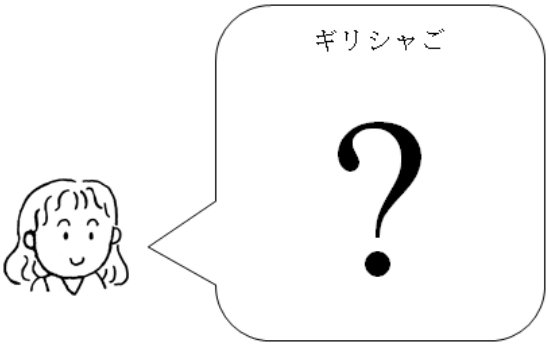

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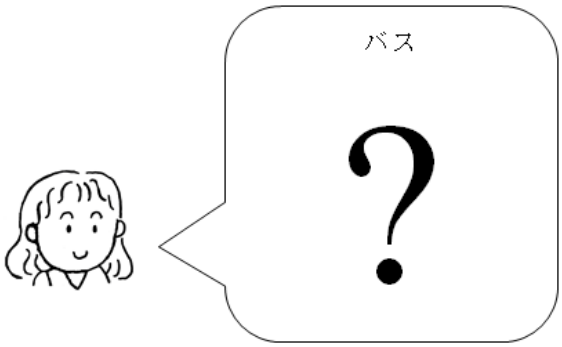

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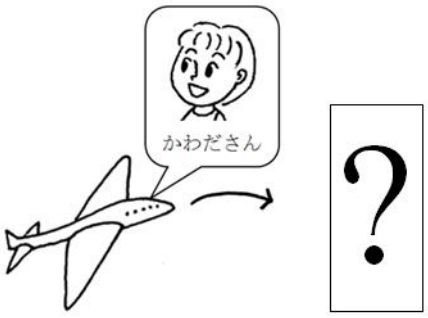

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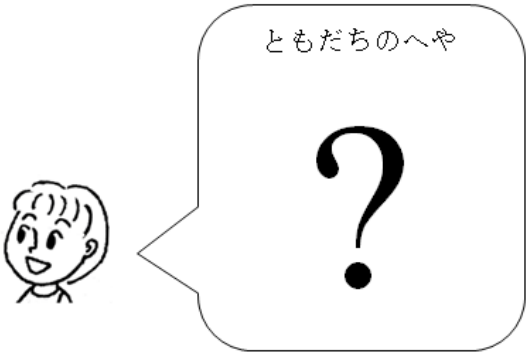

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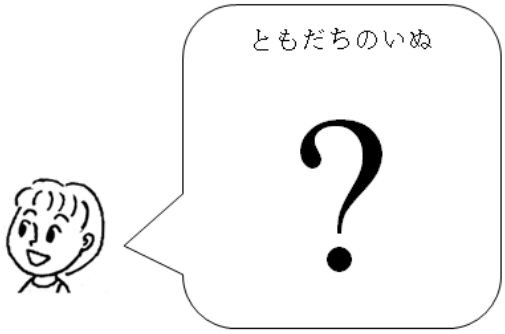

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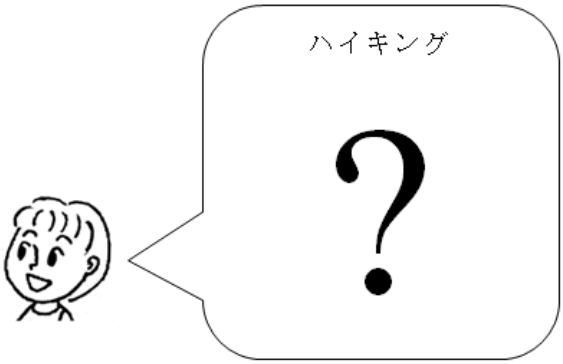

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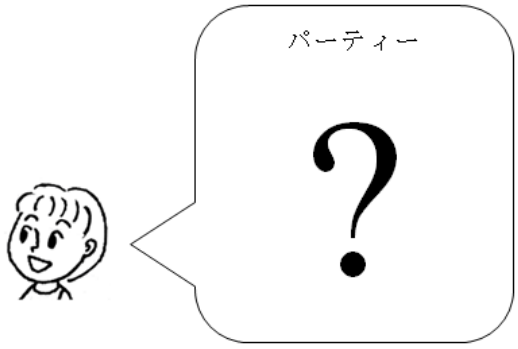

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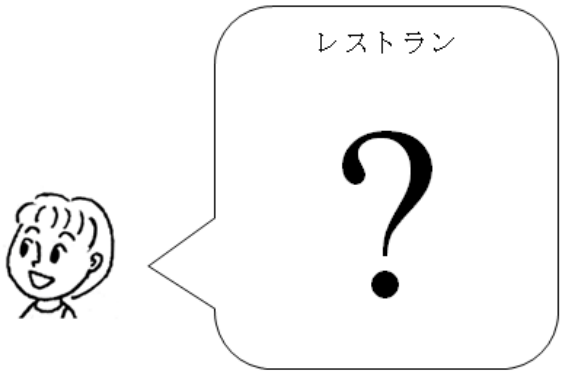

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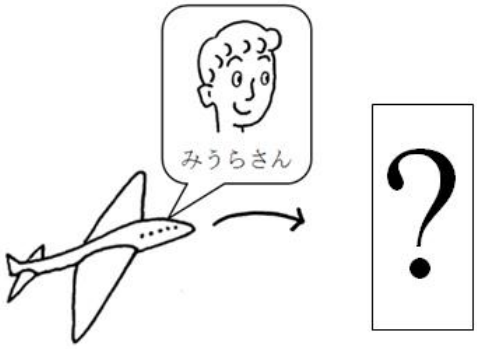

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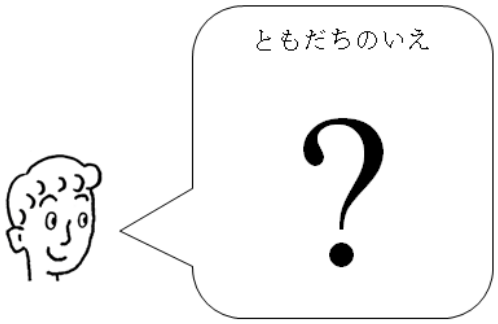

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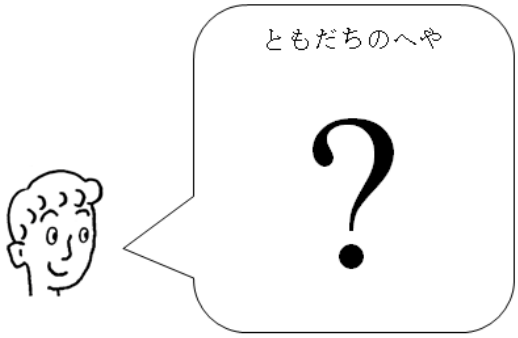

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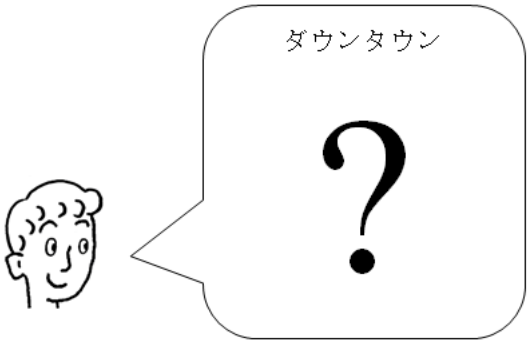

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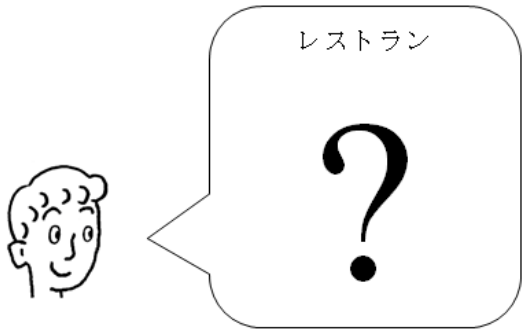

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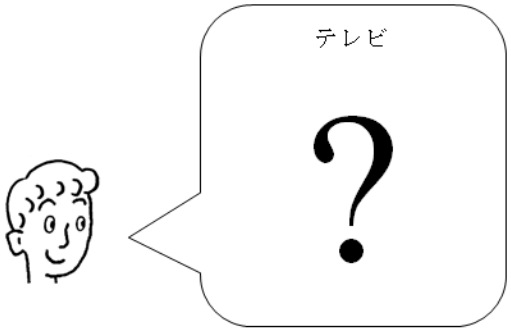
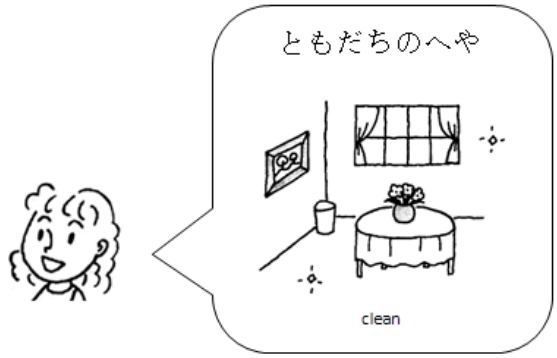


Appendix L
A picture set for immediate post-test (Participants)

Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

9



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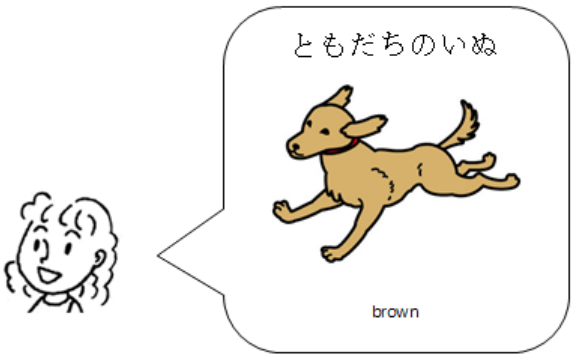

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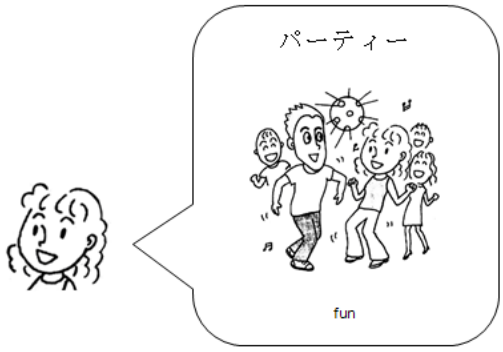

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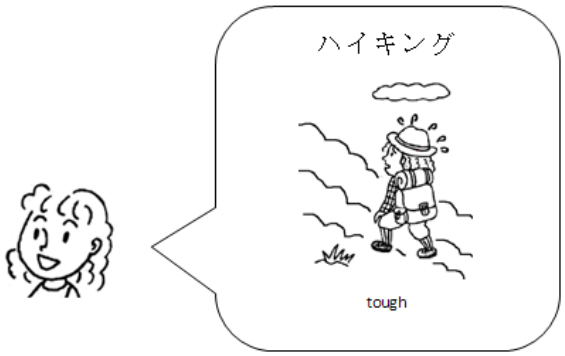

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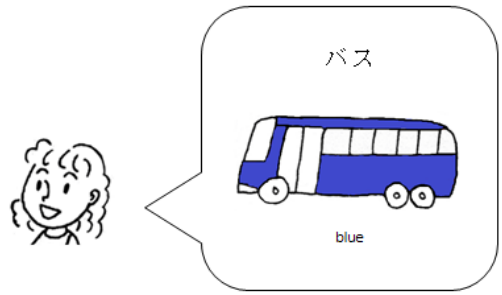

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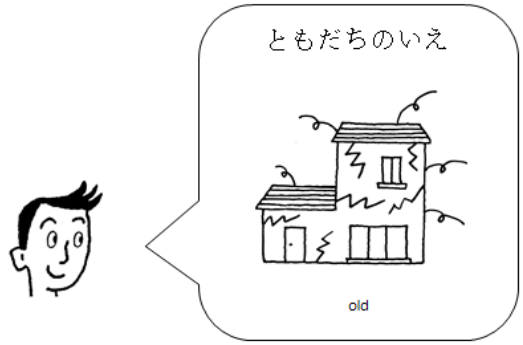

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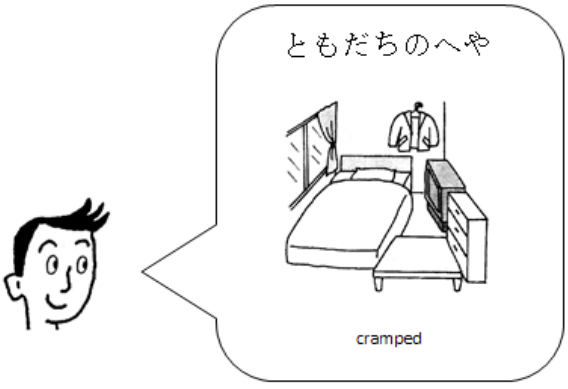

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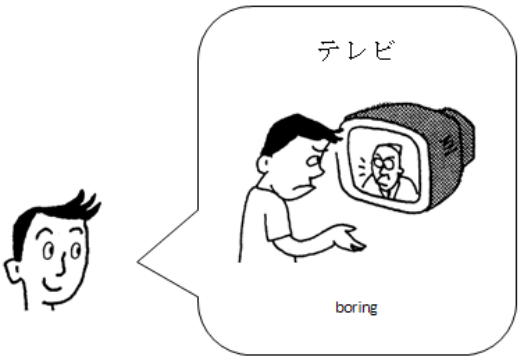

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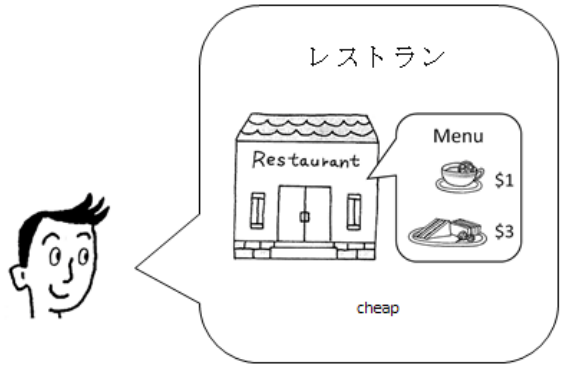

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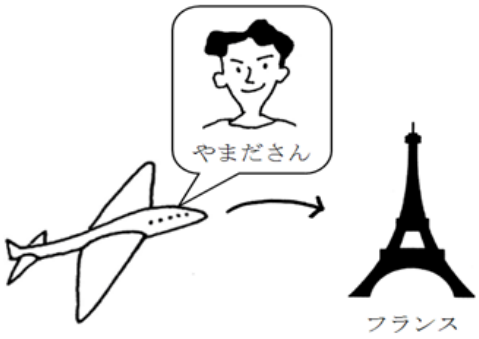

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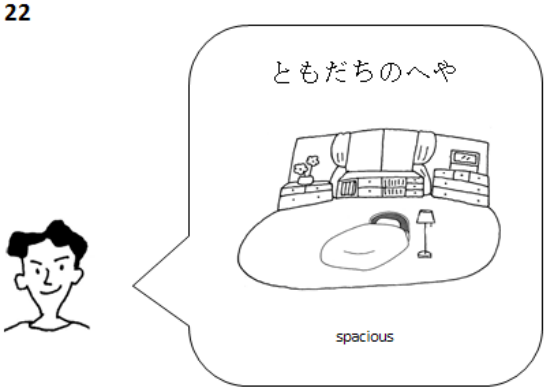

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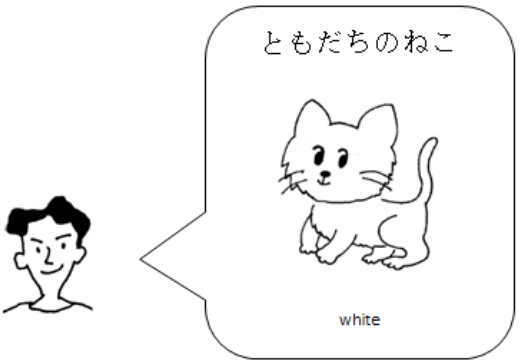

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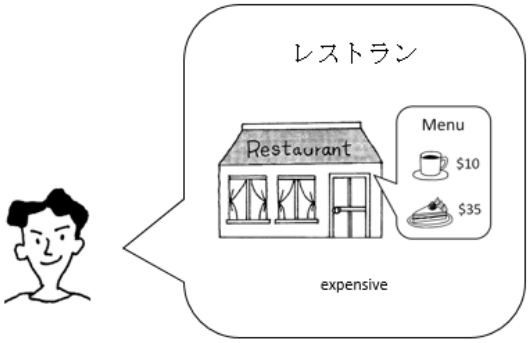

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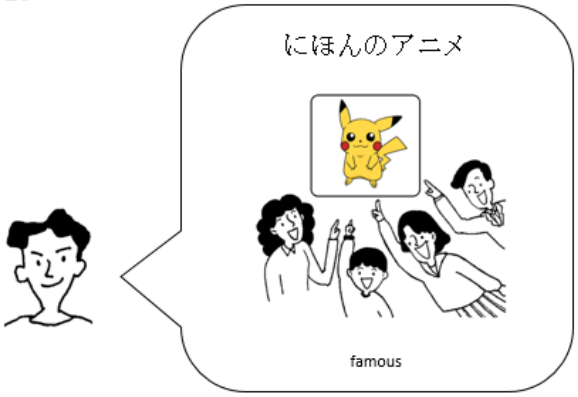

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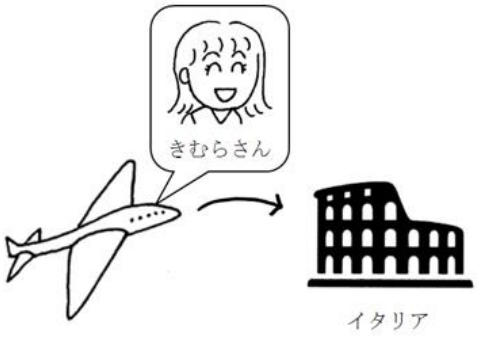

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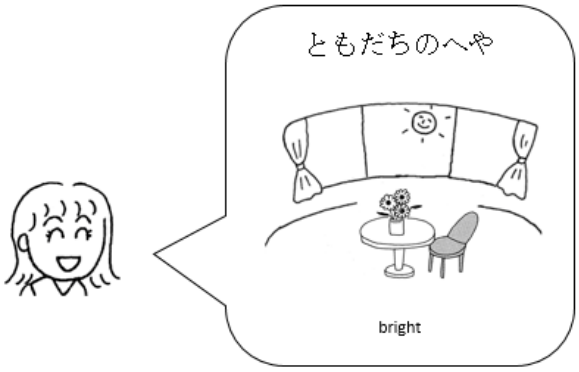

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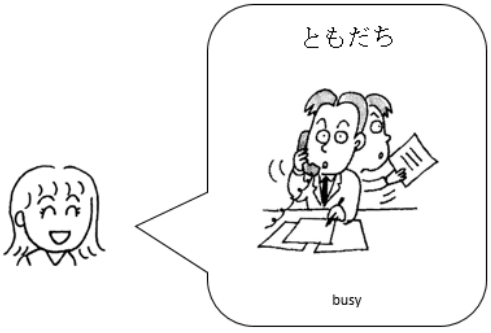

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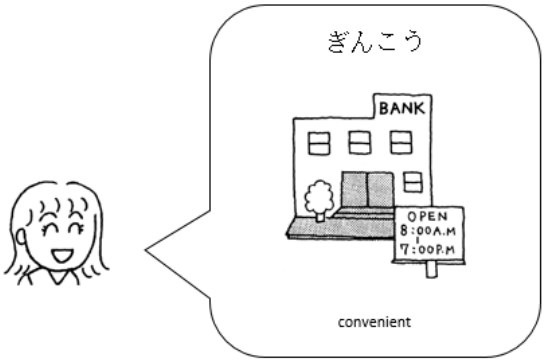

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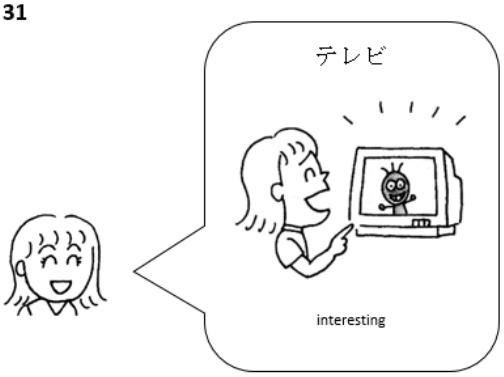

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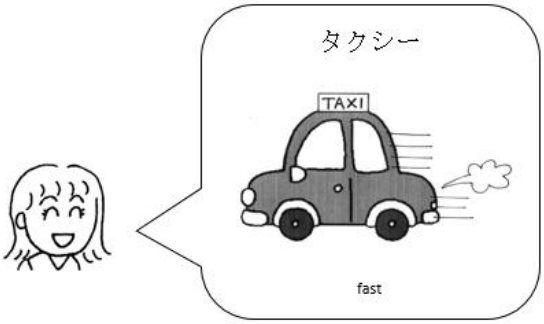
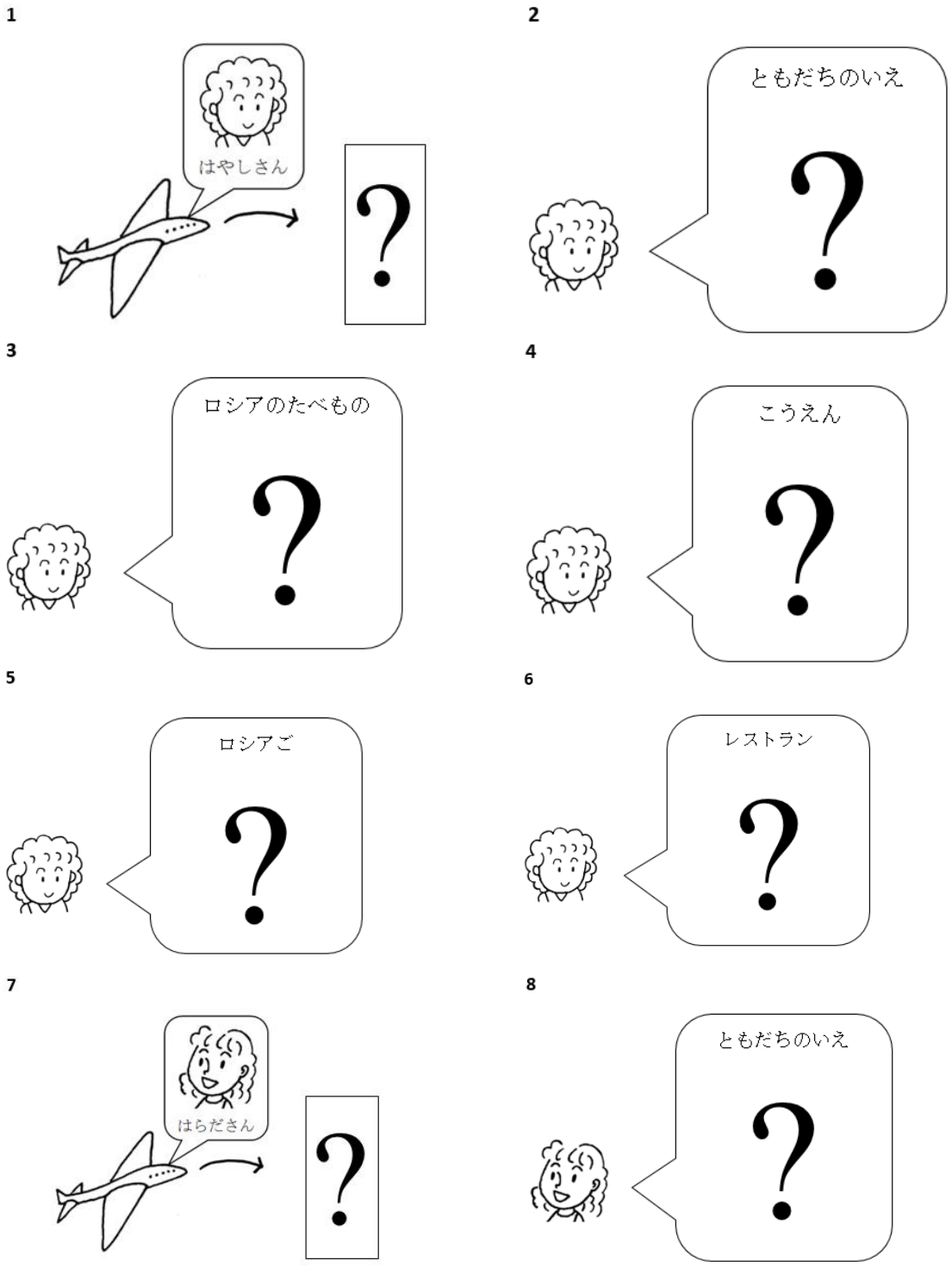


Appendix M
A picture set for immediate post-test (Researchers)



Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

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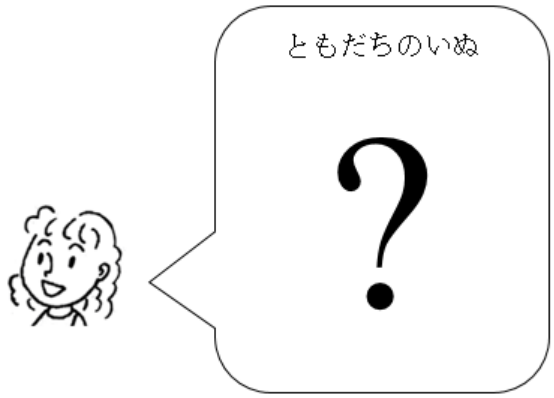
10



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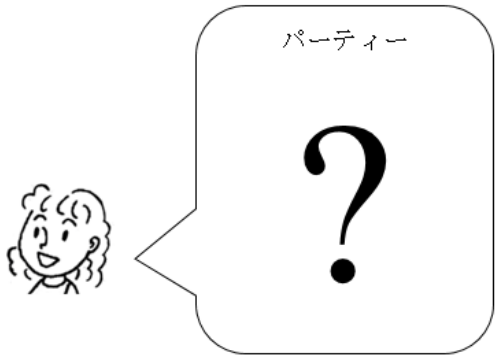

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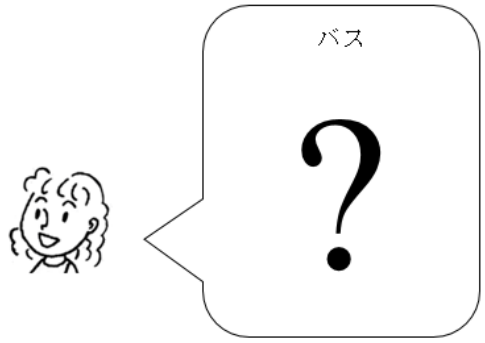

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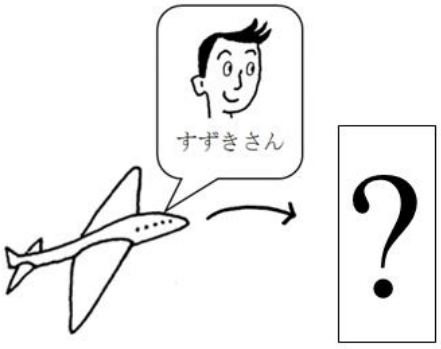

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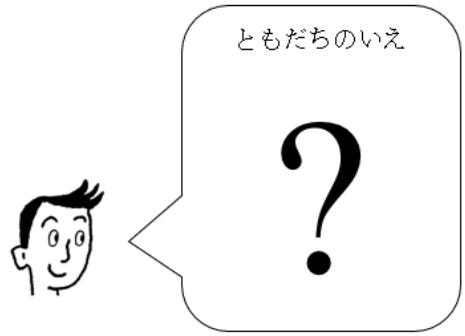

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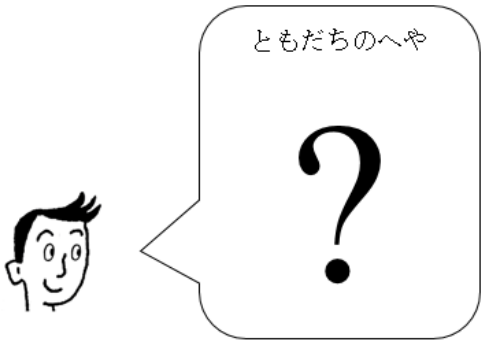

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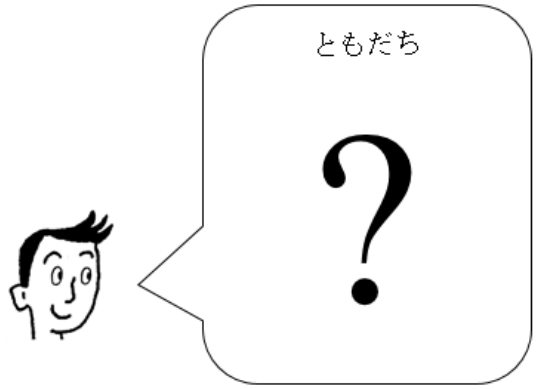

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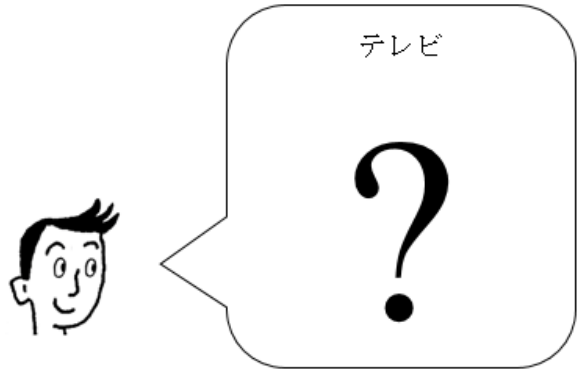

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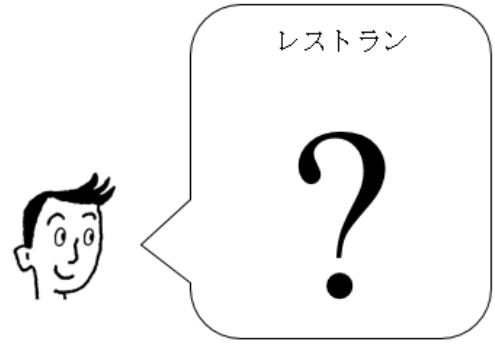

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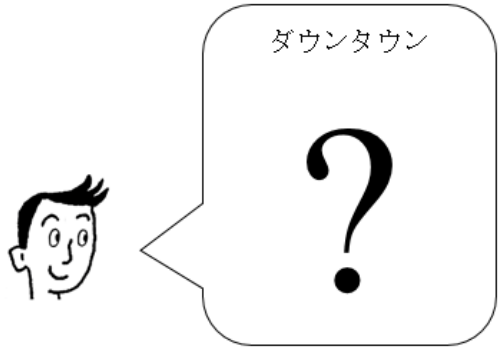

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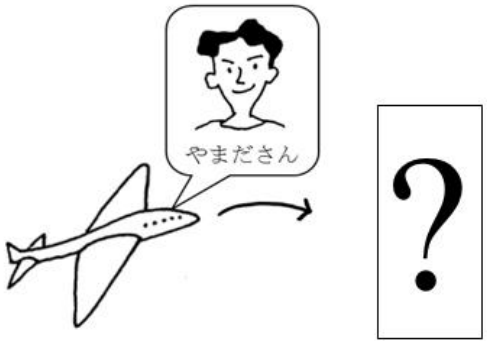

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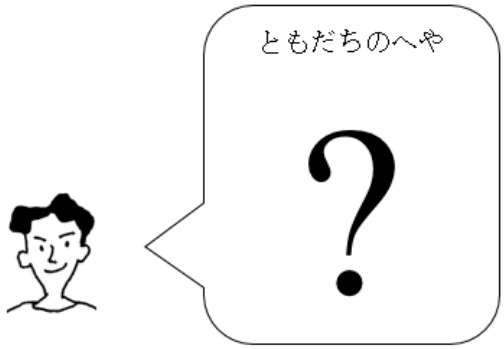

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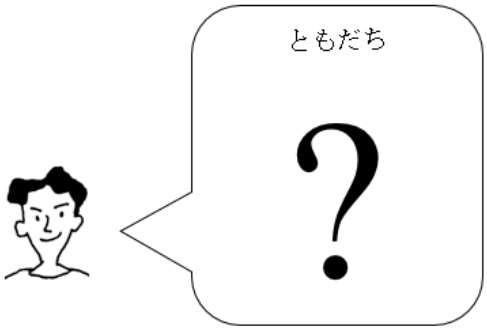

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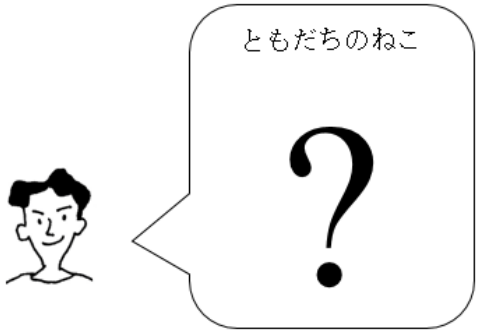

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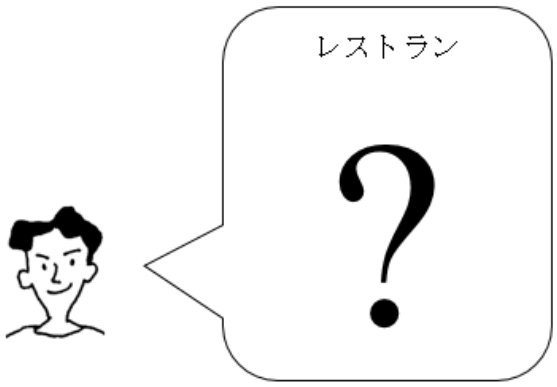

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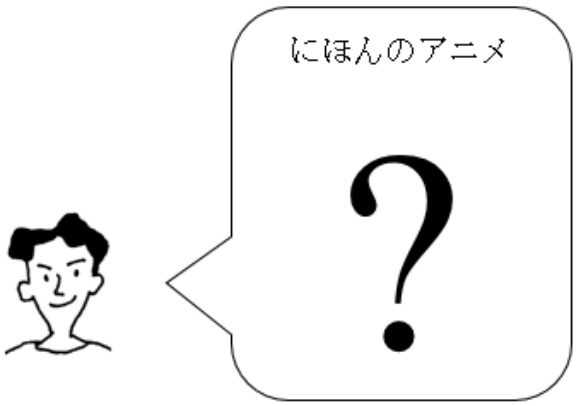

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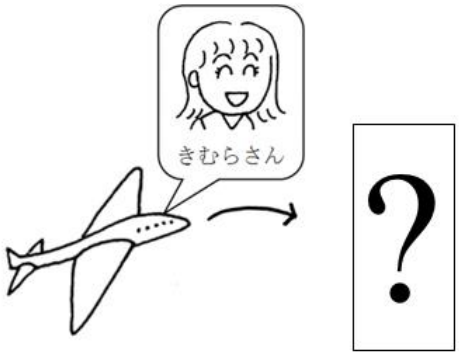

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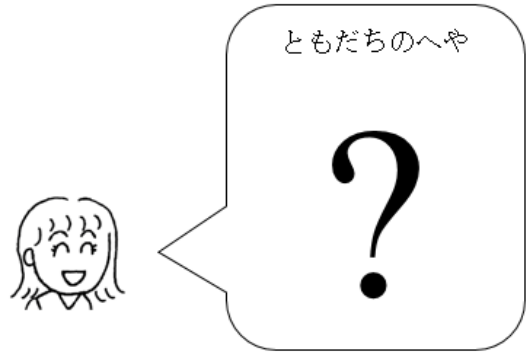

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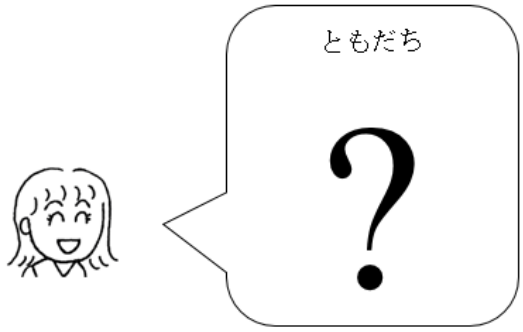

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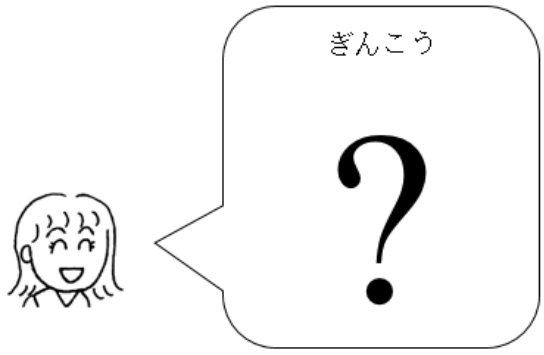
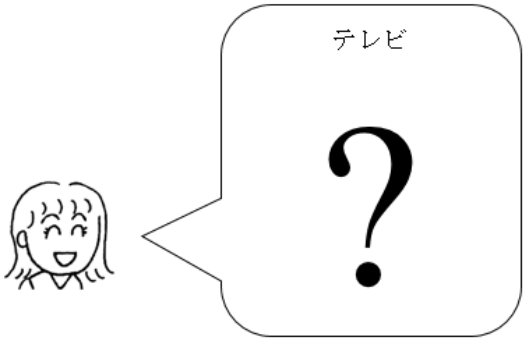
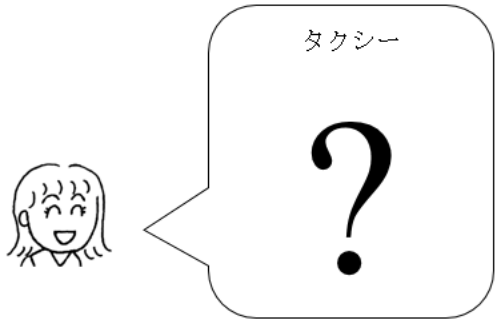


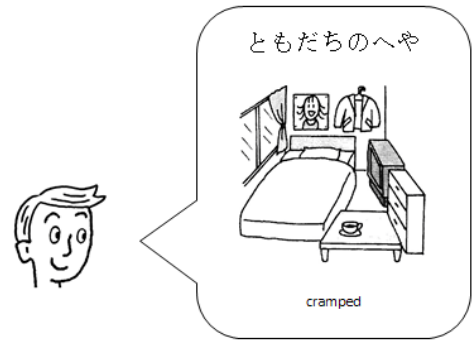




Appendix N
A picture set for delayed post-test (Participants)

Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

9



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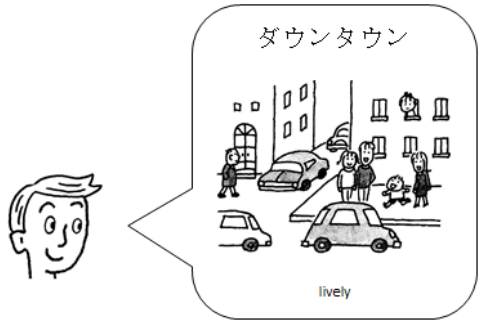

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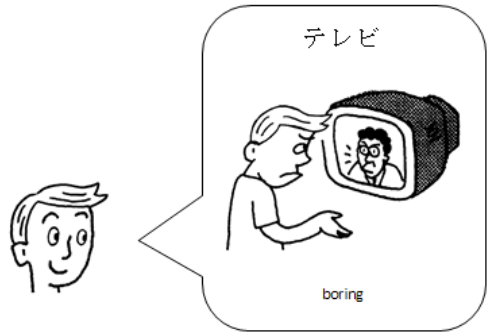

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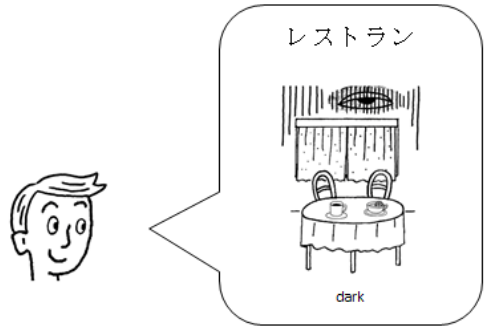

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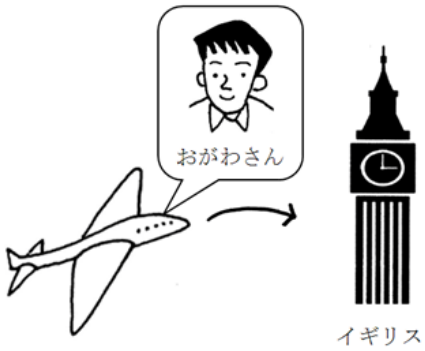

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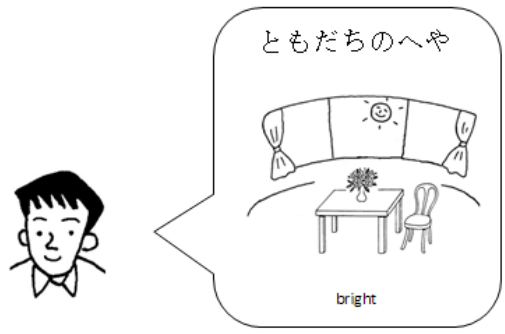

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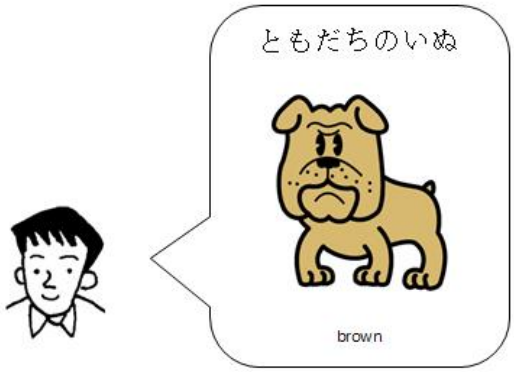

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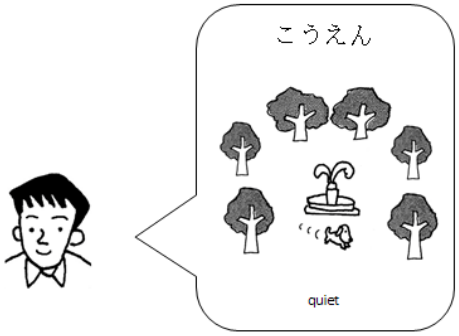

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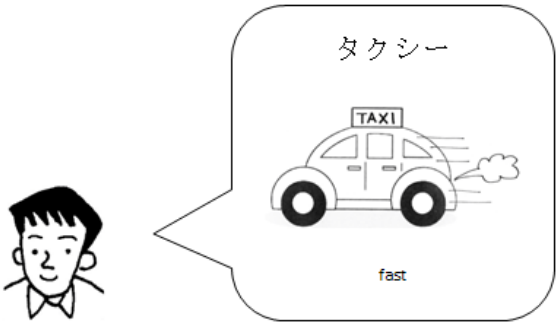

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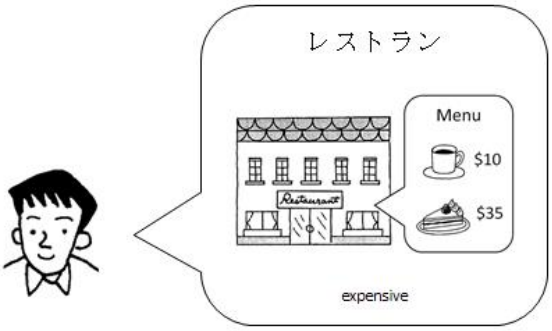

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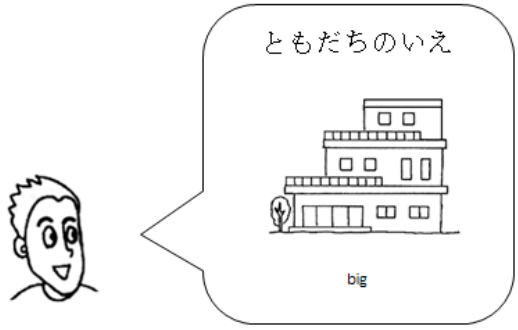

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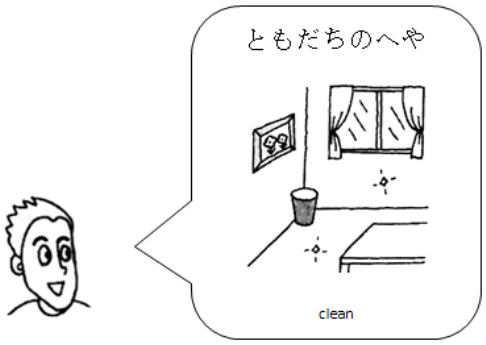

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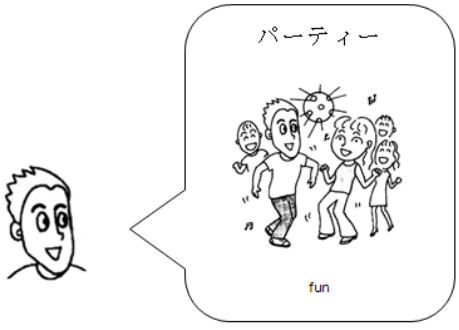

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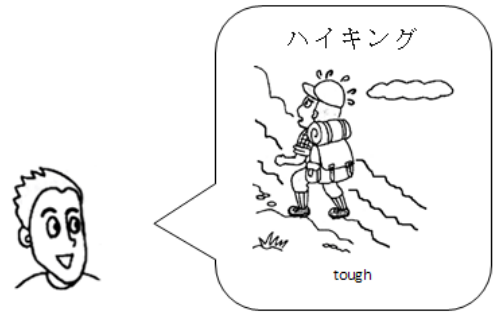

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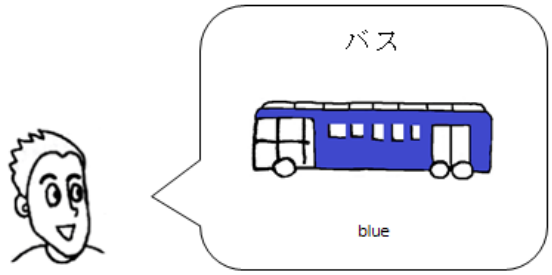

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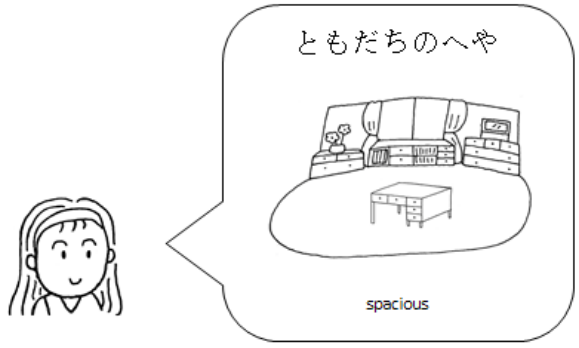

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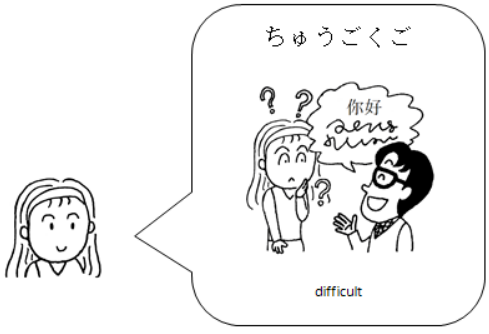

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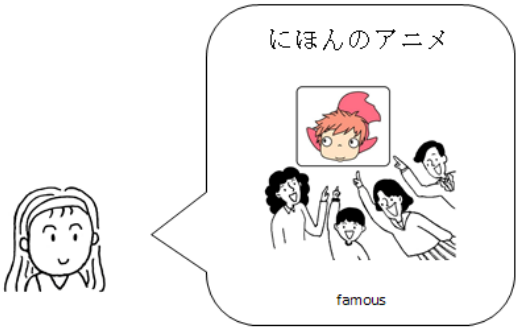
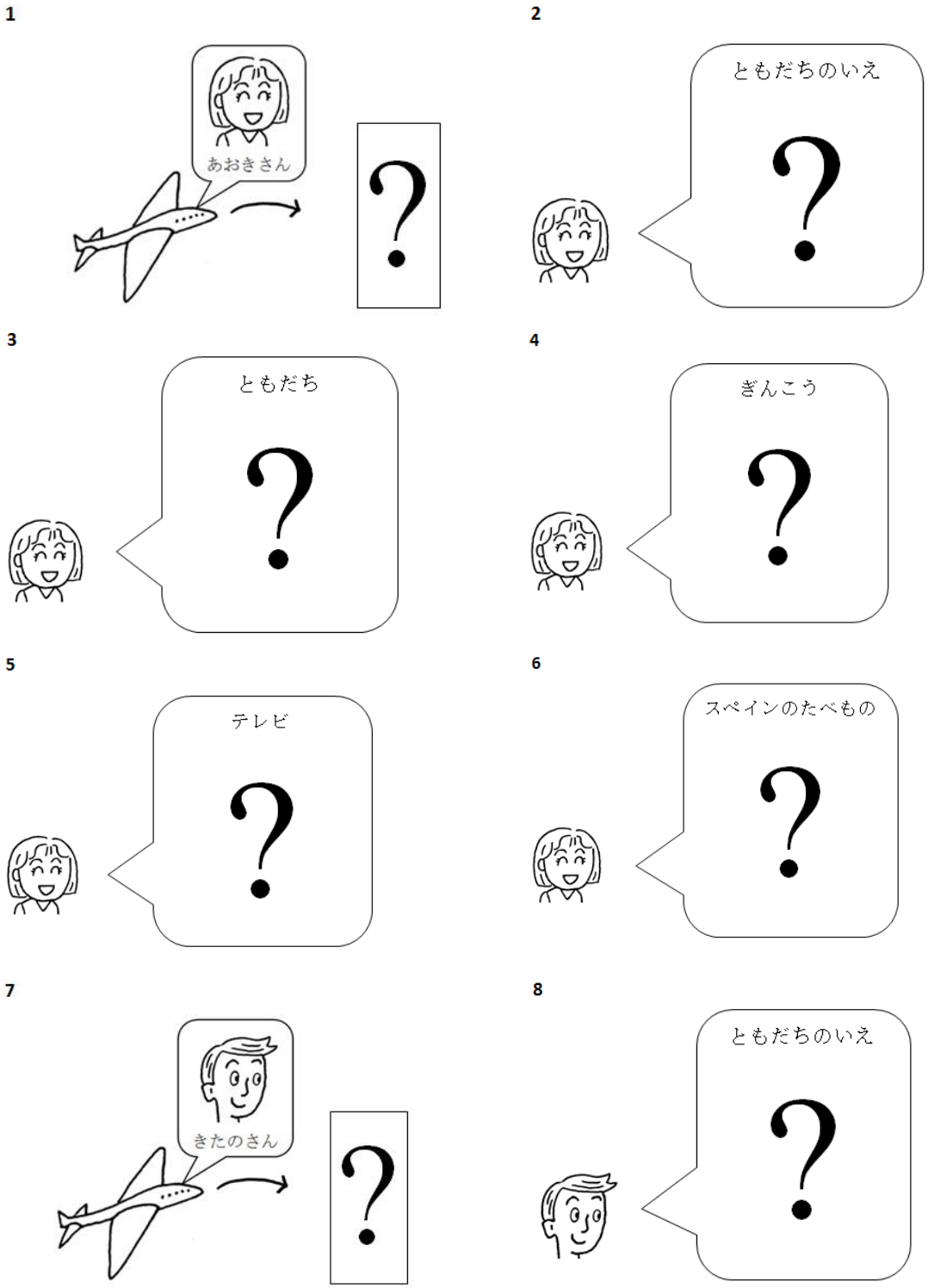


Appendix O
A picture set for delayed post-test (Researchers)



Images are adopted from *Genki: An integrated course in elementary Japanese* (1999) and *E de masutaa nihongo kihon bunkei 85* (1996)

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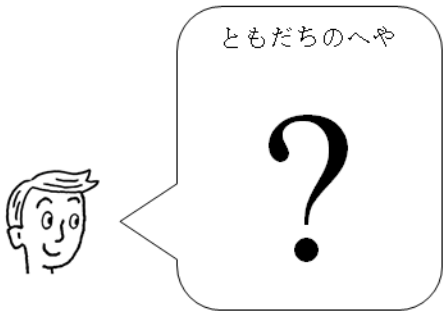

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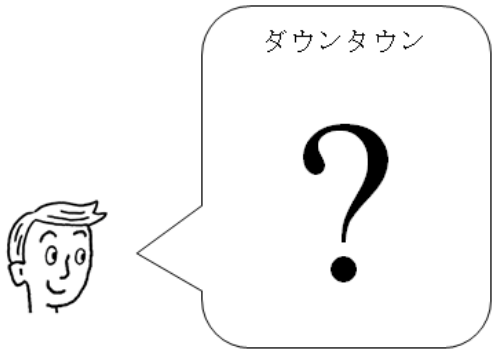

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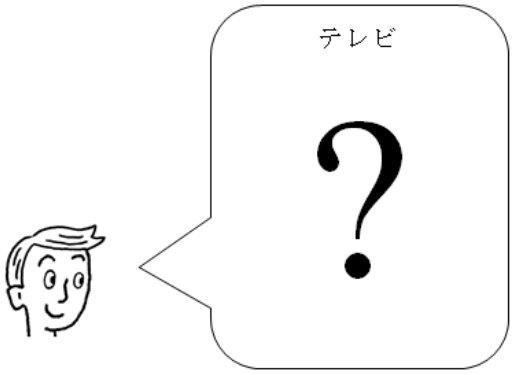

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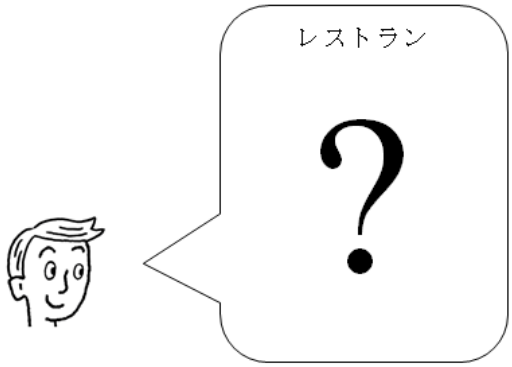

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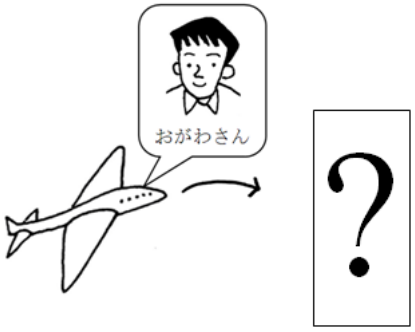

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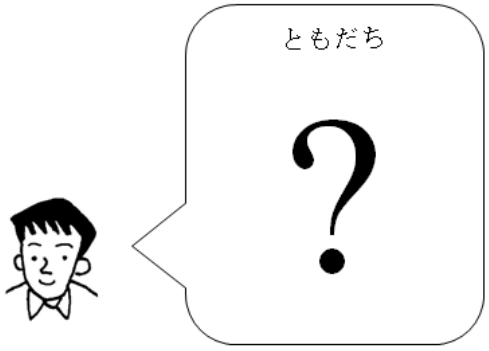

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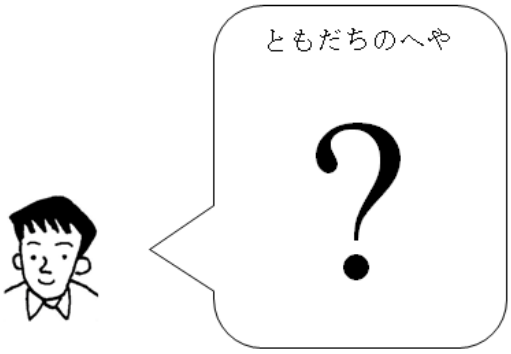

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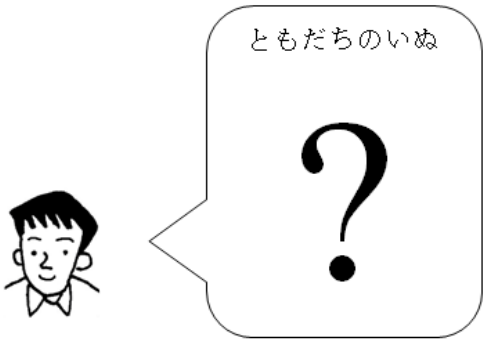

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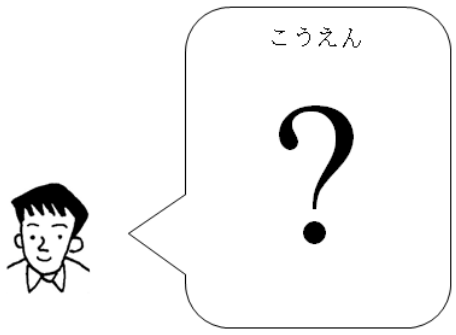

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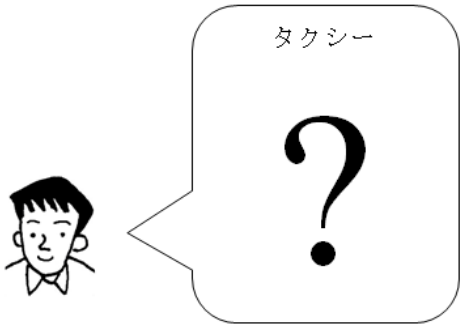

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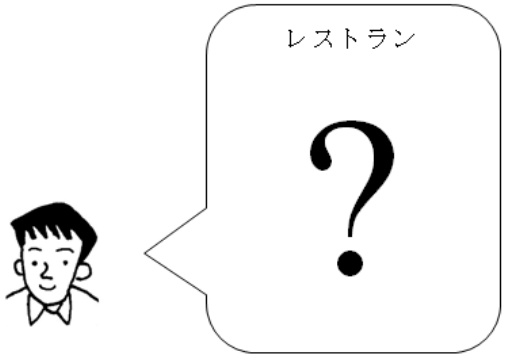

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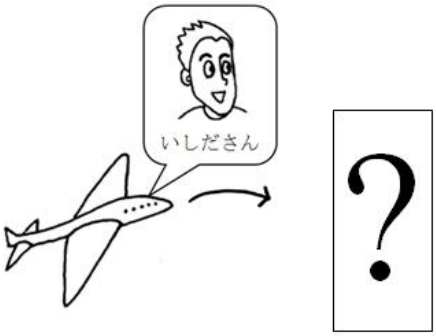

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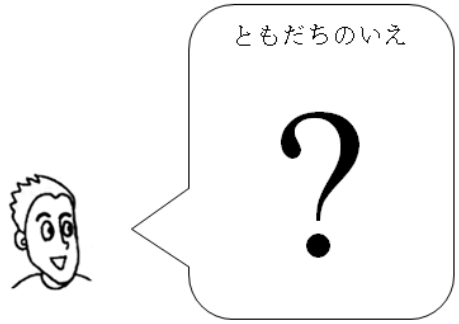

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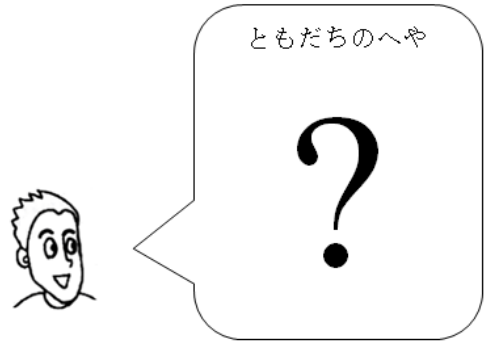

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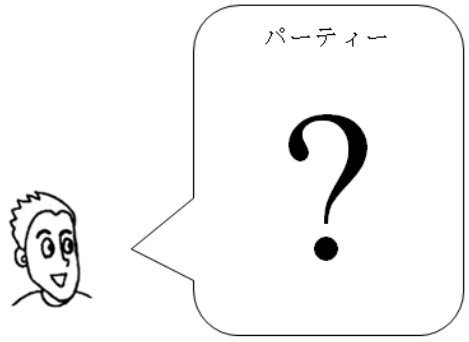

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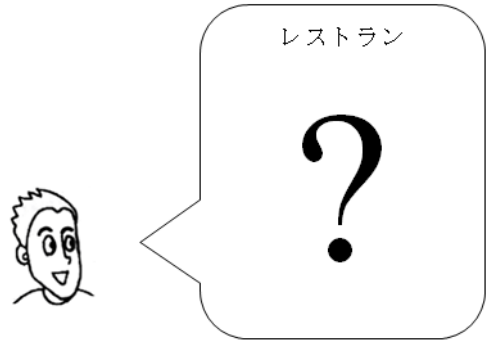

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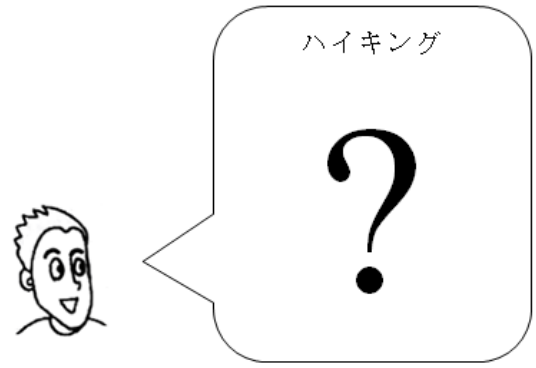

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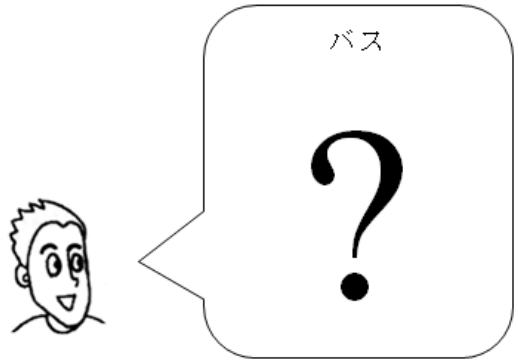

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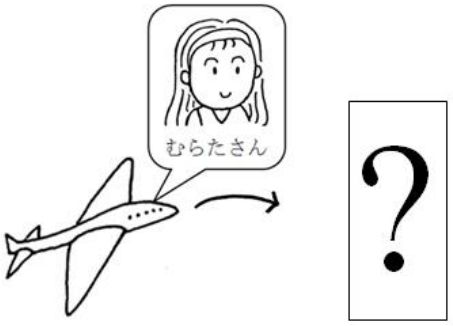

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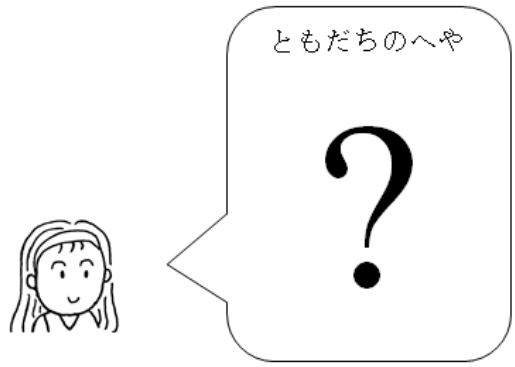

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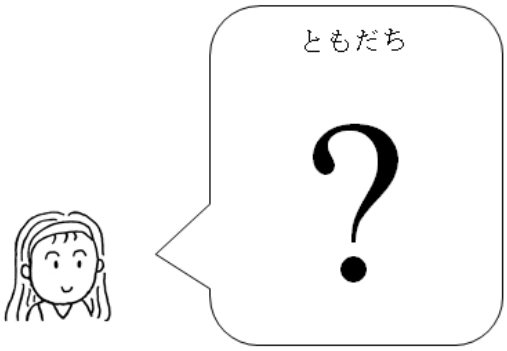

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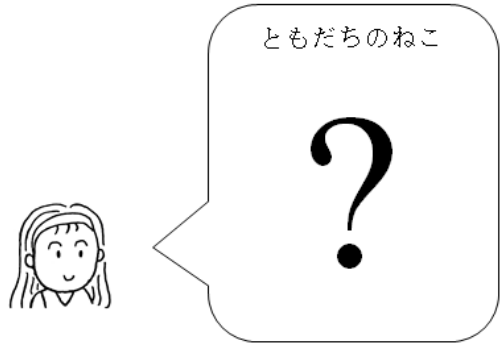

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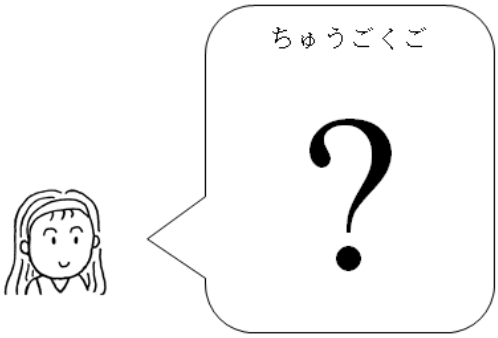

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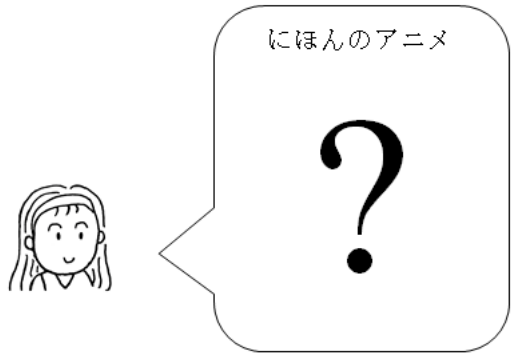

Appendix P
Exit questionnaire

Exit Survey

Please answer the following questions in English as accurately as possible. If you have any questions, please feel free to ask.

1) Did you think that this study focused on a specific grammar item?

Yes No

2) If you chose yes in question 1), please write down the grammar item which you thought this study focused on.

3) If you answered question 2), did you have opportunities to be exposed to this grammar item outside of this study over last six weeks? If so, please write down what kind of opportunities you had (e.g. you practiced this grammar item with your tutor or you read the textbook again).

4) Do you think that the interlocutor gave you feedback during videotaped sessions?

Yes No

5) If you chose yes in question 4),

a) can you tell us what kind of feedback you received from your interlocutor?

b) were you comfortable when you received feedback from the interlocutor?

c) did the feedback make you nervous? If yes, please explain why it made you nervous.

d) did the feedback help you to become better at using the specific grammar item orally? If yes, please write down the name/names of the grammar item(s).

e) did the feedback help you to enhance your overall speaking skills?

6) Please write down any comments related to this study.

Thank you very much for participating in this study! We appreciate your participation from the bottom of our heart! We really hope that this study was beneficial for you to improve your Japanese language skills. Again, thank you so much!

Appendix Q
Instructions for stimulated recall (Participants)

You are going to watch the video of the session we have just had. We are interested in what you were thinking **at the time** you were talking about the pictures.

When I have a question about what you were thinking, I will push pause. Then, I will ask you questions such as, “What were you thinking at this point?” Please say in English what you were thinking at that moment, but NOT what you are thinking right now.

Appendix R
Informed consent form

Consent to Participate in Research

Project Title:	The effect of mental processes triggered by oral corrective feedback and second language development
Principle Investigator:	Megumi Fujio (graduate student researcher) e-mail: megumi.fujio@mail.mcgill.ca
Supervisor:	Roy Lyster e-mail: roy.lyster@mcgill.ca
Department:	Integrated Studies in Education
University:	McGill University
Funder or Sponsor:	SSHRC (410-2011-0671): "Variables mediating feedback effectiveness: From feedback and repair types to learners' age and linguistic targets" (REB #437-0411) awarded to Dr. Roy Lyster

You are being invited to take part in a research study. **This is a consent form for research participation.** It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to ask questions before deciding whether or not to participate.

1. Why is this study being done?

The purpose of this study is to analyze the relationship between mental processes triggered by oral corrective feedback and second language development. Participants in this study will engage in communicative tasks in Japanese, and provide verbal reports about their thought processes during the task. Findings of this study may be published in academic journals.

2. What will happen if I take part in this study?

You will meet a research assistant four times in total in Education building Room 115 or in the library. First, you will be asked to answer a questionnaire. Then, you will engage in

communicative tasks with an interlocutor who is a native speaker of Japanese. The communicative task session will be audio-recorded, and it will take about 20 minutes. In the second session, you will engage in communicative tasks with an interlocutor. This part will be videotaped. After completing the task, you will watch the videotape and a research assistant will ask you to make verbal reports about your thought processes. This part will be audio-recorded. The second session will take about 30 minutes. In the third session, you will have same procedure as the second session. In addition to the same process, you will have another communicative task. This part will be audio-recorded. The whole session will take about 40 minutes. In the fourth session, you will engage in communicative tasks with an interlocutor. This part will be audio-recorded. Then, you will answer an exit survey. It will take about 30 minutes. All video and audio recordings obtained in this study are used only by the principal investigator, and the recordings will NOT be shared with any other person nor be used in any presentations.

3. Will my study-related information be kept confidential?

Data collected in this study will have only a subject code associated with it (not your name) so that data will not be identifiable. Only the principal investigator and a research assistant will have access to the original data, which will not be shared with any other person or third parties. Information will be stored in computer files protected with a password. The data will be stored for five years from the date of publication.

4. Can I stop being in the study?

Your participation is voluntary. You may choose not to participate without penalty or loss of the benefits to which you are otherwise entitled. All data collection procedures will be conducted by a research assistant until all the grades for EAST 240D2 (First Level Japanese) are submitted. This will ensure that your participation or non-participation in this study will not affect your grade in this course. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you and you will not lose any of your usual benefits.

5. What risks, side effects or discomforts can I expect from being in the study?

This is a minimal risk project. The activities that you will be doing have no more risk than you would come across in everyday life.

6. What benefits can I expect from being in the study?

Participants will receive up to $35 according to the following prorated compensation scheme:

Test	Compensation
Pre-test	$5
Post-test	$5
Delayed post-test	$5
Bonus for completing all tests	$20

7. Who can answer my questions about the study?

For questions about the study, please contact the Principal Investigator, Megumi Fujio, megumi.fujio@mail.mcgill.ca.

If you have any questions or concerns regarding your rights or welfare as a participant in this research study, please contact the McGill Ethics Officer at 514-398-6831 or lynda.mcneil@mcgill.ca

Signing the consent form

I have read this form, and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I will be given a copy of this form**.**

Printed name of subject

Signature of subject

AM/PM

Date and time

Appendix S

Background questionnaire

Participant Background Survey

Please answer following questions in English as accurately as possible. If you have any questions, please feel free to ask.

1. How old are you?

2. What is your major?

3. How many languages do you speak?

4. What is your primary language (i.e., the first language that you learned, in which you are the most proficient)?

5. What is your secondary language (i.e., your next most proficient language)?

6. What are your third and fourth most proficient languages?

Third Fourth

7. Please indicate your learning experience of Japanese.

High School ___ years, From ___to ____ , ___ Hours/week

College ___ years, From ___to ____ , ___ Hours/week

Home ___ years, From ___to ____ , ___ Hours/week

Elsewhere (specify)

___ years, From ___to ____ , ___ Hours/week

8. Do you have a family member who speaks Japanese? If so, please write down how Japanese is used in your communications with this family member (e.g. my mother sometimes talks to me in Japanese, but we usually talk in English)

9. Have you ever been to/lived in Japan? Yes No

If yes, please write down when and how long you stayed there.

10. Please write down any extracurricular activities related to learning Japanese (e.g. practice sessions with a conversation partner for 1 hour per week, or talking with Japanese friends for 30 minutes three times a week).