論　　文

Instance Theory's Implications for Improving EFL

MIKAMI Masahiro

1. Introduction

In English as a foreign language (EFL) education in Japan, emphasis has gradually shifted from traditional grammar-translation to a more communication-centric form of instruction. This shift responds to economic globalization and development of computer networks, which have reinforced the importance of English as a necessary means of communication. As a result, junior high school English textbooks have been edited to concentrate more on conversational dialogue. In 2008, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) made English the mandatory means of instruction in high school English classes. Further, in 2011, English became a compulsory subject in the elementary school curriculum.

On the other hand, English instructors who teach in Japanese educational settings are increasingly concerned that, during the shift of emphasis toward communicative usage, basic vocabulary and grammar have been neglected, which results in students' incomplete understanding of the language (Nishida, 2007). In reading comprehension, for example, instructors point out that students lacking basic grammar skills and vocabulary cannot perform higher-level processes (e.g., inferences, analyses, and predictions) in English (Shiki, 2006).

First, in this article, I affirm the proposition that automaticity in lower-level processes (e.g., lexical access and syntactic feature recognition) is the key to success in foreign language (FL) reading. Second, I explore automaticity's nature and underlying mechanism from the perspective of Logan's instance theory of automatization (1988). Finally, I contend that, within the time constraints of the Japanese EFL environment, achieving a high degree of automaticity in accessing chunks (i.e., sequences of words that represent perceptional and production units) should be the focus of instruction.

みかみ　まさひろ（経営情報学科）

2. Automaticity in Lexical Access and Syntax Parsing

2-1 Reading Comprehension in First Language

Research on reading in the first language (L1) has documented automaticity's importance in lexical access (i.e., recalling a word's meaning at recognition) for comprehension. LaBerge and Samuels (1974) suggested that fluent readers automatically recognize most words they read. In addition, they assemble the words, and make connections and inferences efficiently within the time span of working memory. For less fluent readers, by contrast, preceding information fades from working memory before words can be processed, with scant cognitive resources left for comprehension (Pikulski, 1997).

Skilled readers, however, are efficient in not only lexical access but also syntactic parsing and propositional integration (i.e., assembling information in a way that corresponds to previously read information). This is evidenced by English L1 readers being able to comprehend a text better when it is presented in chunk-segmented form than without segmentation (Cromer, 1970; O'Shea & Sindelar, 1983; Taguchi, et al., 2006).

Importantly, however, efficient lower-level processes alone do not make a skilled reader. Background knowledge and an ability to predict and infer also affect comprehension (Anderson & Pearson, 1984; Carrell & Eisterhold, 1983; Taguchi, et al., 2004).

2-2 Reading Comprehension Models of L1

In the widely accepted reading comprehension models for L1, lower-level and higher-level processes proceed concurrently (Rumelhart, 1977; Stanovich, 1980). Reading comprehension results from complex interactions of various processes that require lower-level processes to be automatized sufficiently well in order to make greater cognitive resources available for the higher-level, highly resource-demanding comprehension processes (Taguchi, et al., 2004). Thus, the reader's lower-level processes such as lexical access and syntax parsing should be adequately efficient to allow semantic proposition formation within the time span of working memory.

Less skilled readers might fail in this respect, consuming most of their cognitive resources on lexical access or syntax parsing and allowing preceding information to fade from working memory, thus making integration of propositions difficult. In skilled readers, on the other hand, lower-level processes are automatized.

2-3 Reading Comprehension in FL

There is no empirically established causal link between lexical access efficiency and FL reading comprehension enhancement (Fukkink, et al., 2005; Taguchi & Gorsuch, 2002; Taguchi, et al., 2004), or automaticity in syntax parsing and reading comprehension.

It is plausible, however, that the notion of automaticity in lower-level processes applies to FL reading. In fact, several researchers (e.g., Grabe & Stoller, 2002; Taguchi, et al, 2006) have suggested the importance of automaticity in lexical access and syntactic parsing. Moreover, Japanese EFL settings contain many students, who laboriously and painfully work on lexical items and grammatical structures when reading English passages.

Clearly, inefficiency in lexical access and syntactic feature recognition makes reading slow and laborious for FL learners. Thus, in contrast to L1 readers, who internalize some knowledge of vocabulary and syntax before learning to read, FL learners must begin with vocabulary and grammar, which then become automatized with practice (Grabe & Stoller, 2002; Koda, 1996).

As discussed in the following sections, for efficient FL reading, the lower-level processes can be automatized with practice because of their consistencies. In spite of their polysemy, lexical items carry the same meaning each time they are read. Likewise, syntactic rules govern words in the same way. The higher reasoning processes, on the other hand, cannot be automatized due to their irregularities, and are dependent on the context (Yoshimura, 2000). Thus, achieving sufficient automaticity in lexical access and syntactic feature recognition should be the priority of FL instruction.

3. Properties of Automaticity

Before discussing how to achieve automaticity in lower-level processes for EFL reading comprehension enhancement, we must explore the nature of automaticity and the conditions needed for its development.

Several researchers (Hasher & Zacks, 1979; LaBerge & Samuels, 1974; Logan, 1978, 1980; Schneider & Shiffrin, 1977) have characterized automaticity as possessing the following properties: speed, effortlessness, autonomy, and lack of conscious awareness. Further, it develops with repeated practice in consistent environments (Logan, 1978, 1979; Schneider & Shiffrin, 1977). Of the aforementioned properties, speed and effortlessness are particularly relevant to EFL.

Speed is an important property of automaticity, and reaction time decreases with repeated practice (Logan, 1997). The reaction speed follows the *power law* (Logan, 1988, 1992; Newell & Rosenbloom, 1981), which states that speed increases with repeated

practice, but gains, which are greatest early on, diminish with further practice.

Automatic performance is effortless, whereas non-automatic performance is not. We experience this automaticity regularly: we perform a much-practiced task with ease and even pay attention to another task concurrently (Logan, 1997).

Automaticity and non-automaticity can be viewed as the two extremes of a continuum, on which one process, being more automatic, is more prominent than the other (Logan, 1997).

4. Automaticity from the Perspective of Instance Theory

Logan (1998, 1990, 1992) proposed the Instance Theory of Automatization (ITA) based on episodic memory. It postulates that the performance of a task stores an instance representation or memory trace that can be retrieved when it is repeated. Further, a task-relevant knowledge base forms as the number of memory traces increases with repetitions (Logan, 1988).

This theory marked a major shift in the conceptualization of automaticity from "resource-based" (LaBerge & Samuels, 1974; Posner & Snyder, 1975; Schneider & Shiffrin, 1977) to "memory-based," governed by theoretical and empirical principles (Logan, 1995).

4-1 Three Pillars of Assumption

Logan's ITA rests on three pillars of assumption: obligatory encoding, obligatory retrieval, and instance representation.

4-1-1 Obligatory Encoding

The obligatory encoding assumption states, "Attention to an object or an event is sufficient to cause it to be encoded into memory" (Logan, 1998: 1720). Everything attended to becomes encoded in memory. How well it is encoded depends on the conditions of attention, but it is encoded nevertheless (Logan, 1992).

4-1-2 Obligatory Retrieval

The obligatory retrieval assumption states, "Attention to an object or event is sufficient to cause things that were associated with it in the past to be retrieved from memory" (Logan, 1998: 1720). Thus, the act that causes encoding also causes retrieval. Not only is everything attended to encoded in memory but also every trace associated with it in the past is recovered from memory simultaneously. The effectiveness of retrieval depends on the conditions of attention, but the retrieval process occurs nevertheless (Logan, 1992).

ITA asserts that obligatory retrieval involves a race among different memory traces and the first trace retrieved determines performance (Logan, 1988). As the number of memory traces increases with the repetitions of a task, so does the possibility that one trace is retrieved exceptionally fast. This explains the decrease in reaction time.

The trace fastest from scores of traces is likely to be significantly fast. However, it is unlikely that the trace retrieved fastest from the scores of traces plus one will be much faster. This accounts for the gradual slowing down of the decrease in reaction time in the *power law* (Logan, 1997).

4-1-3 Instance Representation

The instance representation assumption states, "Each trace of past objects and events is encoded, stored, and retrieved separately, even if the object or event has been experienced before" (Logan, 1998: 1720). Thus, each discrete experience (even an often repeated one) is represented as a separate memory trace.

Each experience is encoded as "a constellation of co-occurrences of the features, properties, objects, and so forth that comprise it" (Logan & Etherton, 1994: 1022). Thus, a memory trace can consist of stimuli, responses made to them, judgments made about them, or interpretations made from them, all bound together (Logan, 1998).

4-2 Automaticity: Memory Retrieval

According to ITA, automatic performances result from the retrieval of memory traces, whereas non-automatic ones involve costly algorithms (Logan, 1988, 1990). The theory states, "All examples of automaticity are based on the same kind of processing —memory retrieval" (Logan, 1997: 133). When people repeatedly perform a task, obligatory encoding accumulates in memory instance representations of the act; then, obligatory retrieval supports their performance when they repeat the task (Logan, 1995).

The development of automaticity requires consistency. Consistency ensures the increase of the useful memory traces, which reinforces retrieval strength and speed (Logan, 1988). Repeating a task allows all its memory traces to develop into a knowledge base, and all traces of that base are retrieved to support a particular performance of the task (Logan, 1995). The number of memory traces accumulated and instances retrieved increase with the number of repetitions. Thus, the memory to task response becomes stronger and faster.

ITA does not assume any processing capacity, arguing that non-automatic

performance results from a lack of memory traces and not cognitive resources. Thus, although process-based learning could work in novel situations and stimuli, automaticity (in view of ITA) occurs only in response to specific stimuli and situations. Its transfer to novel situations with unfamiliar stimuli would not be good (Logan, 1988).

5. ITA's Implications for EFL

5-1 Teaching in Chunks

In English, a chunk is a sequence of words that represents a perceptual and productive sense unit (Kadota, 2007; Tsuchiya, 2004). A sentence consists of chunks, each of which contributes to the sentence's meaning.

A chunk may be of several types: a group of words governed by grammatical rules, or a group segmented into smaller units by analytic processing (e.g., free combinations, restricted collocations, figurative idioms), or it might not be subject to segmentation (e.g., pure idioms).

A chunk can be interpreted by the meanings of lexical items in it and its syntactic structure. It can be perceived as the total images of the words that constitute it (e.g., free combinations, restricted collocations, figurative idioms). In addition, a chunk can itself represent an interpretation (e.g., pure idioms).

Since long passages usually contain more complex structures than conversational ones (Yoshimura, 2000), teaching in chunks is preferably accomplished with reading materials. Indeed, the importance of learning syntactic features cannot be overemphasized for Japanese EFL learners, whose native language is so linguistically distant from English.

5-2 Automaticity in Accessing Chunks

ITA's obligatory encoding assumption suggests that vocalizing a chunk with its interpretation clearly in mind forms an instance representation in which its orthography, phonology, and interpretation combine in memory.

ITA's instance representation assumption predicts that repeated vocalizing of a chunk increases the number of its memory traces (i.e., instance representations), which respond strongly and quickly to it due to obligatory retrieval. Memory response becomes stronger and faster with the increase in instance representations, leading to automaticity in accessing the chunk. In addition, memory response to the lexical items, syntactic structure or segmented units of the chunk also becomes stronger and faster with an increase in instance representations of the chunk.

5-3 Expanding Consolidated Knowledge Base

ITA indicates that increasing the number of automatized chunks in memory (i.e., massive accumulation of the chunk's instance representations) leads to proficiency in EFL. Upon encountering a novel sentence, visually or aurally, its components (e.g., lexical items, syntactic features, units of chunks, and chunks) trigger a strong, rapid response from automatized components stored in memory that ensure availability of space for the higher-level comprehension processes. Efficient access to chunks may also improve speech production's fluency and accuracy by allowing more processing and manipulation time. Thus, amassing automatized chunks serves as a knowledge base that a learner can efficiently access for language comprehension and production.

When assessing Japanese EFL education, we must consider the extremely limited time allotted to junior and senior high school English instruction. Assuming that a student receives four 50-minute English sessions weekly for 35 weeks a year during junior high school and six 50-minute classes weekly during high school, a total of 875 hours are spent learning English. On comparing this with the 35,040 hours that children need to acquire their native tongue (Suzuki, 2003), it is clear why our students struggle with English. Moreover, students learn English as a foreign language, so they are not forced to use it regularly.

Therefore, expecting Japanese students to fully develop communicative competence (i.e., the ability to listen, read, speak, and write with relative ease) is unrealistic. The curricula should place greater emphasis on internalizing the basis for communicative competence rather than on the competence itself: i.e., on automaticity in accessing chunks. Students should be encouraged to consolidate chunks in their memory through constant repetition and not to engage in a variety of communication activities. Of course, once curricular emphasis shifts to building such automaticity, instructors would be responsible for its classroom implementation.

In an environment that forces one to use only English, automatized linguistic resources would immediately serve as an efficiently accessible reservoir for language comprehension and production. Furthermore, those internalized resources also serve as a foundation for the four English language skills necessary to achieve academic and professional goals.

6. Conclusions

This article's purpose was to concur with a widely accepted view among researchers that inefficiency in lower-level processes (e.g., lexical access and syntactic feature recognition) prevents improvements in FL reading, and therefore they must be

automatized through practice to enhance comprehension. Logan's instance theory was employed to explore automaticity's nature and underlying mechanism. It asserts that automaticity results from memory retrieval and that the accumulation of memory traces reinforces automaticity. With regard to the EFL setting, Logan's theory suggests internalizing chunks through constant repetition and increasing the number of internalized chunks in order to develop a knowledge base that an EFL learner can efficiently access, while listening, speaking, reading or writing. As the time spent learning English in the current Japanese educational system is limited, building and expanding such a knowledge base should be the focus of student instruction.

References

Anderson, R. C.,& Pearson, P. D. (1984). A schema-theoretic view of basic processes in reading comprehension. In P. D. Pearson (Ed.), *Handbook of reading research* (255－292). New York: Longman.

Carrell, P. L.,& Eisterhold, J. C. (1983). Schema theory and ESL reading pedagogy. *TESOL Quarterly, 17*, 553－573.

Cromer, W. (1970). The difference model: A new explanation for some reading difficulties. *Journal of Educational Psychology, 61*, 471－483.

Fukkink, R. G., Hulstijn, J., & Simis, A. (2005). Does training in second-language word recognition skills affect reading comprehension? An experimental study. *Modern Language Journal, 89*, 54－75.

Grabe, W., & Stoller, F. L. (2002). *Teaching and researching reading*. Harlow: Pearson Education. Hasher, L., & Zacks, R. T. (1979). Automatic and effortful processes in memory. *Journal of Experimental Psychology: General, 108*, 356－388.

Kadota, S. (2007). *Science of Shadowing and Reading Aloud*. Tokyo: Cosmopia.

Koda, K. (1996). L2 word recognition research: A critical review. *Modern Language Journal, 80*, 450－460.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology, 6*, 293－323.

Logan, G. D. (1978). Attention in character classification: Evidence for the automaticity of component stages. *Journal of Experimental Psychology: General, 107*, 32－63.

Logan, G. D. (1980). Attention and automaticity in Stroop and priming tasks: Theory and data. *Cognitive Psychology, 12*, 523－553.

Logan, G. D. (1988). Toward an instance theory of automatization. *Psychological Review, 95*, 492－527.

Logan, G. D. (1992). Shapes of reaction-time distributions and shapes of learning curves:

A test of the instance theory of automaticity. *Journal of Experimental Psychology: Learning, Memory and Cognition, 18*, 883－914.

Logan, G. D.,& Etherton, J. L. (1994). What is learned during automatization?: The role of attention in constructing an instance. *Journal of Experimental Psychology: Learning, Memory and Cognition, 20*, 1022－1050.

Logan, G. D. (1995). The Weibull distribution, the power law, and the instance theory of automaticity. *Psychological Review, 102*, 751－756.

Logan, G. D. (1997). Automaticity and reading: Perspectives from the instance theory of automatization. *Reading & Writing Quarterly, 13 (2)*, 123－146.

Logan, G. D. (1998). What is learned during automatization?: Obligatory encoding of spatial location. *Journal of Experimental Psychology: Human Perception and Performance, 24*, 1720－1736.

Newell, A., & Rosenbloom, P. S. (1981). Mechanisms of skill acquisition and the law of practice. In J. R. Anderson (Ed.), *Cognitive skills and their acquisition* (1－55). Hillsdale, NJ: Erlbaum.

Nishida, H. (2007). Improving Reading with the Help of Reading Aloud. *Aichi University Language and Culture, 16*, 117－131.

O'Shea, L. J., & Sindelar, P. T. (1983). The effects of segmenting written discourse on the reading comprehension of low- and high-performance readers. *Reading Research Quarterly, 18*, 458－465.

Pikulski, John. (1997). Teaching Word-Identification Skills and Strategies: A Balanced Approach. In *Invitations to Literacy*.

Posner, M. I., & Snyder, C. R. R. (1975). Attention and cognitive control. In R. L. Solso (Ed.), *Information processing and cognition: The Loyola symposium* (55－85). Hillsdale, NJ: Erlbaum.

Rumelhart, D. E. (1977). Toward an Interactive Model of Reading. In S. Dornic (ed.), *Attention and Performance, 6*, 573-603. New York: Academic Press.

Schneider W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing: Detection, search, and attention. *Psychological Review, 84*, 1－66.

Shiki, O. (2006). Teaching Reading Using the Shadowing Method: The Effect of Repetition on Comprehension. *Journal of Inquiry and Research, 84*, 212－228.

Stanovich, K. E. (1980). Toward an interactive compensatory model of individual differences in the development of reading fluency. *Reading Research Quarterly 16*: 32－71.

Suzuki, J. (2003). *English Teaching from the Perspective of Language Processing*. Presented at the 6th annual conference of the English Phonetic Society of Japan

Kansai-Chugoku Branch.

Taguchi, E., & Gorsuch, G. J. (2002). Transfer Effects of Repeated EFL Reading on Reading New Passages: A Preliminary Investigation. *Reading in a Foreign Language, 14(1)*, 43－65.

Taguchi, E., Takayasu-Maass, M., & Gorsuch, G. J. (2004). Developing reading fluency in EFL: How assisted repeated reading and extensive reading affect fluency development. *Reading in a Foreign Language, 16(2)*, 70－96.

Taguchi, E., Sakamoto, E., & Gorsuch, G. J. (2006). Developing second and foreign language reading fluency and its effect on comprehension: A missing link. *The Reading Matrix, 6(2)*, 1－18.

Tsuchiya, S. (2004). *Instruction of Reading Aloud*. Tokyo: Kenkyusha.

Yoshimura, F. (2000). Automaticity Theory and EFL in Japan: With Some Specific Applications for Reading. *Literacy Across Cultures Spring/Summer 2000*, 1－10.

（平成24年10月31日受付、平成24年11月19日受理）