Neuroscience-Informed Language Pedagogy: Enhancing Business English Learning in the Japanese University Context

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This paper summarizes the author's contribution to the LLL SIG-sponsored forum "Bridging Social Distances in Online Learning" presented at the JALT 2025 CUE SIG Conference, co-presented with Zuocheng Zhang, Yasuo Nakatani, Rachel Patterson, Julia Kimura, Brent Amburgey, Yoshiko Matsumoto, among others.

The aim of this report is to explicate the manner in which insights from neuroscience can sharpen TESOL methods for Japanese university Business English classes, and TESOL instruction more generally, ranging from enhanced memory retention to more effective communication. The discussion centers on core variables such as motivation, attention, repetition, multisensory learning, chunking, and empathy, revealing how brain-based methods can boost memory, sustain engagement, and strengthen intercultural skills. For instance, when dopamine fuels motivation and tasks spark emotion, the brain retains information more effectively. Increased motivation and emotional salience can be combined with spaced repetition to support long-term recall. Meanwhile, empathy and social learning enhance communicative competence in global contexts. In Japanese classrooms, these strategies advance language learning beyond unimpactful grammar drills, enabling students to speak confidently in international business interactions and collaborate more smoothly with colleagues from other cultures. Classrooms thus function as structured simulation environments that prepare learners for authentic professional experiences.

Keywords: neuroscience, TESOL, Japanese business English, memory, motivation, language learning, salience

Introduction

Japan is fast becoming a significant participant in international commerce, and this development necessitates educational approaches that both enhance memory retention and sustain learner motivation. Neuroscience provides a foundation upon which TESOL can design more effective methods for second language

instruction. This report examines the integration of neurological findings into TESOL materials to strengthen learners' retention of newly acquired vocabulary, sustain engagement with course content, and support cross-cultural communication. Although the discussion draws from Japanese Business English classrooms, the brain-based pedagogical principles presented here hold broader value for TESOL and can help prepare students to participate in global interaction and multicultural teamwork.

General Neuroscience and TESOL Learning Principles

Dopamine, Motivation, and Learning

Dopamine supports students' motivation, influences how they respond to rewarding experiences, and strengthens learning, making it especially important in second language teaching. According to Bromberg-Martin et al. (2010), dopamine neurons do not simply respond to rewards. These neurons also register signals related to interest and alertness, allowing students to focus more effectively on meaningful learning activities (Figure 1; Bromberg-Martin et al., 2010).

Figure 1 explains that dopamine neurons work in two useful ways for learning. The first type, the salience-coding neurons, responds to events that are new, interesting, or socially important, helping learners direct their attention and stay mentally engaged. The second type, the value-coding neurons, respond when something is rewarding, helping learners evaluate and remember what is valuable. The alerting signal shown between these two types helps prepare students to notice and process meaningful information. In this way, dopamine supports attention, motivation, and learning—not only through rewards but also through meaningful engagement.

This explains why classroom tasks that feel exciting, relevant, or socially interactive—such as active group discussions—tend to be remembered more strongly. Kelly (2013) notes that dopamine connects motivation, reward, and learning. Gruber et al. (2014) likewise show that curiosity strengthens memory through dopamine.

For this reason, TESOL activities can be designed to stimulate dopamine responses, increasing attention and supporting long-term memory.

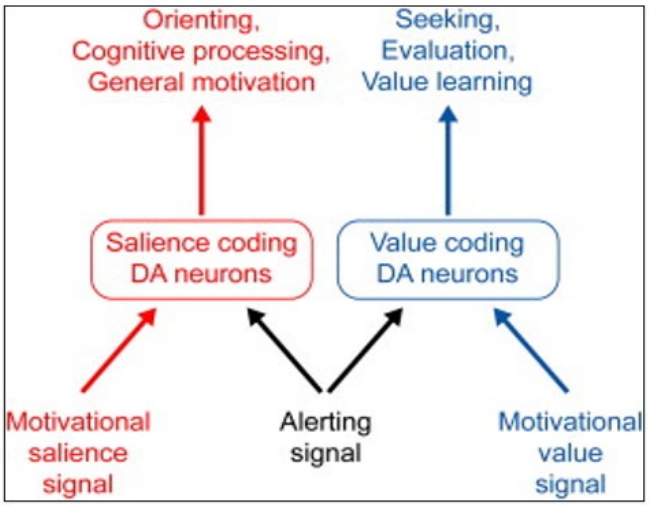

Figure 1: Motivational and Alerting Signals (Bromberg-Martin et al., 2010)

Attention, Emotion, and Retention

Attention only stretches so far, and neuroscience reveals that when lessons are not interesting and have no spark of surprise, students rapidly lose their attention. Medina (2009) confirms that "people don't pay attention to boring things," explaining that focus starts to fade in about ten minutes unless something triggers it again, e.g., a joke or a story that resonates with students' experiences. Al-Shargie et al. (2019) corroborate this view, noting that monotonous or repetitive stimuli can quickly lead to a vigilance decrement, where sustained attention declines, cognitive efficiency drops, and errors increase. Military psychology shows similar results. Warm et al. (2009), for example, demonstrated that accuracy in detecting signals decreases sharply as the duration of vigilance increases (Figure 2). The graph illustrates that correct detections begin near 95% at ten minutes but drop to around 70% at thirty minutes, and continue declining beyond that point. In other words, sustained attention deteriorates rapidly over time when engagement is not renewed. In the context of teaching English as a second language, the deterioration in concentration spans underscores the need for varied and engaging activities that keep learners alert, motivated,

and fully immersed in the learning process.

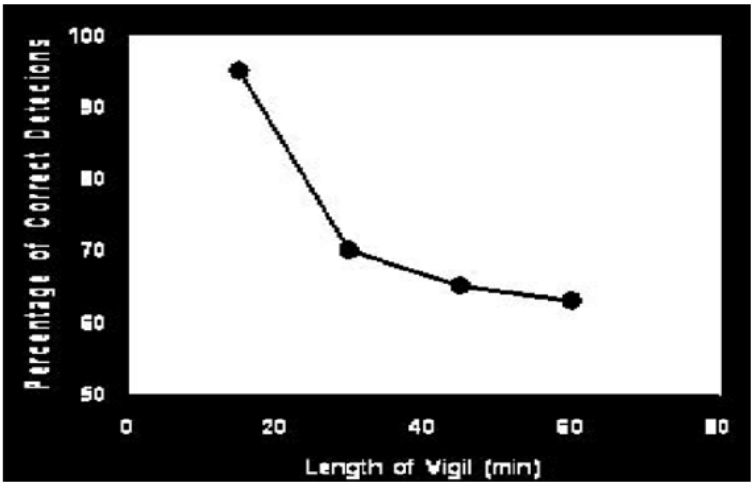

Figure 2: Vigilance Decrement (Warm et al., 2009)

Emotion shapes the way people learn. Tyng et al. (2017) opine that emotions not only direct attention but also strengthen memory, allowing learners to concentrate on what is most relevant and recall it more effectively. Kelly (2013) also asserts that emotion guides a person's thought on what is meaningful, which in turn helps students to recall it easily later. For learners, engagement in emotionally charged activities such as role playing can give the spark they need to stay fully engaged. Storytelling, humor, and real-life examples do not just reset the attention "clock"; they lock the lesson into memory by tying it to the moments charged with feeling.

In Business English classes, empathy and emotion impact the learning process. Nouri (2014) clarifies that humans are naturally built for dialogue, where social and cognitive threads weave together, letting learners build knowledge step by step through real, meaningful exchanges. When a conversation sparks emotion, it is easily retained by learners. Meaning is anchored on personal memories or cultural touchstones and that bond simplifies the ability to remember. Neuroscience research revealed that mirror neurons, linked to both language and empathy, helps learners to simulate another person's intentions and emotions (Hickok, 2009; Corballis, 2010). Hence, when people participate in conversations that carry real emotional weight, they sharpen their language skills and become more empathetic. Therefore, dialogue-based, emotionally resonant tasks foster both linguistic competence and intercultural

empathy.

Repetition for Lasting Learning

Memory in learning is not built by a single moment but the recurrent learning processes. According to Medina's (2009) Brain Rule number 5, "Repeat to remember," one can lock something into the long-term memory by revisiting it at spaced intervals. Kelly (2011) further explains that when one repeats an action, the same neurons react again, triggering a burst of dopamine, helping new synapses to form. Ghazi-Saidi and Ansaldo (2017) affirm this idea by using fMRI scans to show that repeating and imitating words in a second language reshapes the brain, while also tightening the links between language and control networks. In TESOL, this process facilitates building the structured cycles of exposure, for example weaving the same new word into conversations and readings.

Multi-Sensory Learning

Learning should go beyond the abstract input, as it thrives on rich sensory engagement. Medina (2009) claims that learners retain more knowledge when information is presented through multiple sensory channels, including visual, auditory, and kinesthetic. The multisensory learning approach brings these channels together, allowing learners to see the information visually, hear it through meaningful use, and experience it through physical interaction (Figure 3). By engaging visual, auditory, and kinesthetic pathways simultaneously, the brain processes information more deeply and creates stronger memory connections. This approach is especially relevant in TESOL, where learners benefit from seeing a word, hearing it in a conversation, and physically enacting it through gestures or role plays. Curtis (2011) expands on this idea by identifying the deep processing factors that shape effective learning: connecting to prior schema, engaging with novelty, storytelling, problem-solving, and peer interaction. These tasks help to ensure that multisensory input runs deeper than surface impressions, anchoring it to real meaning.

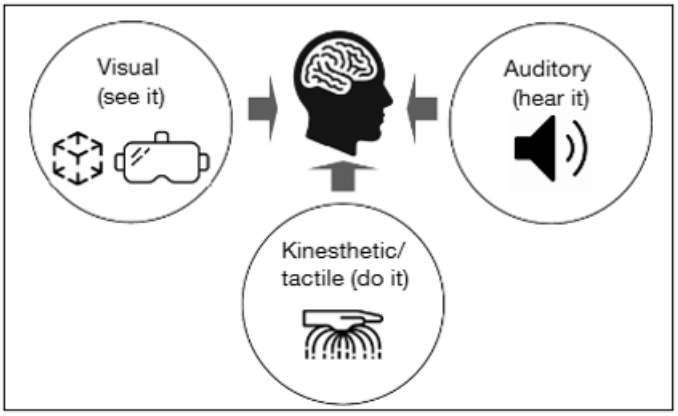

Figure 3. Multisensory Learning Approach (Sanfilippo et al., 2022)

The brain's dopamine salience system boosts the learner's memory. In this regard, Bromberg-Martin et al. (2010) emphasize that dopamine neurons respond strongly to salient events, whether positive or negative, and this response helps to prioritize what enters the memory. Findings from Musfeld et al. (2024) further support this argument by illustrating a clear performance difference between high- and low-salience conditions (Figure 4). In the high-salience condition, approximately 65% of participants recognized repeated cues, whereas only about 30% did so under low salience; similarly, long-term memory scores remained significantly higher when salience was present. These findings confirm that salience not only facilitates immediate recognition but also supports durable memory retention. Hence, salience contributes to both working memory and long-term retention. For TESOL, the impact of salience has implications for the design of materials, as they are required to be more than just text and sound, and can be expanded to visual infographics, task simulations, and embodied activities like role plays, with crucial patterns in the input being made salient through highlighting and prosodic emphasis.

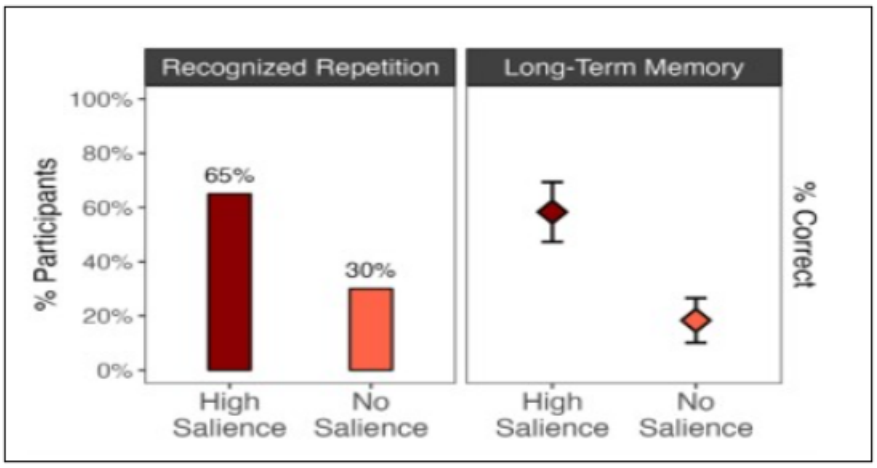

Figure 4: Effect of Salience on Recognition and Recall (Musfeld et al., 2024)

Chunking and Working Memory

Working memory—the mental “notepad” of the brain—has been found to hold only a few pieces of information at once. To prevent working memory from getting overloaded, learners benefit from “chunking,” which is grouping information into meaningful units (Thalmann et al., 2019). For example, it is easier to remember “How are you today?” as one expression rather than recalling each word separately. According to Norris and Kalm (2021), short-term verbal memory is enhanced when words can be organized into larger units; this effect is reminiscent of data compression, enabling more information to fit inside the limited capacity of the brain. In TESOL, chunking may be used in teaching formulaic expressions, collocations, and dialogue frames. Organizing words into larger units not only enhances the efficiency of working memory but also contributes to fluency since learners retrieve pre-formed language chunks instead of suffering through individual words.

Overall, learning is more effective when the brain is engaged in natural ways. This alignment between cognitive processes and teaching practices can be seen in the neuroscience principles that support learning (Table 1). The table highlights how reward and curiosity activate the brain’s reward system, how emotional engagement supports attention, and how repetition stabilizes long-term memory. It further shows that engagement of multiple senses deepens processing, that chunking aids recall by reducing cognitive

load, and that social connection supports motivation and collaboration. Taken together, these principles offer a coherent conceptual map for brain-informed pedagogy. Importantly, they demonstrate that effective TESOL instruction is not a matter of isolated techniques, but of integrating interconnected processes that align with how the brain naturally learns and remembers.

Principle	Key Idea
Brain's reward system	Rewards and curiosity boost memory
Attention & emotion	Emotion and novelty enhance focus
Repetition	Spaced practice strengthens memory
Multisensory learning	Engaging multiple senses improves learning
Chunking	Grouping information aids recall
Empathy	Social connection supports learning

Table 1. Neuroscience Principles Supporting Learning

Application to the Japanese University / Business English Context

Japanese university students often study English for years through grammar drills, tests, and teacher-centered lessons. Yet in real communication, they may still struggle to recall words, speak with confidence, and understand cultural nuances. Business English makes this even harder because it requires not only accurate language but also intercultural fluency. Neuroscience-informed TESOL offers new ways to address these problems. By grounding classroom practices in how the brain naturally learns, teachers can support deeper engagement with vocabulary, stronger memory consolidation, and more spontaneous language recall.

Strategies such as multisensory input, contextualized repetition, meaningful chunking, and salience-based highlighting can help Japanese learners move from memorization to usable communication. Moreover, neuro-based methods promote intrinsic

motivation, which is often muted in highly exam-focused settings. Students begin to view English not as an academic requirement but as a tool for participation in global teamwork, negotiation, problem solving, and professional networking. This shift is especially crucial in Business English, where clarity, responsiveness, and interpersonal awareness carry as much weight as grammatical accuracy.

When lesson design incorporates elements identified in neuroscience—reward, attention, social collaboration, emotional salience, and retrieval practice—Japanese students gain not only language proficiency but also increased willingness to communicate. In this sense, the neuroscience perspective does more than improve memory; it supports the development of communicative confidence and cross-cultural competence, both of which are central to success in international business environments.

Motivation and Professional Scenarios

Dopamine research underscores learning's core functions of motivation and reward (Bromberg-Martin et al., 2010; Kelly, 2013). For Japanese Business English learners, task design that incorporates elements of real-life professional situations can effectively engage curiosity and reward mechanisms. A perfect example is the mock negotiation role play wherein students attempt to reach an agreement in teams, successfully eliciting intrinsic motivation, especially when gamified through points, rankings, or peer recognition. Additionally, social motivation remains a strong driving force in Japan's collectivist culture. While helping students to work together in teams, group assignments also integrate learning with cultural principles regarding harmony and contributions to society. According to Gruber et al. (2014), curiosity helps consolidate memories through dopaminergic activity; hence tasks presented as real-world challenges (for example, "How would you sell a Japanese product in Europe?") promote intellectual curiosity while facilitating long-term retention.

Focus, Emotion, and Meaningful Content

Attention is fragile, and it declines easily within minutes if not renewed. To maintain attention in Japanese classrooms, activities need to be introduced at different tempos and formats. For instance, introducing debate with video analysis of short films followed by reflective writing breaks monotony and recharges learners' attention "clock." However, emotion reinforces that effect: Tyng et al. (2017) show that emotionally arousing content enhances both attention and memory consolidation. Business English materials can make use of this principle by including case studies with emotional resonance, for instance touching upon cultural blunders made by Japanese firms abroad or improvising the tension of first meeting foreign colleague.

Humor and storytelling further enhance engagement. Telling stories about successful Japanese entrepreneurs in the global marketplace not only illustrates professional English usage but also provides culturally relevant encouragement. As Nouri (2014) asserts, humans are inherently predisposed to interaction, which relates to emotional development accompanying cognitive growth. Class discussions that involve genuine disputes or negotiations reflect this, allowing students to acquire language in emotionally salient contexts while they practice professional communication.

Repetition for Retention

Without some structured support, vocabulary and phrases quickly fade. Neuroscience reiterates that once the neural connections are strengthened, then long-term memory is formed through repetition (Medina, 2009; Curtis, 2011). In the case of Japan's Business English learners, educators can design spiral syllabi that revisit important business lexicons like "deadline," "partnership," and "proposal" in contexts such as emails, oral presentations, and negotiations. Practical tools include digital flashcard applications featuring spaced repetition algorithms, in-class review rounds where old vocabulary is applied in new tasks, and student-led quizzes. The Repetition Networks article by Ghazi-Saidi and

Ansaldo (2017) states that networks for both language and control are modified through repetition; this reinforces the neural basis of practice. As for Japan, neuroscience implies a significant shift from sheer volume in memorization to strategic spacing and contextual variety to enhance memory.

Multi-Sensory Practices

Human brains learn most effectively when engaged through multiple sensory channels. In the context of Japanese Business English classes, where there is a great deal of dependence on textbooks, multi-sensory and embodied approaches make learning much more effective. Students may see visuals such as infographics pertaining to market trends or diagrams explaining email etiquette. They may also listen to international podcasts or engage in simulation activities like conference calls, which help to augment their listening abilities. Kinesthetic activities include role play scenarios, mock interviews, and impromptu presentations where they can express themselves through gestures and body motion. These methods connect language with real-life experiences making the lessons memorable while helping students gain confidence along with practical communication skills. Curtis (2011) highlights the following three important aspects to support deep processing: novelty, storytelling, and social interaction. Activities such as negotiation games or cross-cultural simulations allow learners to connect language with real-world embodied action. In addition, through imitation of others' gestures and vocal features, they can create speech and empathy enabled by mirror neurons (Hickok, 2009; Corballis, 2010). Thus, the imitation mechanism strengthens both pronunciation and intercultural understanding.

Chunking and Formulaic Expressions

Working memory is limited, so learners benefit from chunking language into ready-made phrases. Japanese learners of English need ready-made phrases very much because, as Norton (2001) observes, they often struggle in conversations due to differences

between Japanese and Western normative uses of formulaic expressions. While Japan's set phrases such as *Itadakimasu* before eating are highly predictable, English boasts an expansive yet less fixed and context-dependent range of expressions (Norton, 2001). Business English teaching may address this gap by teaching formulaic chunks such as "I look forward to your response." Such chunks directly that serve as tools for conversation and reduce cognitive load during interactions. Chunking is a form of information compression that enhances retrieval speed and ease (Norris and Kalm, 2021). Learners acquire useful tools for practical use by learning these expressions in the context of dialogue frames such as opening a meeting, apologizing, or negotiating terms.

Empathy and Intercultural Skills

Apart from the execution of language, neuroscience-influenced TESOL also stresses the role of empathy and social cognition in communication. As Nouri (2014) notes, dialogue is biogenically rooted in human cognition and cannot be dissociated from emotional processing. Authentic dialogue in Business English classrooms, whether through intercultural simulations or collaborative problem-solving, is neural interdependence at work. Students do much more than practice vocabulary; they live the social and emotional dynamics of communication. For Japanese students, who are likely to be globally employed, this statement means that Business English lessons can also serve as training in intercultural empathy. When students work together across borders, they need more than just English, they have to read subtle shifts in tone, respect different viewpoints, and adapt the way they communicate to fit the moment.

Pedagogical Implications

Neuroscience principles in Japanese Business English education leads to several direct implications:

- Designing for motivation: Tasks built around progressive

challenges, gamified competition, and social collaboration can activate dopamine-driven learning.

- Using activities such as case studies and storytelling to enhance attention and recall.
- Incorporating spaced repetition, digital tools, and peer teaching to improve long-term retention.
- Using combinations of visual, auditory, and kinesthetic input, and encouraging role play and embodied practices that simulate real business environments.
- Prioritizing chunks for phrases and dialogue to support fluency and reduce cognitive load.
- Emphasizing empathy by creating activities that involve intercultural collaboration and reflective dialogue in order to develop the social-emotional skills necessary for global readiness.

Conclusion

Neuroscience-informed TESOL makes a bridge between academic-oriented English teaching and practical needs of global business that allows Japanese learners to contribute actively and confidently in international teams as well as cross-cultural initiatives. While helping Business English teaching learn from critical principles of motivation, emotional engagement, repetition, multisensory practice, and chunking, effectiveness can be added in a transformative manner. Adding formulaic phrases to the natural conversations helps transform the uncertainty to fluency; it provides the learners with assurance to navigate through different professional environments. Once the concepts of empathy and intercultural competence are incorporated into this approach, the classroom will serve as a training ground of effective global interaction. The neuroscience-based TESOL students will have far more than a language; they will have the flexibility and relational intelligence to succeed in international business.

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