EXPERIMENTING WITH NEUROELT MAXIMS

IN A JAPANESE TERTIARY CLIL CONTEXT

by

TAKASHI UEMURA

A dissertation submitted to the
College of Arts and Law
of the University of Birmingham
in part fulfilment of the requirements
for the degree of

Master of Arts
in
Teaching English as a Foreign or Second Language (TEFL/TESL)

This dissertation consists of approximately 11,547 words
Supervisor: Robert S. Murphy

ELAL,
College of Arts &Law
University of Birmingham
Edgbaston, Birmingham B15 2TT
United Kingdom

March 2015

CONTENTS

ABSTRACT

This dissertation documents the first pilot study exploring CLIL from neuroscientific perspectives in Japan. By implementing *neuroELT* maxims, this paper investigates how well learner predictions, solvable mysteries, and teacher-student assessment of presentations enhances learner motivation and understanding in a Japanese tertiary CLIL context. The literature review unravels overlapping elements between *neuroELT* maxims and CLIL. In the experiment, the CLIL approach was implemented in 3 of 30 business English classes. In the experimental group (EG), teacher-student assessment of presentations was added to self- and peer-to-peer assessments, while the control groups (CGs) concentrated on self-and peer-to-peer assessments only. Pre- and post-test questionnaires were administered to 49 second-year engineering students. After that, 6 students from EG and 10 students from CGs were recruited for focus group interviews. Learner understanding was demonstrated to be enhanced by implementing learner-prediction activities and teacher-student assessment of presentations. Nevertheless, positive correlation between learner motivation and understanding could not be detected. Some methodological and pedagogical faults led to the proposal of a pedagogic model termed *Triangular Alignment-Choice Instructional Modulation* (TACIM) and a metacognitive activity called *Simulation of Emotion Attached Mirroring Activity* (SEAMA). Finally, a more extended full-year research design is suggested for future research.

DEDICATION

To my parents

Persistence, determination, and responsibility — three are the sources of energy that
my father taught me to help me overcome life's countless challenges

Creativity, passion, and aspiration — three inspirational qualities that
my mother has bestowed upon me ever since I came into the world

I am truly proud of being your son.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank Mr. Robert S. Murphy, my dissertation supervisor. Mr. Murphy opened a door for me to the world of neuroscience and English language education. I have respected Mr. Murphy as not only a researcher but also a genuine educator. A series of face-to-face meetings at his private office on my dissertation were full of inspiration and scholarly discovery. During his tutoring process, I realized that Mr. Murphy applied *neuroELT* pedagogy so that I could learn his instructions in a highly efficient fashion. I will definitely miss these enlightening moments that I was able to share with Mr. Murphy after an hour-and-a-half motorway drive from my workplace to his office every month.

I am also strongly indebted to Dr. John Adamson, my tutor during the six modules. Dr. Adamson taught me the foundations of research skills and EFL academic conventions. Without his sincere support and productive feedback, I could not have been confident enough to embark on my dissertation. I was always impressed and blessed with Dr. Adamson's kind and professionally quick responses to my queries. Furthermore, my first publication on Content and Language Integrated Learning (CLIL) would not have been possible without his support.

My thanks also goes to Prof. Saito, my mentor and the director of the Global Engineering Development Center (GEDC) at the Faculty of Engineering at Yamaguchi University. Prof. Saito was always supportive and accommodating to my postgraduate studies at the University of Birmingham. Prof. Saito's generous understanding of my studies and need to support my family with three children was a powerful vehicle to complete my MA studies while working for the GEDC.

I appreciate Prof. Helgesen at Miyagi Gakuin Women's University and Prof. Kelly at Kansai University for their kind acceptance of my interviews on my *neuroELT* research and fascinating input regarding their previous and latest works.

Last, but not least, I would like to thank my family. From the bottom of my heart, my special thanks goes to my wife Chie. Without her understanding, encouragement and strong mentality to support this middle-aged husband with an excessive, teenage ambition, my entire MA studies were absolutely not possible. I will never forget her organic vegetable soup, with carefully chosen ingredients, and a number of her Facebook massages, with which she gave me heartfelt encouragement whenever I needed to concentrate on my paper writing at different locations. I was able to pursue my studies in a healthy and focused manner. Regarding my three children, Kai, Souma, and Yuna, I am thankful to them just being my sons and daughter. They may not realize how much I was invigorated and encouraged by them cheerfully calling me "Papa!" whenever I came back from work or MA studies. They were my source of empowerment to complete this challenging MA. Someday when they become parents, I hope they will realize what I was doing and learn something from my endeavor at the age of 40.

LIST OF TABLES AND FIGURES

Tables

Figures

CHAPTER 1 INTRODUCTION

This is the first pilot study exploring learner motivation and understanding in the Japanese tertiary Content and Language Integrated Learning (CLIL) context from a neurobiological perspective by adopting "*neuroELT* maxims" (Murphy, 2014a).

In the face of ongoing globalization, the expansion of bilingual classes and curricula and the implementation of active learning in Japanese universities have been rapidly demanded under the initiative of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Against this backdrop, CLIL methodology has increasingly gained popularity in Japan due to its simultaneous focus upon language and subject learning. Personally, I believe that CLIL pedagogy has great potential to serve as a catalyst to enhance not only Japanese EFL teaching, but also subject teaching in a bilingual setting.

My first encounter with *neuroELT* was three years ago at the FAB3 International Conference, in which Robert Murphy did a plenary on neuroscience and ELT. It inspired me to pursue evidence-based research supported by neurobiological findings. This experience motivated me to further explore CLIL from a neurobiological perspective, and then I found elements of CLIL overlapping with *neuroELT*.

However, there has been no CLIL research conducted through the lens of neuroscience in the Japanese EFL context. Therefore, this is the first pilot study applying neuroscientific interpretation by employing *neuroELT* maxims to the Japanese tertiary CLIL context. The following three *neuroELT* maxims were chosen for this pilot study because of their overlap

with elements of CLIL.

14. “Prediction” is a tremendously powerful tool.
23. “Solvable mysteries” are central to all natural learning processes.
25. “Assess” in three ways.

In this dissertation, I first review the relevant literature on the above three maxims, then the notion of CLIL, and the overlapping elements between CLIL and *neuroELT.* After that, the research methodology and the associated results are illustrated. Next, in light of the results of this research, the possible methodological and pedagogical faults are discussed. I must concede that the data was not totally satisfying. However, from that, I was motivated to create a pedagogic model termed *Triangular Alignment-Choice Instructional Modulation* (TACIM) and a metacognitive activity called *Simulation of Emotion Attached Mirroring Activity* (SEAMA). I elaborate on these two pedagogic proposals in latter parts of the discussion chapter. Finally, a more extended full-year research design is suggested for future research.

CHAPTER 2 LITERATURE REVIEW

2.1 NeuroELT and the brief history

2.1.1 What is *neuroELT*?

NeuroELT is an emergent discipline in English language teaching, which is defined as "[t]he intersection of neuroscience, especially MBE (mind/brain/education) and English Language Teaching, with a special interest in teaching/learning (i.e., classroom application)" (Helgesen, 2014). Some people may think it sounds synonymous to neurolinguistics. However, Helgesen (2014) argues that neurolinguistics focuses theory and less upon classroom application, while *neuroELT* acknowledges that theory is helpful and vital, but is required to be "evidence-based" and applicable to classroom contexts. Kelly (2014) suggests that *neuroELT* concerns the neuroscience of not only teaching but also learning language, including subjects such as attention, stress, development, and pedagogy.

2.1.2 Brief history of *neuroELT*: Pre-FAB phase

While the foundation was set at least one decade earlier, it can be said that the birth of *neuroELT* was July 2011, when the First Annual Brain Days (FAB) International *neuroELT* Conference was held in Kitakyushu and Kansai in Japan (Murphy, 2011). FAB was found by four scholars based in Japan, who share common research interests in neuroscience and ELT: Robert Murphy, Curtis Kelly, Marc Helgesen, and Tim Murphey (Murphy, 2015). The original motivation to bring *neuroELT* to life was from the dilemma that traditional ELT holds.

Murphy (2015) argues that most of the applied linguistics and TESOL literature appears to be the product of the "external observation" and is a "compilation of guesswork" without investigating the biological mechanisms within learners. Kelly and Sandy (2008) maintain that, despite implementing state-of-the-art theories and activities, none of them seems to be effective. It is only recently that the emphasis of language teaching shifted from how language works to how language learning takes place in the brain (Kelly and Sandy, 2008).

Before the inception of *neuroELT*, the FAB co-founders had explored the capacity of interdisciplinarity between neuroscience and ELT individually, which I refer to as the pre-FAB phase. During the pre-FAB phase, Murphy (2009) explored age-related tendencies in Japanese learners' self-organization and self-understanding, and the role of Japanese culture

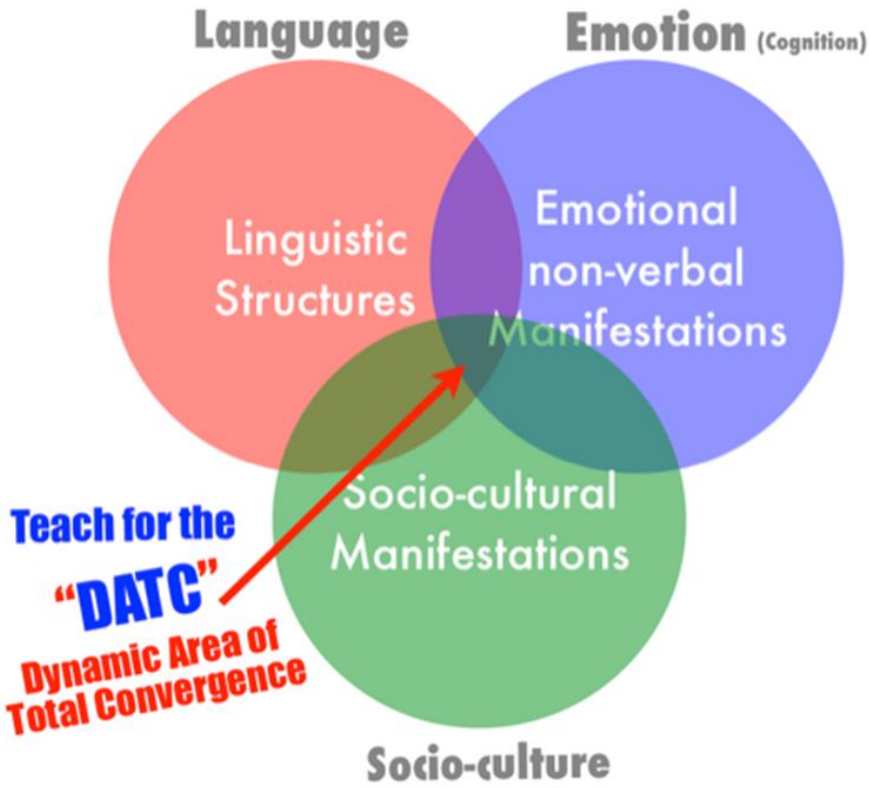


Figure 2.1. Dynamic Areas of Total Convergence (DATC)
(adapted from Murphy, 2014b)

upon their cognitive development by adopting the Self-in-Relationship (SiR) interview developed at the Harvard Graduate School of Education (GSE), which was applied by Murphy in the Japanese EFL context for the first time. Then, Murphy (2009) proposed pedagogic approaches termed *Teaching for Dynamic Areas of Total Convergence* (TfDATC) and *Consciousness-Raising, Emotion Analysis, Manipulation and Expression* (CREAME). The DATC is the notional convergence area where tri-elements (language, cognition, and culture) dynamically interact during the development and application of novel linguistic concepts (Figure 2.1).

The convergence area becomes bigger if all three components are nurtured inside and outside of the classroom (Murphy, 2009). TfDATC accentuates the importance of balanced development of all three constructs, which nurtures a larger, more dynamically practical DATC and better L2 proficiency. Murphy (ibid.) further developed a seven-step pedagogic methodology called CREAME (Figure 2.2), by applying TfDATC and integrated elements from research at the Harvard GSE and the University of Birmingham: CELS. In fact, CREAME methodology is successfully implemented in Murphy's published course book series "Optimal Levels!" (2010-2015), a series that has proven to be popular among students, likely due to the implementation of TfDATC and CREAME (Murphy and Uemura, 2013).

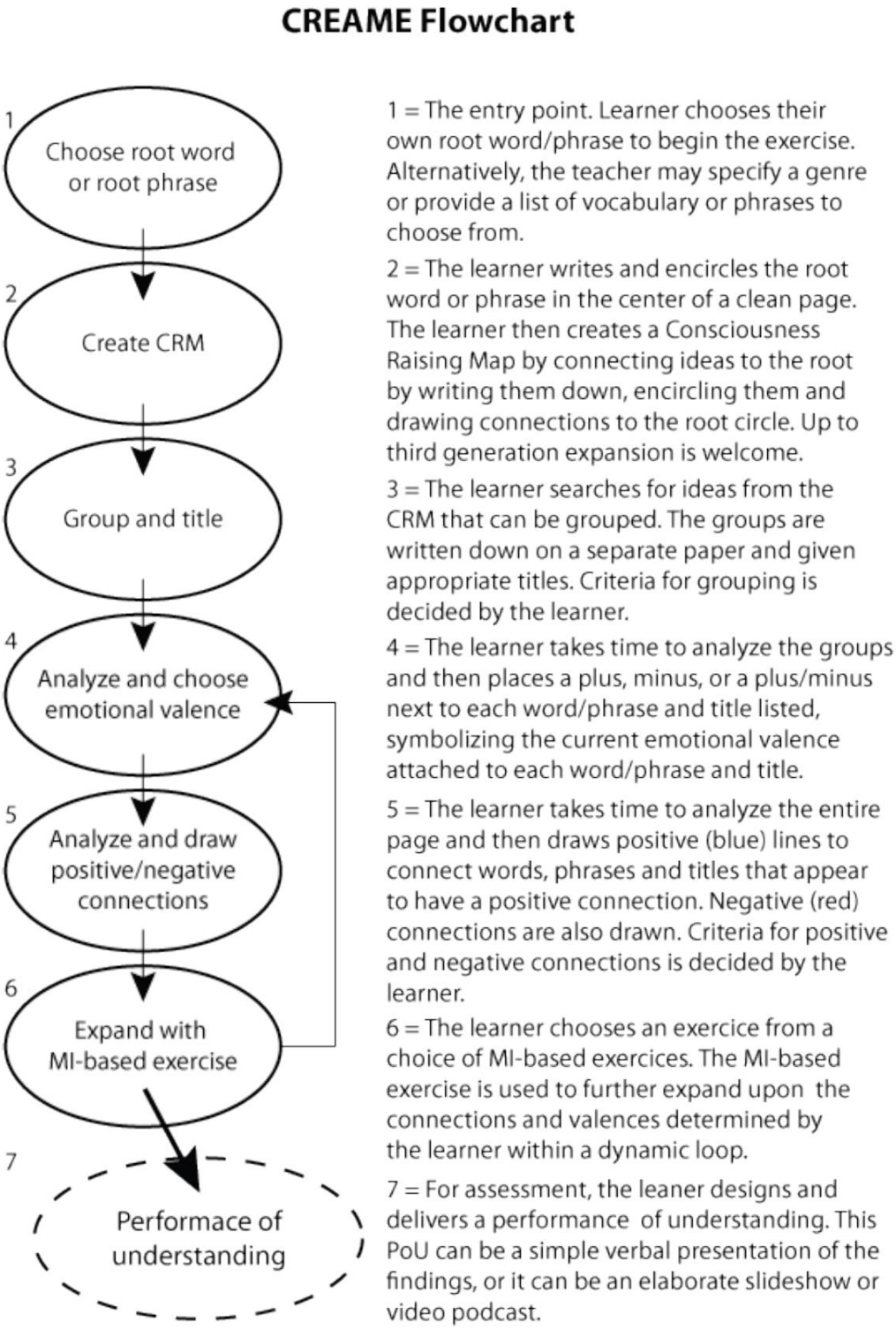


Figure 2.2. CREAME: a seven-step pedagogic methodology (adapted from Murphy 2009)

Helgesen (2015a) has had a strong interest in positive psychology since at least 2005. He did a plenary on positive psychology at CLESOL in New Zealand in 2006, and did a number of similar sessions all around the world. Then, Helgesen (2015a) launched a website titled *ELT and Happiness* in 2007 to share his resources in public. Helgesen (2015b) suggests that Positive Psychology should be incorporated into the ELT classroom since it has been proven that happy students generally "learn more", "work longer at tasks", and "approach those tasks with more enthusiasm" and, as students feel good, the neuronal connections fire more rapidly

Eight things happy people do

1. **Notice good things in your life.** Write down 3-5 of them every week.
2. **Practice kindness:** Do nice things for people. It makes you happier.
3. **Notice life's joys.** When something good happens, stop.
   - make a picture in your mind. OR
   - Tell yourself what happened. OR
   - Remember the feeling.

   This way, you can save the moment.
4. **Thank someone who has helped you.** Who has been important in your life? A teacher, a *sempai*, a parent. Write them a letter or tell them. Explain what they did for you. Say *thank you*.
5. **Learn to Forgive.** When someone does something bad to you, don7t hold the anger inside. Let go of the anger. Writing a letter to forgive someone is a good way.
6. **Take time with your friends and family.** They love you. You love them. Spend time with them. Let them know you appreciate them.
7. **Take care of your body.** Get enough sleep and exercise. Do stretching, smiling, and laughing.
8. **Learn ways to deal with problems.** Remember, we all face problems. Learn to move past them.

Figure 2.3. Helgesen's (2006) abridged version of
Eight Steps toward a more Satisfying Life

while neurotransmitters and hormones such as serotonin, endorphins, and dopamine are released, further encouraging engagement with the learning. Figure 2.3 shows Helgesen's (2006) abridged version of University of California—Riverside psychologist Sonja Lyubomirsky's *Eight Steps toward a more Satisfying Life* (see Centre for Confidence and Well-being, 2015). Helgesen (2006) proposed classroom activities which subsume elements of each step, and, in doing so, students are surely addressing the thoughts in English and utilizing language in novel, creative manners.

Kelly and Sandy (2008) suggested that teaching practices should be brain compatible, emphasizing language learning processes rather than language forms. For instance, Kelly and Sandy (2008) argued that it is important to encourage deep processing, personal relevance and emotion. The volume of language retention depends upon how much of the brain is utilized for processing; therefore, deep processing brings about deep learning, causing extensive neural growth and connections. Moreover, the amygdala, "the brain's emotion center", evaluates the relevance and meaningfulness of new input and determines whether or not it should be retained or dismissed (Kelly and Sandy, 2007: 30).

2.1.3 Brief history of neuroELT: Post-FAB phase

Recent *neuroELT* research has extensively proposed brain research evidence-based ideas for classroom application. Murphy (2014) at the *neuroELT* lab at the University of Kitakyushu has put forward "The 50 Proposed Maxims for ELT" (APPENDIX I), which are derived from an elaborate review of published neuroscientific literature. As mentioned in Chapter 1, this paper tests three of these maxims in my Japanese tertiary CLIL context. Furthermore, in his latest publication, Murphy (2015) suggests five neuroscience-based tips for language teachers.

The keywords being: *captivation, personalization, emotion, choice,* and *prediction*. What do they emphasize? (1) Teachers need to *captivate* learner's attention by providing intrinsically motivating material so that neurons are stimulated enough to build connections (Murphy, 2015). (2) Because of learner's individual variance of neural networks, lessons should be "meaningful and applicable to the real world for each student" (Sousa and Tomlinson 2010, cited in Murphy 2015). It is not necessary to prepare different lesson plans for individual students, but to provide students with some options, such as setting activities with three levels of difficulty and/or three modes of attaining the shared learning goal. (3) Emotional attachment to an experience excites the neural networks, and, with the excited neurons, the information is more likely to be further processed and will be finally available for future use (LeDoux 1996, cited in Murphy 2015). It is suggested that simulating the emotional state of the characters in a story being read or listened to will be effective as the pre-task, the during-task, and the post-task of reading or listening. (4) It is also important for pedagogy to provide learners with the chance to make real *choices* by introducing a selection process with a set of activities, which stimulates primary networks that generate physical pleasure through dopamine and endorphin release. (5) Teachers should have students involved in *prediction* activities since neural reward predictors unconsciously activate a prediction cycle accompanying dopamine release (Murphy, 2015.).

From the viewpoint of EFL textbook authoring and their findings from neuroscience, Helgesen and Kelly (2014b) have proposed a *Do-It-Yourself NeuroELT* list, with ideas to make textbooks in regular English classes more brain-friendly. Somewhat similar to Murphy's list above, Helgesen (2014) emphasizes seven ideas from the 50 maxims. These include "Go for emotion" (e.g. introducing touching stories, easing self-disclosure, encouraging learning through discovery), "Give students choices" (e.g. writing some options on the board that

students can do next after finishing the task early), “Increase variety/novelty” (e.g. incorporating at least one “out of the textbook” activity in each lesson), “Teach across the senses (e.g. including the involvement of visual, auditory, and haptic senses)” “Challenge (e.g. Having students talk about the same topic after the dialogue practice for 2-3 minutes while keeping the textbook closed)”, “Let the learners create” (e.g. encouraging students to draw mind-maps), and “Personalize” (e.g. applying students’ own ideas to dialogue, pair or group work that they have already used) (Helgesen and Kelly, 2014a).

2.1.4 Summary

NeuroELT has been increasingly growing. Murphy’s CREAME and TfDATC, developed during the pre-FAB phase, have led to more extensive proposal of the 50 *neuroELT* maxims after the FAB. Helgesen’s Positive Psychology background and Kelly’s research on deep processing, personal relevance, and emotion have also led to *Do-It-Yourself NeuroELT* list.

2.2 Learner predictions

2.2.1 Prediction and the brain

Prediction enhances motivation as personal attachment becomes linked to the outcome (Willis, 2008). As personal connections are made with the learning content, one’s learning attitude turns more positive, and this optimism alters the brain’s neurochemistry with increased dopamine release, causing the brain to foster stronger memories related to the new learning (Willis, 2008). Dopamine release is increased, coupled with positive feelings, when you believe you have correct answers (Salamone & Correa, 2002). In this case, dopamine works

as “a learning-friendly neurotransmitter, promoting motivation, memory, and focus along with pleasurable feelings” (Willis, 2010: 54). Furthermore, with the dopamine pleasure caused by correct prediction, learners demonstrate intrinsic motivation to pursue challenges and typically endeavor to attain the next level of achievement (O’Doherty, 2004). This is why games and gambling can be so addictive (Murphy, 2014c).

Future thought is closely related to memory (Szpunar and Tulving, 2011). McDermott, Szpunar, and Arnold (2011) point out that similarities are found between *episodic future thought* and remembering. According to Atance and O’Neil (2001: 533), *episodic future thought* is defined as “a projection of the self into the future to pre-experience an event”. It is suggested that memory is drawn upon to accomplish *episodic future thinking* (McDermott et al., 2011). More specifically, people make predictions by combining representations in memory to create a new scenario in mind (Bar, 2011). As memory is imperfect subsuming tendency to errors and distortions, the future is not a complete repetition of the past. Therefore, *episodic future thinking* is a constructive process (Schacter and Addis, 2007).

Prediction is a cerebral activity utilizing the information stored in patterns in the brain and is activated when it has information in patterned memory groups abundantly enough to identify similar patterns in novel input and predict their meanings (Willis, 2008). Barsalou (2003b, cited in Barsalou, 2011: 29) proposes the relation between the patterns and “a situated conceptualization”, which refers to the idea that concepts are not generally processed alone, but “situated in background settings, events, and introspections.” Thus, *a situated conceptualization* is an intricate structure of multimodal elements speaking for a familiar situation (Barsalou, 2011). As an element of the patterns agrees to what is experienced, there are more patterns active in memory. An active *situated conceptualization* becomes a

substantial source of prediction through these patterns (Barsalou, 2011).

2.2.2 Executive function and strategic networks

Executive function is an "umbrella term" for the intricate cognitive processes that assist ongoing, goal-directed behaviors, and most of the definitions include many of the components illustrated in Table 2.1 (Meltzer, 2007:1).

- Goal setting and planning
- Organization of behaviors over time
- Flexibility
- Attention and memory systems that guide these processes (e.g., working memory)
- Self-regulatory processes such as self-monitoring

Table 2.1. Elements often included in the definition of executive function (Adopted from Meltzer 2007:1-2)

Executive function reckons the subsequent optimal step, or considers if we should keep going or change routes (Moran and Gardner, 2007). Then, being fully developed, executive function further associates dispositions, preferences, interests, and self-concept with newly facing circumstances; namely, to consider how this situation relates to us and what we should do now. To decide routes, executive function involves the unification of three parameters: what one wishes to achieve (hill), can do (skill), and focuses energy upon (will), and this faculty is dependent upon one's accessibility to self-relevant information, or "intrapersonal intelligence" (Moran and Gardner, 2007: 31). Executive function emanates from *intrapersonal intelligence*, which refers to the computational competency to figure out and utilize information about

oneself. It is generally believed that intrapersonal functions are processed in the frontal lobes of, especially, the right hemisphere, which also have to do with executive function according to neuroimaging studies. The self-relevance cycle afforded by *intrapersonal intelligence*, developing during the period between the second year of life and middle adulthood, encourages simplification of the intricacy derived from social interaction and future orientation (Moran and Gardner, 2007)

Moran and Gardner (2007) suggest that there are two developmental stages of executive function: the apprentice and the master. For the apprentice, executive function accentuates behavioral regulation and adaptation to norms; therefore, goals are initially set by others, but, the individual gradually assumes the responsibility for some facets of goal setting over time and with skill mastery. The will is socially regulated so that the energy is only directed to societally preferred goals. Conversely, for the master, executive function emphasizes the accomplishment of genuine personal meaning; therefore, goals are not so much provided to be culturally accepted as set autonomously, and skills and will are so utilized and possibly reshaped according to the direction of their goals that they become more flexible (Moran and Gardner, 2007).

How are these goal-oriented functions processed in the brain? It is through "strategic networks" that we "[i]dentify a goal", "design a suitable plan", "execute the plan", "self-monitor", and "[c]orrect or adjust actions" often without conscious manner (CAST, 2002-2015). According to CAST (2002-2015), neuroimaging studies demonstrate that the prefrontal cortex monitors intricate strategic faculties and plays a crucial role to identify goals, select optimal plans, and self-monitor. Furthermore, strategic networks entail "top-down" and "bottom-up" processing. In regards to the former, neural signals in higher-order region in the

cortex are conveyed down to the spinal cord. Therefore, the cortex orders muscles to act and monitors if the goal has been achieved, while altering the plan appropriately. The latter involves the cerebellum, which takes sensory feedback and compares it with other signals that inform our intended actions. Thus, the cerebellum notifies our strategic networks if our actions are on the right track (CAST, 2002-2015).

2.2.3 Summary

People make predictions by assembling pieces of memory together. Prediction also becomes motivating when it is personally meaningful since positive emotion triggers dopamine rush, which encourages retention of new input. To attain the future goals, complex cognitive processes called executive function are activated. This goal-directed function is processed through strategic networks, which involves goal setting, choice of optimal plans, and self-monitoring.

2.3 Solvable mysteries and learning

Murphy (2014d) points out that pedagogy should include well timed steps with appropriate challenges for furthering the learning. Those challenges must be solvable—but neither too hard nor too easy. He coined those challenges *solvable mysteries*.

The recent discoveries in social and affective neuroscience have revealed that emotion and cognition are interdependent and that emotion plays a vital role as a guide to successful learning (van Geert and Steenbeek, 2008). Emotion encourages learner recognition, recall of behavior, and associated knowledge over time; “[s]killed intuitions” (Immordino-Yang and

Faeth, 2010: 73) develop via emotional experiences. *Skilled intuitions* are constructed by continually revisiting real or imagined physical sensations according to the cognitive facet of knowledge (Immordino-Yang and Faeth, 2010). With no guiding emotional intuition, factual knowledge is often not useful. Without a feeling of association with the knowledge learned in school, students will find the academic content emotionally meaningless (Immordino-Yang and Faeth, 2010: 78). Therefore, efficient learners construct helpful and associated intuitions which direct their thinking and decision making (Immordino-Yang and Damasio, 2007, cited in Immordino-Yang and Faeth, 2010: 76).

2.3.1 Stress and learning

Learner's state of anxiety generally results from a sense of exclusion from their academic experience, inadequate understanding, and lessons that are tedious, perplexing, anxiety-provoking, or irrelevant to them (Willis, 2006). Excessively high-level challenges make you frustrated, then worried, and eventually anxious, while excessively low-level challenges make you relaxed, then bored (Csikszentmihalyi, 1997). An overwhelming challenge makes people passive and feeling "learned helplessness", a negative state that nothing you do improves the situation (Seligman, 2011: 184). Anxiety and fear related stress releases a chemical called *trimethyltin*, which impairs short-term memory and work efficiency under short stressful conditions and deteriorates long-term memory storage and retrieval, motivation, and creative problem solving under the prolonged stressful condition (Willis, 2006). *Trimethyltin* secreted by stress hampers the growth of dendrites and neurons in the hippocampus, through which information must pass for memory encoding (McEwen, 1999). Stress also makes the amygdala overstimulated and prevents information from passing through this hypermetabolic amygdala to the higher thinking and memory centers of the brain

(Willis, 2006). In other words, the delivery of the new information to the brain regions fails, where it needs processing, connecting to prior knowledge and experience, and storing for later recollection (ibid.).

2.3.2 Optimal level of challenges

However, optimal experiences or “flow” usually occurs “when a person's skills are fully involved in overcoming a challenge that is just about manageable.” (Csikszentmihalyi, 1997: 30). According to Willis (2006), positively challenging lessons moderately stimulate the metabolic activation in the amygdala and therefore promote information processing in the brain because, under mild to moderate metabolic activation in the amygdala, the passage of new sensory input into the brain centers of higher cognition, executive function, and memory storage through the limbic system is quicker. Furthermore, the response of the hormones cortisone and adrenaline to manageable level of stress leads to improved memory (ibid.). Alternatively, high amount of cortisol secretion may cause the cells in the hippocampus to shrink (Kohn, 2004).

2.3.3 Aha moments and the brain

Due to its unique experience, *aha moments* have been explored scientifically for almost a century, and the exploration has further gained momentum through neuroimaging technology (Bowden, Jung-Beeman, Fleck, and Kounios, 2005).

In most cases, information emanated from *aha moments* generally become embedded in long-term memory, according to the observation of the neural activity of this rapid learning

(Rubin, 2011, cited in Nauert, 2011). The amygdala demonstrated significant activity during *aha moments* (Nauert, 2011). The amygdala informs other cortical regions of an emotionally significant internal activity often entailing major neural reorganization. In this way, it promotes retention of information in long-term memory (Rubin, 2011, cited in Nauert, 2011).

	Search solutions (Analytical solutions)	Insight solutions (Solutions with *aha moment*)
Characteristics	(1) it is effortful, deliberate, and largely conscious; (2) it proceeds incrementally from beginning to solution state; (3) intermediate results are available to working memory; (4) the gradual accumulation of partial knowledge can be tracked while the problem is being solved […]. (Aziz-Zadeh, Kaplan, and Iacoboni, 2009: 908)	(i) solvers experience their solutions as sudden and obviously correct (the Aha!) (ii) prior to producing an insight solution solvers sometimes come to an impasse, no longer progressing towards a solution (iii) solvers usually cannot report the processing that enables them to overcome an impasse and reach a solution. (Bowden, Jung-Beeman, Fleck, and Kounios, 2005: 323)
Direction of attention	Outward	Inward
Pattern of brain activity before the presentation of problem solution	greater neural activity over visual cortex	greater activation in a network of areas including Broca's area and the right insula

Table 2.2. Difference between search solution and insight solution

With reference to the mechanism of *aha moments*, most researchers suggest that it entails idiosyncratic processes (Bowden, Jung-Beeman, Fleck, and Kounios, 2005). According to an EEG study, there was a burst of EEG activity (40-Hertz gamma-band) at electrodes over the right anterior temporal lobe, which is located straight above the right ear, 300 milliseconds before the solution with an *aha moment* (Kounios, and Beeman, 2009). Gamma activity

represents neuronal connections (Goleman, 2011). During a gamma spike, *aha moments* sometimes cause a pleasurable feeling (ibid.).

Furthermore, there was another burst of slower EEG activity (approximately 10 Hertz alpha-band) just before the gamma spike, detected over right occipital cortex, which is located at the right side of the back of the head (Kounios, and Beeman, 2009). These alpha and gamma activities suggest that, in the case of slightly activated problem solution present in the right temporal lobe, this solution can be retrieved in a more facile manner by tentatively limiting visual inputs, which enables the solution to be brought to awareness. (ibid.)

Table 2.2 illustrates the difference between search solution (analytical solution) and insight solution (solution with an *aha moment*). An EEG study identified greater neural activity over the visual cortex before problems were analytically solved, and this may result from the passage of visual information to higher cortical regions (Kounios, and Beeman, 2009). More specifically, in preparation for solving the problem analytically, the subjects focused their attention outwardly, or to the screen on which the following problem was going to be shown (ibid.). Alternatively, insight solutions involved a network of areas including Broca's area and the right insula, which demonstrated a greater activation than the search solutions at the beginning of problem solving (Aziz-Zadeh, Kaplan, and Iacoboni, 2009) In order to prepare for solving the problem with an *aha moment*, the subjects focused their attention inwardly, namely, preference to "lexical-semantic processing" and the search and obtainment of slightly activated possible solutions (Kounios, and Beeman, 2009: 212).

2.3.4 Summary

Emotion plays an integral role in successful learning. While stress overstimulates the amygdala and therefore hampers the passage of information to higher cortices, mild to moderate level of challenges reasonably activate the amygdala and promote information processing. Thus, *solvable mysteries* are optimal for learning. Furthermore, learner's achievement by overcoming *solvable mysteries* may cause aha moments, with which new input is retained in long-term memory.

2.4 Assessment in three ways

2.4.1 Self-assessment and the brain

Self-assessment represents the learners' involvement in judging their own learning, especially their accomplishments and learning outcomes (Boud & Falchikov, 1989). It aims to increase

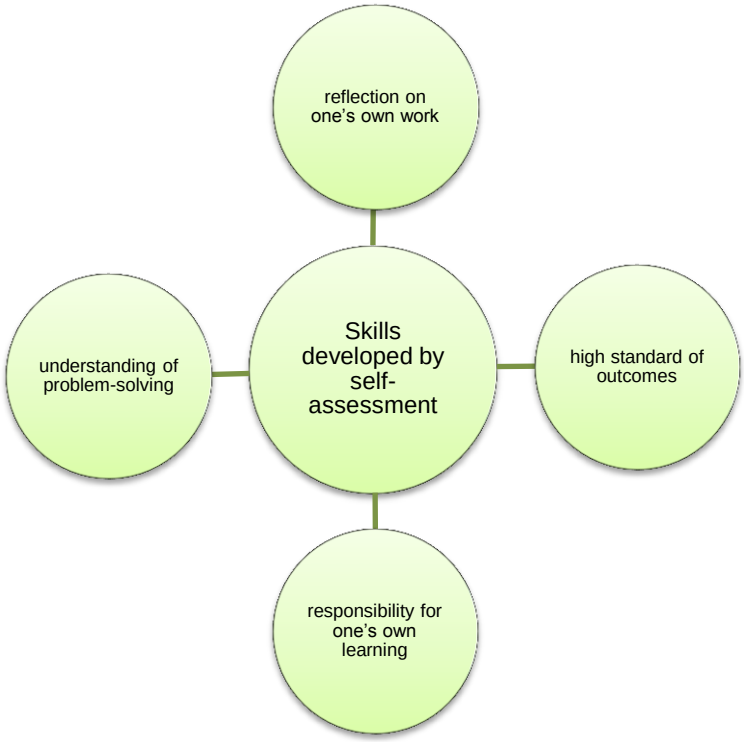


Figure 2.4. Skills developed by self-assessment

the students' role as active participants in their own learning (Boud, 1995). Self-assessment brings about "more reflection on one's own work, a higher standard of outcomes, responsibility for one's own learning and increasing understanding of problem-solving" (Dochy, Segers, and Sluijsmans, 1999: 337; see Figure 2.4). It was also noted that students demonstrated increased confidence to assume greater responsibilities in orientating and

assessing their future learning (Sambell and McDowell, 1997; see Figure 2.5). Furthermore, even a simplistic self-assessment (by rating learner's own achievement using a 1-5 scale) will be effective enough to enhance learner's motivation and alignment (Murphy, 2014d). Keeping a score on oneself (through self-monitoring) contributes to learner's enhanced motivation and improved self-efficacy since, by providing learners with opportunities to evaluate their chosen strategies and effort, they do not attribute progress to external input, but ascribe it to their chosen strategies and effort (Joseph, 2005).

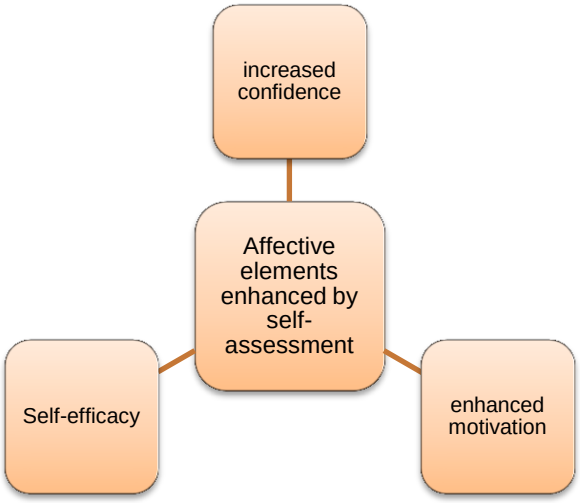


Figure 2.5. Affective elements enhanced by self-assessment

Self-Assessment triggers learner's metacognitive awareness (Murphy, 2014d). Metacognition is defined as "knowledge of one's own cognitive processes and products" (Flavell 1971, cited in Samuels, Ediger, Willcutt, and Palumbo 2005: 42). In other words, metacognition is "thinking about one's own thoughts" (Samuels, Ediger, Willcutt, and Palumbo 2005: 42). Metacognition also subsumes "knowledge about cognition" and "regulation of cognition" (Baker 2005: 62). *Knowledge about cognition* represents one's ability to reflect on his/her own cognitive process and contains "knowledge about when, how, and why to engage in

various cognitive activities" (Baker 2005: 62). *Regulation of cognition* refers to the use of strategies with which one can control his/her cognitive efforts such as "planning their moves, checking the outcomes of [his/her] efforts, evaluating the effectiveness of their actions and remediating any difficulties, and testing and revising their learning techniques" (Baker 2005: 62). In his research on literacy instruction, Smith (2005) argued that an attempt to foster metacognition brings about a new viewpoint: a departure from traditional pedagogy which has inclined to emphasize lower order thinking and monolithic rote learning. Learners with high metacognitive skills can monitor and regulate their trajectory toward their own learning goals; therefore, metacognition is essential for successful learning (Griffith and Ruan, 2005).

In considering neurobiological interpretation of metacognition, research findings from simulation and empathy may be helpful since simulating one's own self is closely-intertwined with making inferences about another person's mental and physical state. Simulation of psychological states such as thoughts, beliefs, and emotions are likely to activate the amygdala, medial areas of prefrontal cortex, insular cortex, and the anterior cingulate cortex (Oberman, and Ramachandran, 2007). Alternatively, simulation of actions and physical states may take place in the brain regions including the cerebellum, superior temporal cortex, and the mirror neuron systems (MNSs) of inferior parietal lobule and premotor cortex (Miall 2003, cited in Oberman, and Ramachandran, 2007: 322). MNSs afford an essential mechanism to translate another person's perceived, goal-directed action into the "neurological motor plans that would produce it in one's own body" (Immordino-Yang, 2008: 69). They were discovered in the premotor cortex and are activated by not only observation but also execution of actions (Gallese and Goldman, 1998, cited in Lawrence et al., 2006). Mirror systems help one's own self internalize the goals of another person's actions (Immordino-Yang, 2008). As convergence zones of action and perception in the brain are bidirectionally associated with

perceptual and motoric networks, it is suggested that periodic activations between these networks lead to goal-directed skill development (ibid.)

2.4.2 Peer-to-peer assessment and the brain

Peer assessment refers to "the process through which groups of individuals rate their peers" (Falchikov 1995, cited in Dochy, Segers, and Sluijsmans, 1999: 337). During the peer assessment, learners' feedback or grades (or both) to their peers has to be provided on the product, process or performance, according to the prepared criteria of excellence (Falchikov, 2007). Peer assessment is not only a grading protocol but also a (formative) learning process through which skill development is fostered (Somervell, 1993). Learners benefit from observing their peers throughout the learning process often by gaining a more elaborate knowledge of others' work than their teachers (Dochy, Segers, and Sluijsmans, 1999)..

Figure 2.6. Skills developed by peer assessment

It is suggested that peer assessment provides students with learning from mutual successes and weaknesses (Race, Brown, and Smith, 2005). Students can largely benefit from the most capable group peer member when the process of learning from one another, through which they inevitably recognize any better performances than themselves during the assessment, is rationalized and fostered (ibid.). Furthermore, students may find types of mistakes that they never make themselves. Therefore, this contributes to their raised awareness of what should not be done and hampers the possible future problems of their work (ibid.). In addition, peer assessment is considered to nurture lifelong learning skills and other relevant skills including reflection, autonomy and independence, self-efficacy, responsibility, transfer of learning, enhanced diplomatic skill, and problem-solving (Falchikov, 2007; see Figure 2.6).

Peer assessment has been also noted to exert a positive influence on learners' affect such as reduced stress, increased confidence, and enhanced intrinsic motivation (Falchikov, 2007; see Figure 2.7).

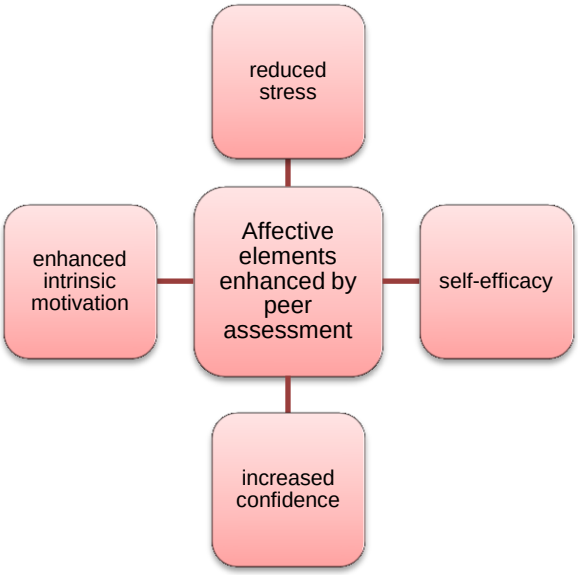


Figure 2.7. Affective elements enhanced by peer assessment

Humans are innately social (Hari and Kujala, 2009). Unlike great apes, humans are far more cooperative in every aspect (Tomasello, 2014). Therefore, human brain mechanisms should be explored considering these social foundations (Hari and Kujala, 2009). "[T]he human brain is a social organ of adaptation" and has evolved to be associated with and learn from other brains in the circumstance of emotionally important relationships (Cozolino, 2013: xxi). Unlike the brain stem, the limbic system and the cortex are "experience-dependent". Therefore, they are modified by interacting with our physical and social world (Cozolino, 2013: 27).

Synapses are small gaps dividing individual neurons and accommodate various chemical substances involved in synaptic transmission, essential for neuronal survival and growth (Cozolino, 2013). Likewise, our social behaviors involve *social synapse*. Our mutual messages are received by the senses and, within the social networks of the receiver's brain, transformed into electrochemical signals, causing a sequence of chemical changes, electrical activation, and new behaviors and bring about new messages. As we interact, we are involved in the long-term reciprocal brain construction (Cozolino, 2013).

2.4.3 Teacher-student assessment of presentations and the brain

While raising the importance of self-assessment and peer-to-peer assessment, Murphy (2014d) argued that teacher assessment should not be totally eliminated. Teacher assessment is also necessary for learners because of its faculty to maintain learners' alignment and confidence. Teachers can assess learners' understanding by having learners give a presentation to teachers at the end of the class, or even with few-minute mini-presentation. These can be almost as effective as 20-minute presentations (Race, Brown, and Smith, 2005). Without the

opportunity to apply knowledge gained in the literature and lectures, learners' understanding will not be cultivated (Blythe, 1998). Students regard presentations as a public performance, or something that needs addressing seriously. Therefore, they work on their research and preparation, which leads to deeper learning regarding the subject (Race, et al., 2005).

As a pedagogical concept commonly used at Harvard GSE, Understanding (with a capital U) is an ability to perform various actions, by which one demonstrates his or her grasp of a topic while advancing it, and demonstrates an ability to apply knowledge in new ways (Blythe, 1998; Murphy, 2009). In many schools, activities are not designed to encourage or present learner understanding, but merely to focus upon routine skill and knowledge building (Blythe, 1998: 14-15). In order to differentiate activities from such routine performances, Blythe (1998: 56) discusses "Performances of Understanding (PoUs)", which refers to the activities that provide learners with opportunities to apply their knowledge in new and visible ways and require learners to transcend the input provided to produce something new by "reshaping, expanding, extrapolating from, applying, and building on" their prior knowledge. The optimal *Performances of Understandings* contribute to both learners' development and demonstration of their understanding (Blythe, 1998: 56).

The aforementioned learner presentation to teachers is one good way of teacher-student assessment. Nevertheless, giving an oral presentation is a anxiety-provoking social experience that induces stress to learners especially in the face of teachers and peers. This is not necessarily a bad thing. This stress may also attribute to "novelty", "preparedness" or "predictability" (Mason 1968, cited in Preuß, Schoofs, Schlotz, and Wolf, 2010: 227). To address such threats or challenges, biologically adaptive reactions are made such as an increased activity of the sympathetic nervous system and the hypothalamic-pituitary-adrenal

(HPA) axis (Preuß et al., 2010: 221). In association with the activation of the HPA axis, the adrenal cortex releases an increased level of cortisol (de Kloet et al. 2005). Oral presentations have been found to cause enhanced cortisol stress reaction and increased salivary cortisol concentrations before and after the oral presentation (Preuß et al., 2010). However, Kuhlmann and Wolf (2006) identified that cortisol improved long-term consolidation of emotional arousal while also hampering consolidation of neutral arousal. Cahill and Alkire (2003) detected enhanced long-term memory consolidation for comparatively arousing input as a result of inevitable releases of stress hormone, epinephrine. Furthermore, the arousal effects are more evident when recall tasks are administered in a delayed manner than an immediate fashion (Kuhlmann and Wolf, 2006). Therefore, adrenergic hormones can retrogradely enhance human long-term memory (Cahill and Alkire, 2003).

2.4.4 Summary

In self-assessment, MNSs seem to play a crucial role in simulating one's own learning process, and therefore metacognitive skills are nurtured. In peer-to-peer assessment, learners benefit from interaction with peers, which generates mutual brain construction through *social synapse*. Teacher-student assessment of presentations stimulates learner's cortisol release, but it helps long-term consolidation of emotionally arousing event like giving a presentation.

2.5. Connection to Content and Language Integrated Learning (CLIL)

2.5.1 What is CLIL?

The 1990s' movement of European integration and internationalization led the European

Commission to embark on a project encouraging all Europeans to be able to communicate in not only their L1 but also two more community languages (de Graaff, Koopman, Anikina and Westhoff, 2007). Against this backdrop, Content and Language Integrated Learning (CLIL) has developed as a practical way to enhance language teaching and learning (de Graaff, et al., 2007). CLIL is defined as "a dual-focused educational approach in which an additional language is used for the learning and teaching of both content *and* language" (Coyle, Hood, and Marsh, 2010: 1). It is necessary that language should be learned in context, which entails reorganization of the subject and the relevant cognitive processes utilizing a foreign or second language (Swain, 2000). When it comes to content and language, EFL teachers may be reminded of Content-Based Instruction (CBI) or immersion. Strictly speaking, there are some differences between CLIL, CBI, and immersion (Table 2.3). In CLIL, subject and language are taught simultaneously, while, in CBI, content are taught in language classes (Dale and Tanner, 2012). CLIL differs from immersion in that immersion provides no focus on language in subject classes and requires students to learn all their subjects by means of another language (Dale and Tanner, 2012).

Items	CBI	CLIL	Immersion
What is the aim?	to teach language	- to teach language - to teach subject	to teach subject
Who teaches?	language teachers	- language teacher - subject teacher	subject teacher
What do they teach?	mainly topic	- topic - subject	subject
What do they give feedback on?	language	- language - content	content

Table 2.3. Pedagogic differences according to "content + foreign language" (Adapted and translated from Ikeda 2012: 4)

To foster development of CLIL pedagogy, Coyle (1999) proposed the 4Cs framework, demonstrating the interrelationship of the constructs between content (subject matter), communication (language), cognition (learning and thinking), and culture (cultivating intercultural awareness) (Figure 2.8). The framework does not simply regard subject and language individually, but considers content to be situated in the domain of "knowledge for learning" (integration of content and cognition) and language to be a medium for learning (integration of communication and intercultural understanding) (Coyle, 2007). Culture plays a vital role in the interaction between language and thought since culturally unique perspectives are embedded in language (Brown, 2007).

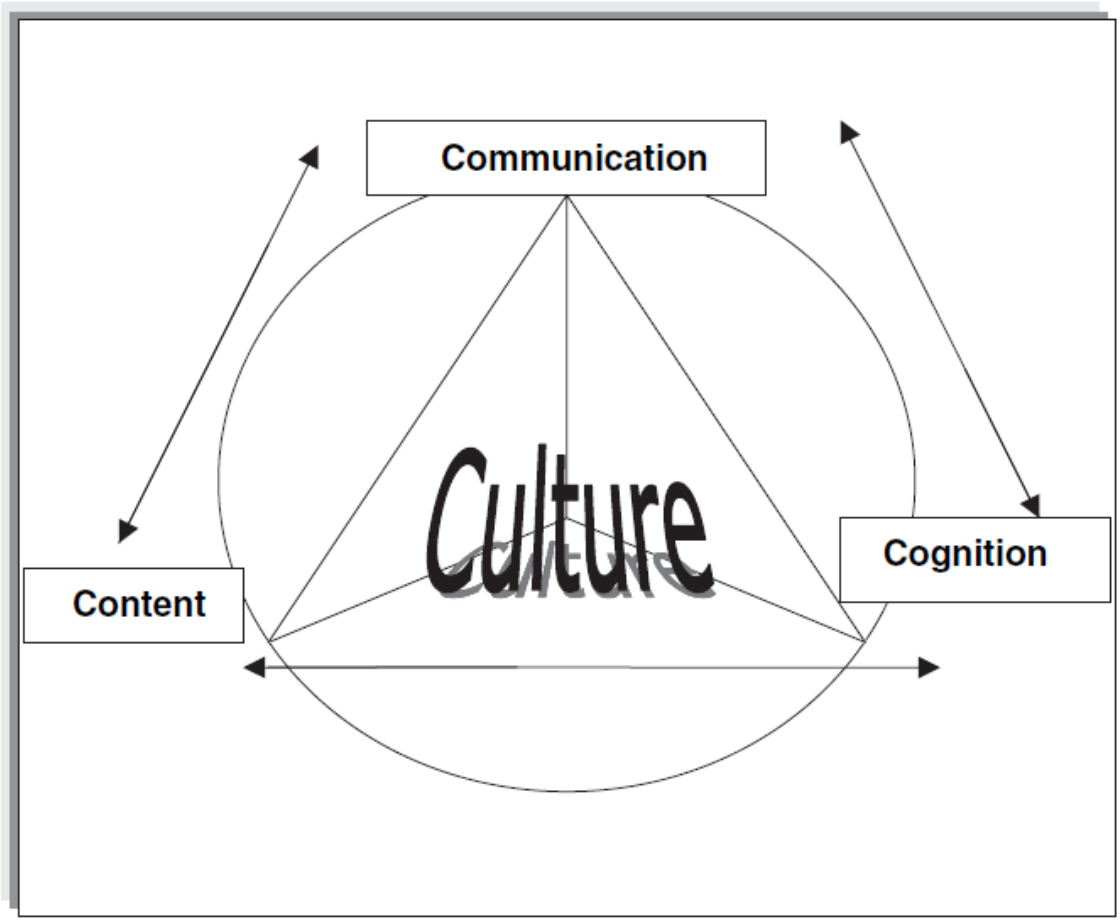


Figure 2.8. The 4Cs Framework for CLIL (adapted from Coyle 2007: 551)

One of the advantages of CLIL is its flexibility to accommodate various approaches (Uemura, 2013). As can be seen in Figure 2.9, as long as the quality of CLIL is maintained by complying with the 4Cs framework, CLIL can allow variations according to the purpose (language learning or content learning), frequency (implementing CLIL in a couple of classes or implementing CLIL in the whole curriculum), ratio (partial implementation of CLIL tasks during the class or full implementation of CLIL tasks during the class), and language (teaching in L1 and L2 or teaching only in L2) (Ikeda, 2011).

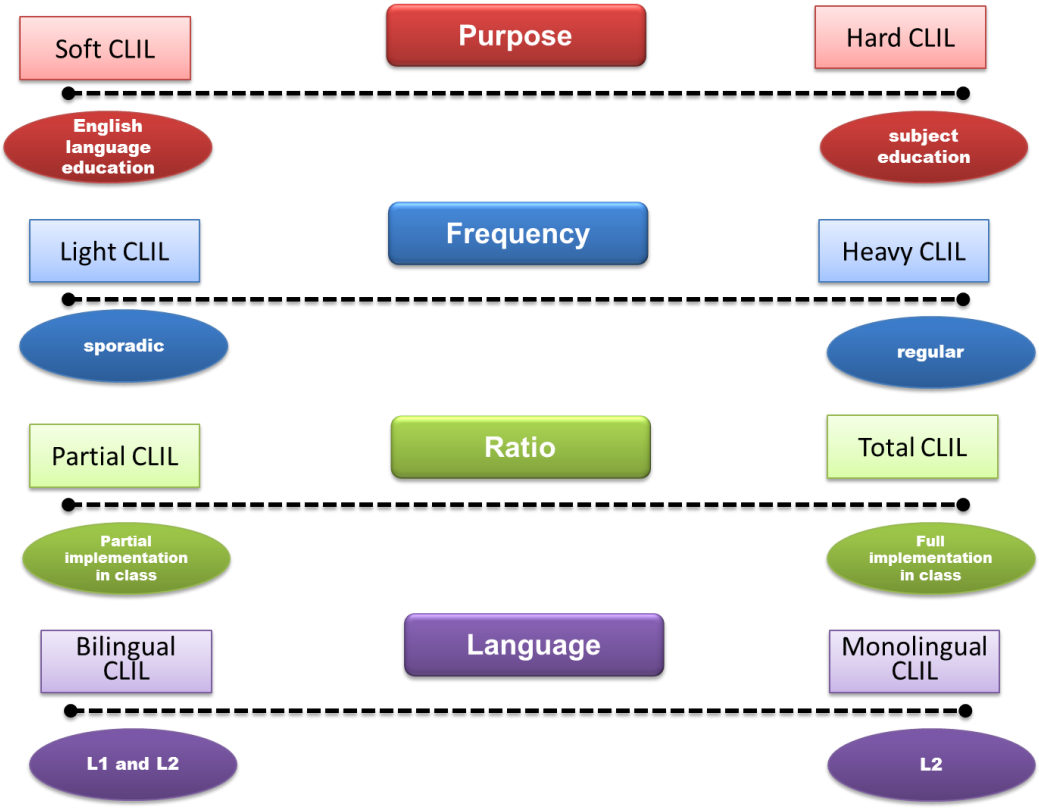


Figure 2.9. Variations of CLIL (Adapted and translated from Ikeda, 2011)

It has been demonstrated that CLIL helps learners improve their vocabulary, writing accuracy, morphosyntax, grammar, oral fluency, and communication strategies (Dalton-Puffer, 2015). It

is also argued that CLIL enhances learner motivation (Lasagabaster, 2011).

2.5.2. Overlapping elements between CLIL and *neuroELT*

This section will utilize Skeet and Tanner's (2014) *three course meal approach* (Table 2.4), a framework for effective CLIL lesson planning, in order to demonstrate overlapping elements of CLIL and *neuroELT* (Table 2.5).

A three-course meal	
	Main ingredients
Starter	Activating language and content ↓
Main course	Student engagement and interaction, abundant scaffolding, critical thinking, authentic materials ↓
Dessert	Reflecting and/or evaluation

Table 2.4. Three course meal approach to CLIL lesson planning (Adapted from Skeet and Tanner 2014: 18)

In CLIL, starter aims to activate language and content relevant to the learning objectives (Skeet and Tanner, 2014). Enhancing understanding refers to anchoring the current knowledge into previous learning (Mehisto, Marsh, and Frigols, 2008). It is our existing knowledge base and present level of understanding that act as the groundwork and the anchor for new learning (Mehisto et al., 2008). From *neuroELT* perspectives, starter involves setting a goal and predicting a learning outcome. When making predictions, people flexibly assemble pieces of

memory together (McDermott et al., 2011). Also, people make predictions by associating representations in memory to create a new scenario in the mind (Bar, 2011).

Main ingredients	CLIL	neuroELT
Starter	Anchoring into prior learning	Assembling pieces of memory together in order to make predictions
Main course	Social-constructivism: ZPD, scaffolding, and social interaction	Solvable challenges: moderate stimulation of the metabolic activation in the amygdala, and encouragement of the information processing of the brain
Dessert	Self-assessment, Peer assessment, Teacher's feedback to students using a plenary (form: flexible such as making simple presentations linked to visuals)	Self-assessment, Peer assessment, Teacher-student assessment (form: flexible, but necessary to follow the concept of PoU)

Table 2.5. Overlapping elements of CLIL and *neuroELT* utilizing three course meal approach (arranged Skeet and Tanner, 2014: 18)

The major learning phase of CLIL, *main course*, posits the notions of social-constructivism such as ZPD (defined below), scaffolding, and social interaction. Scaffolding can be characterized as not so much a rigorously solitary learning process as a peer-assisted, social learning process, which may involve teachers, other learners, materials, structured tasks, parents, and other community members (Mehisto et al., 2008). Scaffolding also enables learners to reach above the level at which things are achievable on one's own and to get into and address novel situations and tasks (Gibbons, 2002). Scaffolding helps learners step out of their comfort zones and challenge themselves to take another step forward (Mehisto et al., 2008). This challenging area is called the zone of proximal development (ZPD), which refers

to the distance between the actual developmental level that an individual learner can accomplish and the level of potential development that a learner may achieve under teacher assistance or in cooperation with more capable peers (Vygotsky 1978). Similarly, *neuroELT* encourages challenging learners to take another step forward from the comfort zone. Positively challenging lessons moderately stimulate the metabolic activation in the amygdala and encourage the information processing in the brain (Willis, 2006). Mild to moderate metabolic activation in the amygdala contributes to the quicker passage of new sensory input into the brain centers of higher cognition, executive function, and memory storage through the limbic system (ibid).

In both CLIL and *neuroELT*, (formative) assessment is an integral part of teaching and learning as illustrated with the term *dessert*. Both include self-assessment and peer-to-peer assessment. Teacher-student assessment can be flexibly adapted. With reference to CLIL, Coyle et al., (2010) encourage self- and peer-assessments, additionally suggesting learners should give simple presentations utilizing visuals as a way of learner assessment. As for *neuroELT*, the form of teacher-student assessment can be flexible, as long as the concept of *Performances of Understanding* is maintained: learners' public demonstration of their understanding in a visible way (Blythe, 1998).

2.5.3 Summary

There are some overlapping elements between CLIL and *neuroELT* in that: (1) Learner predictions rely on one's own prior knowledge. (2) Optimal learning is realized through a little challenging tasks. (3) Assessments entail self-, peer-to-peer, and teacher-student assessment of presentations.

CHAPTER 3 METHODOLOGY

3.1 Research site and the participants

This research is a pilot study conducted in a local national university in the west Japan, and involved 49 sophomore engineering major students (33 male students and 16 female students). The Faculty of Engineering consists of 7 departments, and the number of students participated in this research is shown according to the department in Figure 3.1. The subjects were taking a once-a-week year-long business English course. The course is optional, but only the candidates holding a score of 450 or more on the TOEIC®/TOEIC IP® test are eligible to enroll. The subjects participated in 3 consecutive business English classes in which the CLIL approach was utilized in December 2014. Before then, they attended the classes in which communicative language teaching (CLT) and PPP were mainly employed. In addition, I was teaching 3 classes a week according to student's department (Table 3.1).

3.2. Experimental group (EG) and control groups (CGs)

One of the aims of this research is to investigate how well teacher-student assessment of presentations influences learner motivation and understanding. Therefore, a series of activities in the experimental group (EG) included teacher-student assessment of presentations in addition to self-assessment and peer-to-peer assessment. Conversely, the control groups (CGs) were not involved in teacher-student assessment of presentations. Class C was set to be an experimental group (n=15), while Class A and B were maintained as control groups (n=34).

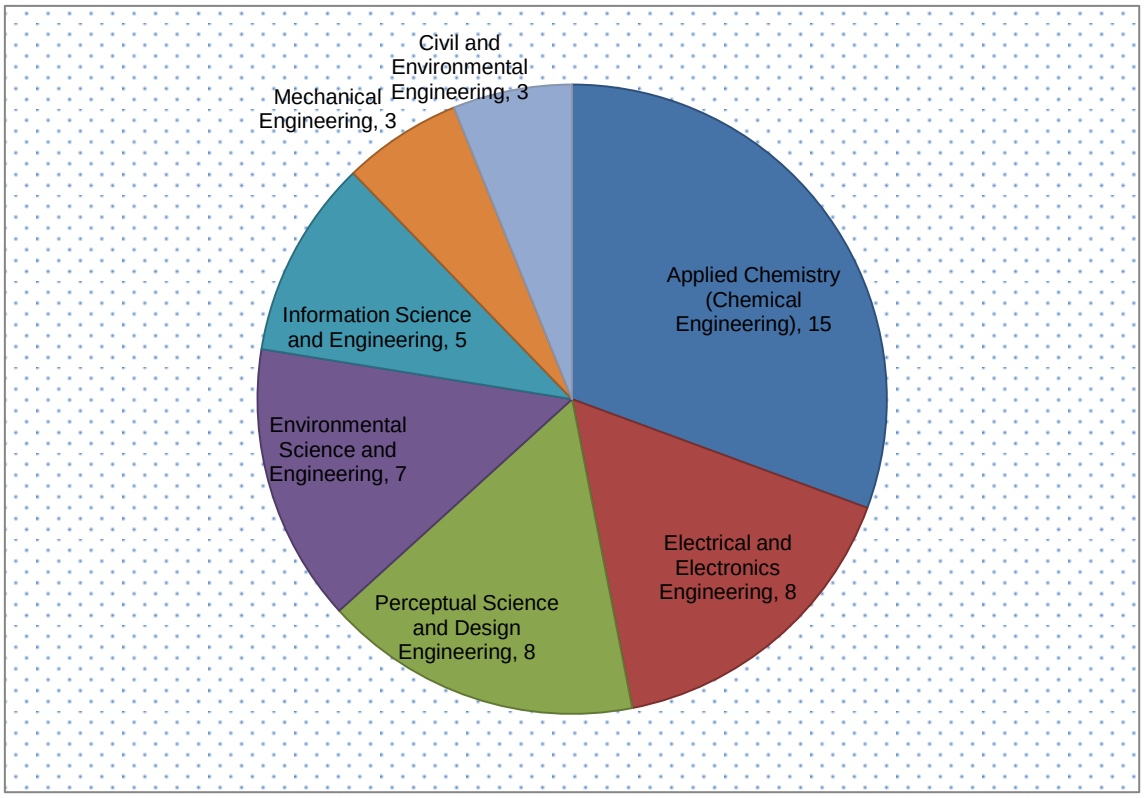


Figure 3.1 The number of students participated in the research according to the department

Class	Department	The number of male students	The number of female students	Total number of students
Class A	mechanical engineering	3	0	3
	civil engineering	1	2	3
	information science and engineering	4	1	5
	electrical and electronic engineering	3	0	3
Class B	applied chemistry (chemical engineering)	10	5	15
	electrical and electronic engineering	4	1	5
Class C	environmental science and engineering	5	2	7
	perceptual sciences and design engineering	3	5	8

Table 3.1: The number of male and female students according to the class

3.3 Measurement and procedures

In this present study, the questionnaire method was selected to gain and analyze the data quantitatively. Then, focus groups were formed, and their discussion theme was raised by the author in light of the quantitative data analysis. In compliance with participants' informed

consent (APPENDIX II, III), the discussion was recorded to be transcribed and analyzed qualitatively. The qualitative data was used for supplementing the quantitative analysis.

3.3.1 Pre-test questionnaire

The other objectives of this present study concern how well learner prediction and solvable mysteries enhance learner motivation and understanding. Furthermore, as Murphy (2014d) states, it is also important to consider the efficacy of self-assessment and peer-to-peer assessment as well as teacher-student assessment. The subjects had never experienced the activities of learner prediction, self-assessment, peer-to-peer assessment, and teacher-student assessment before the CLIL lessons started. The subjects also had an opportunity to contemplate the idea of solvable mysteries per se for the first time in the course. Taken together, by utilizing a pre-test questionnaire, I intended to identify subjects' preliminary judgement regarding the effectiveness of learner prediction, solvable mysteries, self-assessment, peer-to-peer assessment, and teacher-student assessment of presentations on learner motivation and understanding.

The pre-test questionnaire contains 30 items (APPENDIX IV, V). Each part consists of three questions on learner motivation and understanding, respectively. All the items are written in present tense because, if they were written in past tense, the subjects will regard them as something they have already experienced, which may confuse the subjects. The pre-test questionnaire was administered in one class prior to the first CLIL lesson and was answered and collected within the class time using 15 minutes, based upon the subjects' agreement. I observed all the subjects complete the questionnaire within 15 minutes. Prior to the questionnaire administration, I explained the purpose of the research and compliance with

confidentiality, answered the subject's queries, and requested an informed consent to volunteers of goodwill (APPENDIX VI, VII).

3.3.2 Post-test questionnaire

The post-test questionnaire was administered after the third CLIL lessons. The post-test questionnaire was answered and collected after all the CLIL activities within the lesson time taking up 15 minutes. The post-test questionnaire also contains 30 items, but all the descriptions were modified to the past tense because the subjects had now experienced each item by the time of the post-test questionnaire (APPENDIX VIII, IX). CGs did not experience teacher-student assessment of presentations. Therefore, the aim of the questions regarding it was to find whether or not there was any change in learner thoughts about presentations and, if it is the case, examine the reason for the change.

The items 11, 15, 29 scores were inversely converted after collecting pre-test and post-test questionnaires to reflect the accurate nature of the response. (i.e. the scores 1 and 2 are converted into 5 and 4, respectively.)

After collecting the questionnaires, all the marked scores were input to spreadsheets, and the mean scores of each item were calculated. Firstly, all the mean scores were checked to identify if positive results (i.e. scores of 3.0 or more) were gained. Then, comparative analyses were conducted according to each Part and were divided into 2 components: pre-test vs. post-test comparative analyses from Part 1 to Part 3-2, and experimental vs. control group comparative analyses of both the pre-test and post-test of Part 3-3. The former seeks to capture the significant increase/decrease of the mean scores between pre-test and post-test in

all groups. In doing so, this analysis attempts to elucidate how well a series of *neuroELT* activities in the CLIL lessons enhance learner motivation and understanding. The latter attempts to identify any major difference between pre- and post-test according to the group. Any increase/decrease by 0.19 or more was determined to be considered material. This figure was computed by averaging the absolute scores of each fluctuation.

3.3.3 Focus groups

In light of the above quantitative analyses, focus groups were recruited from each class to discuss the possible reasons for the unexpected and unusual results. The focus group interview was conducted in January 2015, four weeks after the post-test questionnaire due to the winter holiday and was held in my office. Each group interview was held in different time slots for 30 minutes based upon participants' agreement, and 5 to 6 students from each class participated voluntarily. At least one student was recruited from each of the 7 departments. Handouts for illustrating the questionnaire results were prepared and distributed to each participant, and 6 discussion questions were provided by the author. The purpose of the focus group interview was confirmed by the participants, and confidentiality was promised to be securely maintained. The interviews were recorded after informed consent by each student. Figures 3.2 to 3.4 illustrate the general information about the participants in each focus group.

Student#	Gender	Department (major)	English Proficiency
Student 1	male	Mechanical Engineering	Avanced
Student 2	male	Mechanical Engineering	Advanced
Student 3	male	Mechanical Engineering	Beginner
Student 4	male	Information Science and Engineering	Lower-Intermediate
Student 5	male	Civil and Environmental Engineering	Intermediate

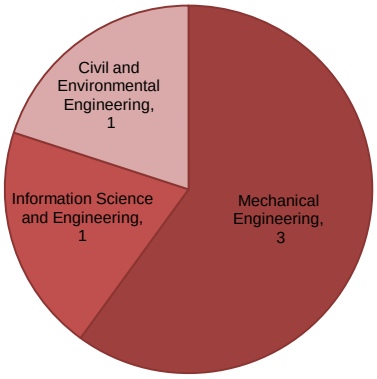


Figure 3.2. General information about the participants in Focus Group 1

Student#	Gender	Department (major)	English Proficiency
Student 6	male	Applied Chemistry	Upper-Intermediate
Student 7	male	Applied Chemistry	Intermediate
Student 8	male	Applied Chemistry	Lower-Intermediate
Student 9	female	Applied Chemistry	Intermediate
Student 10	female	Electric and Electronic Engineering	Intermediate

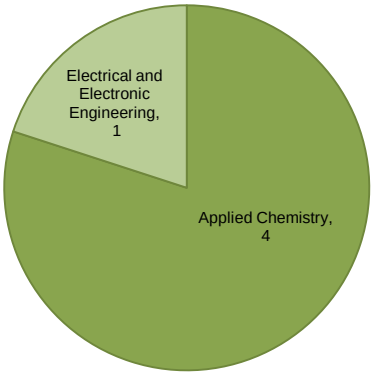


Figure 3.3. General information about the participants in Focus Group 2

Student#	Gender	Department (major)	English Proficiency
Student 11	male	Environmental Science and Engineering	Upper-Intermediate
Student 12	female	Environmental Science and Engineering	Lower-Intermediate
Student 13	female	Environmental Science and Engineering	Lower-Intermediate
Student 14	male	Perceptual Science and Design Engineering	Lower-Intermediate
Student 15	female	Perceptual Science and Design Engineering	Intermediate
Student 16	female	Perceptual Science and Design Engineering	Beginner

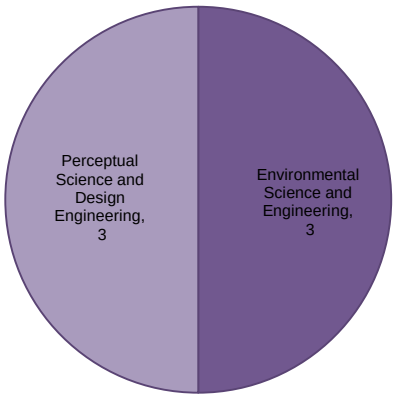


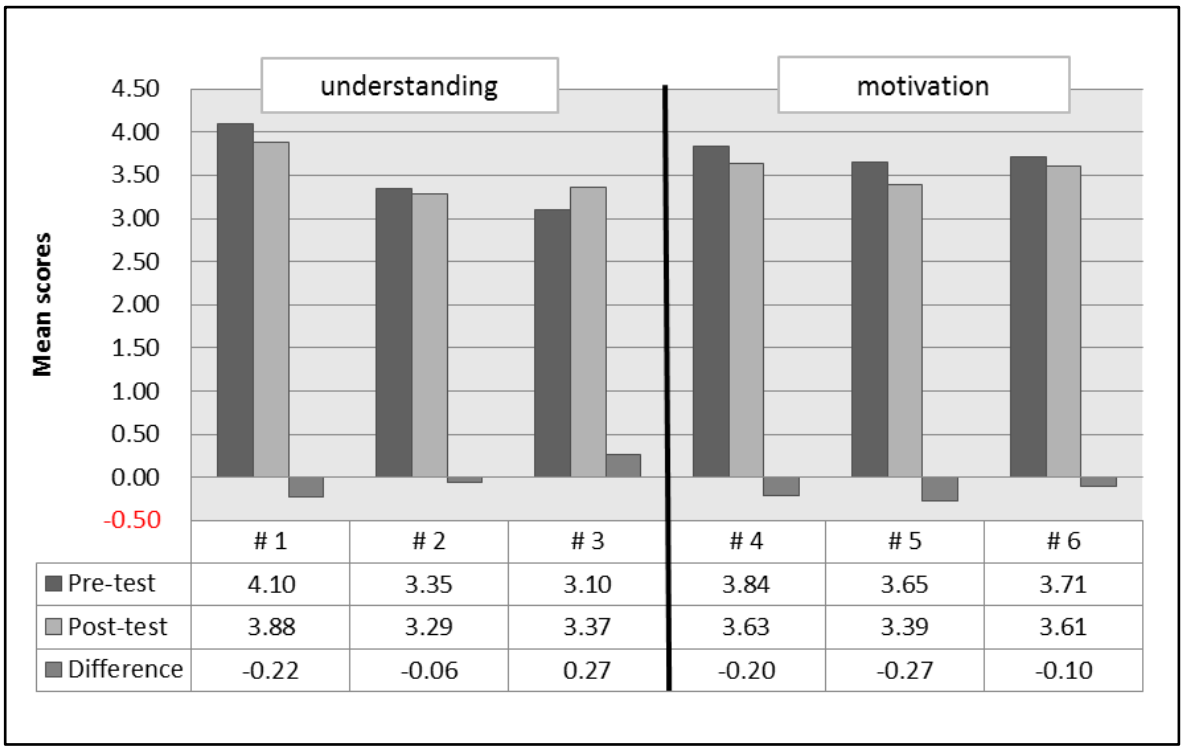
Figure 3.4. General information about the participants in Focus Group 3

CHAPTER 4 RESULTS

In this chapter, the results from the pre-test and post-test questionnaires are described. As mentioned earlier, the higher the mean score is, the more positive the results on learner motivation and understanding are. Firstly, the results from the comparative analyses on the pre-test and post-test questionnaire results are illustrated. This covers the responses from Part 1 to Part 3-2 in the questionnaires, in turn. Secondly, comparative analysis of control groups (n=34) and experimental group (n=15) regarding Part 3-3 is presented. This section also includes pre-test vs. post-test comparative analyses of each group. Finally, qualitative data from focus groups is presented. As mentioned in the methodology chapter, the first section considers an increase/decrease of the mean scores by 0.19 or more as significant, and, in the second section, a difference of the mean scores by 0.23 or more is regarded as significant and is focused upon.

4.1 Part 1 to Part 3-2: Pre-test vs. Post-test comparative analyses

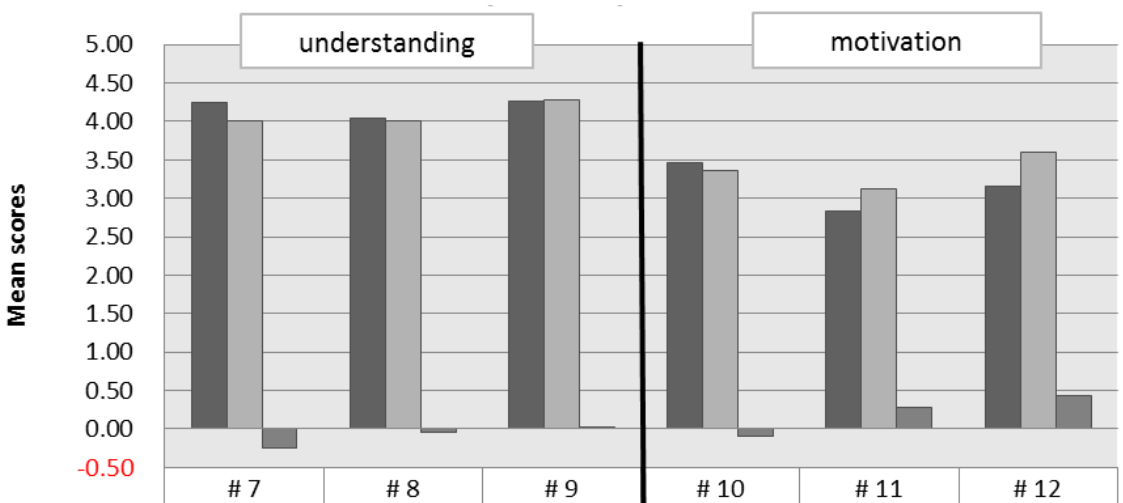
Part 1 tested the possibility of enhanced learner motivation and understanding by learner predictions. As Figure 4.1 shows, there were 3 sharp declines by 0.22 (item 1), 0.20 (item 4), and 0.27 (item 5), and a major increase by 0.27 (item 3). Overall, items on learner understanding ranged from 3.10 to 4.10, while items on learner motivation ranged from 3.39 to 3.84.



	# 1	# 2	# 3	# 4	# 5	# 6
Pre-test	4.10	3.35	3.10	3.84	3.65	3.71
Post-test	3.88	3.29	3.37	3.63	3.39	3.61
Difference	-0.22	-0.06	0.27	-0.20	-0.27	-0.10

Figure 4.1. Comparative analysis of pre- and post-test questionnaire results (Part 1)

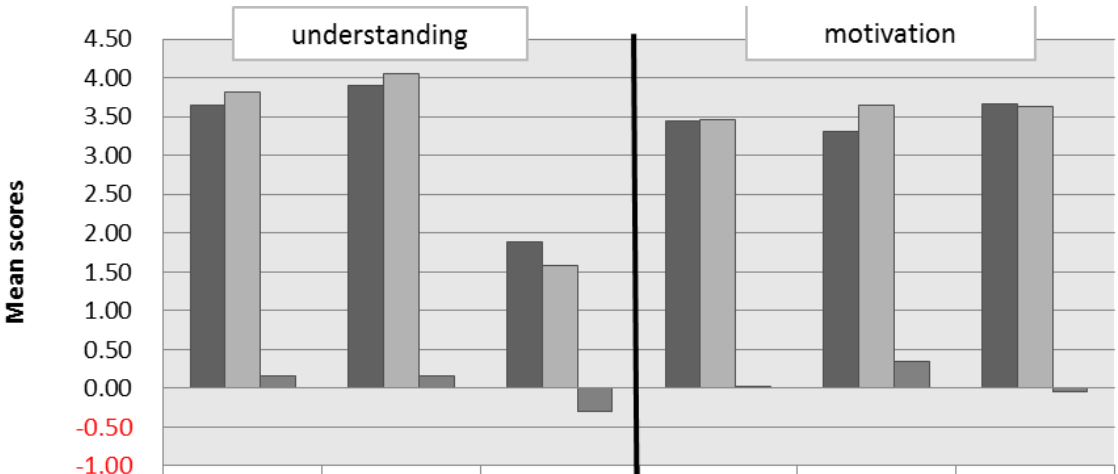
Part 2 tested the possibility of enhanced learner motivation and understanding by solvable mysteries. As Figure 4.2 shows, there were 2 significant rises by 0.29 (item 11) and 0.43 (item 12), and a major drop by 0.24 (item 7). Overall, items on learner understanding ranged from 4.00 to 4.29, while items on learner motivation ranged from 2.84 to 3.59. Although item 11 recorded 2.84 in the pre-test questionnaire, the mean score increased to 3.12 in the post-test.



	# 7	# 8	# 9	# 10	# 11	# 12
Pre-test	4.24	4.04	4.27	3.47	2.84	3.16
Post-test	4.00	4.00	4.29	3.37	3.12	3.59
Difference	-0.24	-0.04	0.02	-0.10	0.29	0.43

Figure 4.2. Comparative analysis of pre- and post-test questionnaire results (Part 2)

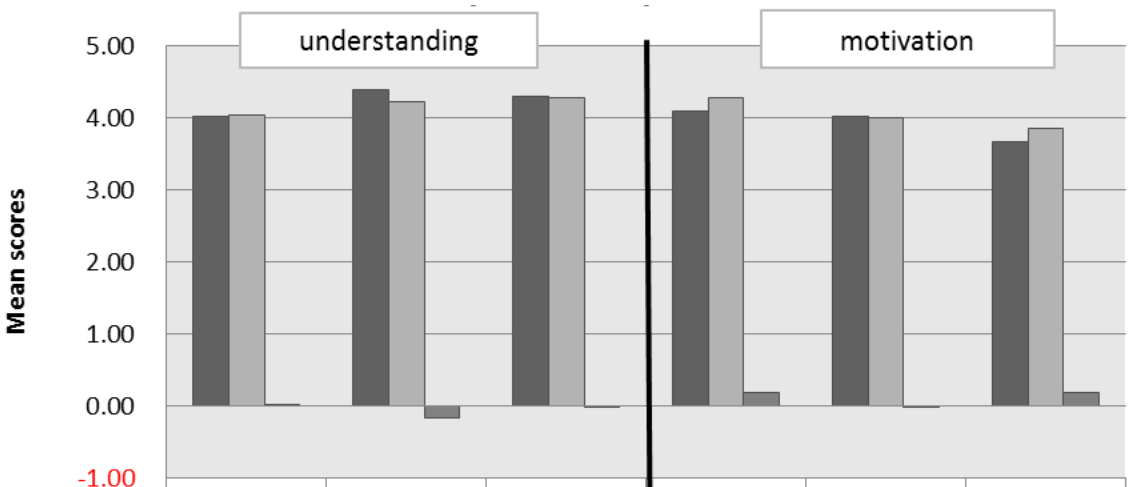
Part 3-1 tested the possibility of enhanced learner motivation and understanding by implementing self-assessment. As Figure 4.3 shows, the mean scores of items 13 and 14 concerning learner understanding moderately increased, but a decrease of the mean score of item 15 by 0.30 was remarkable. Enhanced learner motivation was presented with an increase by 0.35 (item 17). Overall, except for the significantly low scores of # 15, items on learner understanding ranged from 3.65 to 4.41, while items on learner motivation ranged from 3.31 to 3.67.



	# 13	# 14	# 15	# 16	# 17	# 18
Pre-test	3.65	3.90	1.89	3.45	3.31	3.67
Post-test	3.82	4.06	1.59	3.47	3.65	3.63
Difference	0.16	0.16	-0.30	0.02	0.35	-0.04

Figure 4.3. Comparative analysis of pre- and post-test questionnaire results (Part 3-1)

Part 3-2 tested the possibility of enhanced learner motivation and understanding by incorporating peer-to-peer assessment. There was no major fluctuation identified (Figure 4.4). Overall, items on learner understanding ranged from 3.10 to 4.10, while items on learner motivation ranged from 3.39 to 3.84.



	# 19	# 20	# 21	# 22	# 23	# 24
Pre-test	4.02	4.39	4.29	4.08	4.02	3.67
Post-test	4.04	4.22	4.27	4.27	4.00	3.86
Difference	0.02	-0.16	-0.02	0.18	-0.02	0.18

Figure 4.4. Comparative analysis of pre- and post-test questionnaire results (Part 3-2)

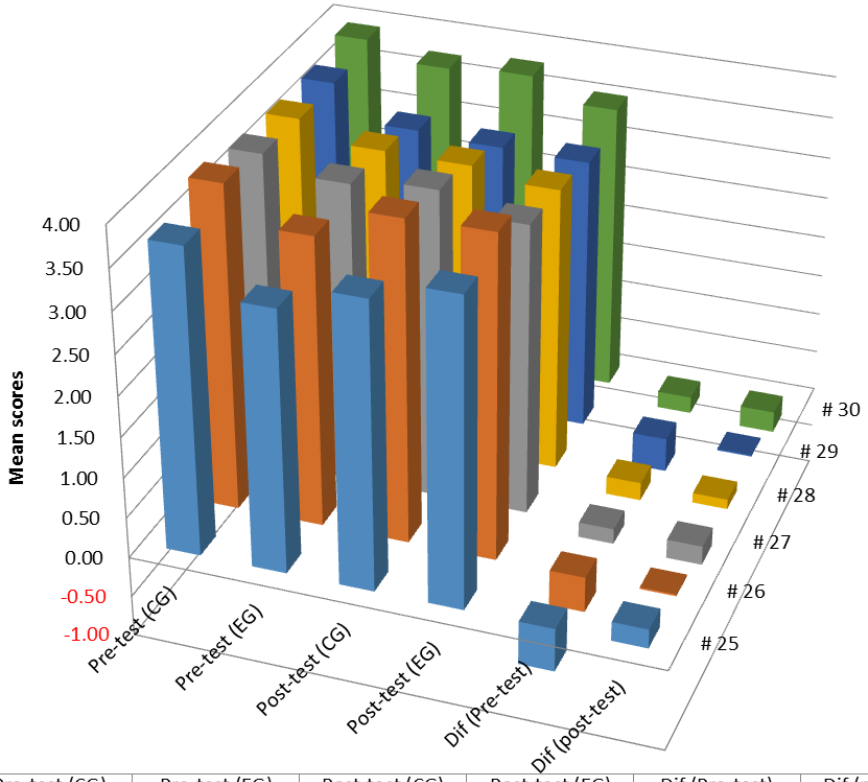
4.2 Part 3-3: Control Groups vs. Experimental Group comparative analysis

Overall, as can be seen in Figure 4.5, positive mean scores of over 3.00 were recorded in response to all items. This section illustrates major difference of the mean scores between control groups and experimental group based upon pre-test and post-test questionnaire results, in turn. Furthermore, pre-test vs. post-test comparative analyses of each group is presented.

Firstly, according to Control vs. Experimental group comparative analysis of the pre-test questionnaire results, items 25, 26, and 29 were found to include significantly lower scores in experimental group by 0.54, 0.44, and 0.42, respectively. Therefore, at the time of the pre-test questionnaire, control groups showed higher learner motivation and understanding than the

experimental group.

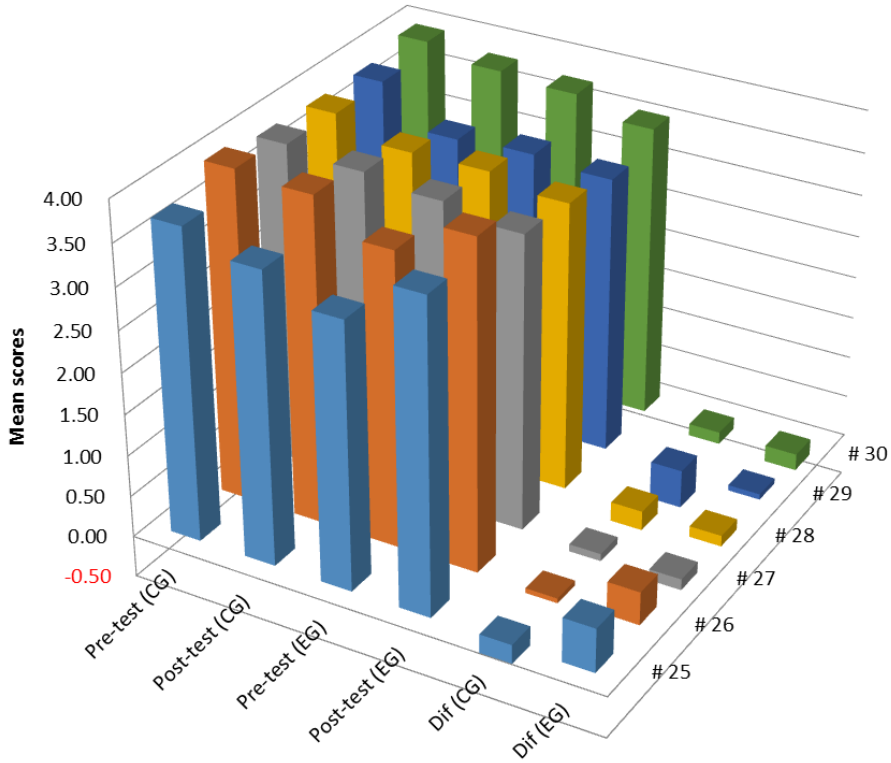
Secondly, Control vs. Experimental group comparative analysis of the post-test questionnaire results demonstrated remarkably lower scores by 0.23 (item 27) and 0.26 (item 30) and a higher score by 0.23 (item 25) in experimental group.



	Pre-test (CG)	Pre-test (EG)	Post-test (CG)	Post-test (EG)	Dif (Pre-test)	Dif (post-test)
# 25	3.74	3.20	3.50	3.73	-0.54	0.23
# 26	3.97	3.53	3.91	3.93	-0.44	0.02
# 27	3.85	3.67	3.76	3.53	-0.19	-0.23
# 28	3.82	3.60	3.59	3.47	-0.22	-0.12
# 29	3.82	3.40	3.35	3.33	-0.42	-0.02
# 30	3.94	3.73	3.79	3.53	-0.21	-0.26

Figure 4.5. Control vs. Experimental Group comparative analysis of pre- and post-test questionnaire results (Part 3-3)

Finally, as shown in Figure 4.6, pre-test vs. post-test comparative analyses of control groups revealed the fact that there were major declines in the post test by 0.24 (item 25), 0.24 (item 28), and 0.47 (item 29). Conversely, the same analyses of experimental group presented the remarkable increases in the post-test by 0.53 (item 25) and 0.40 (item 26).



	Pre-test (CG)	Post-test (CG)	Pre-test (EG)	Post-test (EG)	Dif (CG)	Dif (EG)
# 25	3.74	3.50	3.20	3.73	-0.24	0.53
# 26	3.97	3.91	3.53	3.93	-0.06	0.40
# 27	3.85	3.76	3.67	3.53	-0.09	-0.13
# 28	3.82	3.59	3.60	3.47	-0.24	-0.13
# 29	3.82	3.35	3.40	3.33	-0.47	-0.07
# 30	3.94	3.79	3.73	3.53	-0.15	-0.20

Figure 4.6. Pre- and Post-test comparative analysis of Control and Experimental Groups (Part 3-3)

4.3 Focus group interview data

The following 6 questions in Table 4.1 were chosen because each question involves the biggest fluctuation in each Part of the questionnaire results. Transcribed students' responses according to the group are available in English and Japanese in APPENDICES X and XI, respectively. This section will focus upon especially the results gained directly relevant to the facets of 3 research questions: learner predictions, solvable mysteries, and teacher-student

Question 1
Why do you think that the following contradictory results were identified after three CLIL lessons? Learner understanding improved by implementing learner prediction activities rather than just presenting learning goals at the beginning of the class. However, learner motivation dropped especially by losing motivation to accomplish a little more challenging learning goals in the next class despite achieving the present learning goals.

Question 2
In spite of students' aha! experience during three CLIL lessons, why do you think that it did not lead to students' long retention of the learning items or enhanced motivation to learn a little more challenging items?

Question 3
How do you think self-assessment could have been implemented in light of the following results? Except for # 15 result, both items concerning learner motivation and understanding recorded high scores and increases in general.

Question 4
Why do you think that control groups considered presentations to a teacher to be more necessary and more understanding enhancement than experimental group in the pre-test although both groups had not experienced presentations in this course at the time of the pre-test?

Question 5
Why do you think that experimental group does not seem to admit, but control groups do, the positive correlation between a moderate sense of tension and understanding although experimental group perceived that understanding enhanced by giving presentations to a teacher?

Question 6
Why do you think that control groups considered presentations to a teacher to be less necessary in the post-test whereas they had no experience throughout this course?

Table 4.1 Focus group interview questions

assessment of presentations. Table 4.2 illustrates a summary of distinctive viewpoints from the students in CGs and students in EG.

	CGs	EG
1. Changes in motivation and understanding by implementing learner prediction activities	**Student 8:** I'd like to talk about why learner understanding improved. When I only looked at the demonstrated learning goals, I couldn't read everything because they were written in English. So, it was hard for me to remember what learning goals there were. There was a list distributed in the three-time CLIL lessons, wasn't there? (While doing activities to guess learning goals), we chose today's learning goals will be this and that in the list. That means I chose them as I understood the meaning of the learning goals. It was the last three-time CLIL lessons that made learning goals clear. […] Although I understood learning goals after the (prediction of learning goals) activities, I didn't accomplish them. Therefore, the lessons were challenging enough at that time, and I didn't think I wanted to try the upper level. Then, learner motivation dropped.	**Student 12:** Speaking of vocabulary, it is fine for me just to learn a little difficult vocabulary. However, if the learning involves activities such as considering pros and cons, the vocabulary expected to use becomes difficult. It takes a long time to think in the following cases: if the topic to discuss is difficult, if higher language proficiency and vocabulary are expected, if pros and cons need considering like in debating. Then, I thought it would be better to use the vocabulary with the standard level if we try debating, which we don't usually have chance to do. This way, it will be easier to give presentations in English. The classroom activities are so novel and fresh, which other subject classes don't have such as discussing with peers in a group, thinking about the sentences collaboratively, considering pros and cons and etc… Since we don't have such an opportunity even in Japanese, I feel a little hard to go about the activities in English… But, the activities are really fun, so I don't want you to eliminate the activities! (Everyone laughed).
2. Changes in motivation and understanding with aha moments by overcoming solvable mysteries	**Student 9:** I think our understanding will improve if there is a place where we can utilize what we have learned with aha! experience repeatedly. I guess our motivation to the next step will be enhanced.	**Student 14:** It is certain that I personally feel happy when I have aha! moment. But, when I encounter the next difficult item, I need to struggle again, don't I? I feel it's a little threatening. I tend to feel a sense of threat rather than pleasure.
3. A sense of tension and understanding	**Student 6:** EG should have thought that a sense of achievement was (more) helpful (than a sense of tension) because of their familiarity to presentations, while CG tended to get nervous because of their unfamiliarity to presentations and felt that they would need to prepare well. Therefore, CG should have thought that a sense of tension was helpful to enhance understanding.	**Student 13:** There is only one presenter (from each group), isn't there? Personally, I felt more nervous when I was discussing in a group in an attempt to share each other's wisdom fully. When I gave a presentation, I was actually just reading what we discussed. So, I didn't feel a sense of tension that much.
4. Possible reasons for hesitance to give a presentation	**Student 7:** The three time CLIL lessons were completely different from previous lessons, weren't they? CG could have been attracted to the novelty of the three time CLIL lessons. They could have been so impressive that CG didn't think presentations would be really necessary.	**Student 12:** I don't want to give a presentation if good ideas didn't come up during the discussion because of the difficult content. Or it is fine to think well because the content has become a little difficult, but I (lose confidence and) get embarrassed to give a presentation.

Table 4.2. A summary of different perspectives from students in CGs and students in EG

The first contrast is from replies to Question 1. Student 8 in CG said that, with a mere presentation of learning goals before implementing CLIL lessons, it was impossible for him to finish reading and even understand them. However, he started to be able to understand what to learn after guessing activities of learning goals were incorporated in the CLIL lessons. Nevertheless, it did not necessarily mean that he achieved all the learning goals. Thus, his motivation did not result in an increase. Student 12 in EG demonstrated her perceived pressure from the higher vocabulary level expected to use in a more challenging class and the wide range of novel activities.

The second contrast is from Question 2. Students 9 in CGs admitted enhanced understanding by aha moments, but she said that students did not have the environment in which they could repeatedly use what they learned. Therefore, if they had the environment, learner motivation and understanding would probably improve according to Student 9. Student 14 in EG said that although aha moment was a pleasurable experience, students certainly would encounter the next difficult learning content and then would feel threatened or tense.

The third contrast is from Question 5. Student 6 in CGs said that because EG should have been familiar with giving presentations, EG thought that it was not their sense of tension, but their sense of accomplishment that was effective for enhancement of understanding. According to Student 12, since CGs were not accustomed to giving presentations and would feel tense, CGs may have thought that they would prepare and learn well before giving presentations. She added that her perceived sense of tension was stronger when she was discussing with her peers in an attempt to come up with good ideas than when she gave a presentation because she just read the group ideas aloud.

The final contrast is from Question 6. Student 7 in CGs said that three CLIL lessons were so different from the prior lessons that students could have been attracted to the novelty and could have thought the extra presentation was unnecessary. Student 12 in EG demonstrated her feeling of embarrassment if no good ideas came up during the discussion due to the difficulty of the content.

CHAPTER 5 DISCUSSION

This chapter discusses the responses to the three research questions in the context of this present pilot study:

1. How well do learner predictions influence learner motivation and understanding in a CLIL context?
2. How well do solvable mysteries enhance learner motivation and understanding?
3. In addition to self-assessment and peer-to-peer assessment, how well does teacher-student assessment (of presentations) enhance learner motivation and understanding?

In this chapter, the discrepancies between the actual results and the hypothesized results are noted. Then, the possible methodological and pedagogical faults are discussed. Next, reflecting upon the discussion points, a pedagogical model (TACIM) and an activity (SEAMA) are proposed. Finally, limitations of this study and ideas for the future are considered.

5.1 How well do learner predictions influence learner motivation and understanding in a CLIL context?

The results show that learner understanding is enhanced by implementing prediction activities rather than just demonstrating the learning goals at the beginning of the class. Furthermore, the mean scores of both learner motivation and understanding stayed over 3.2 in the post-test, which represent relatively positive consequences. However, despite a slight increase in learner

understanding from prediction activities, overall learner motivation dropped slightly. Why was this inverse outcome obtained? It may have derived from the possible faults in the pedagogy and research methodology. These factors will be discussed in the following two sections.

5.1.1 The possible faults in the research methodology

The three-time CLIL lessons were too short to familiarize students with the learning goals of the prediction activities, let alone induce their perceived motivation. They seemed to have used their energy and focused especially on grasping the procedures of the activities and understanding the challenging content. As Student 6 stated, three time CLIL lessons were too short to get accustomed to and enhance learner motivation. Since it was also the first attempt in the course to implement activities using the video, Student 13 argued that the activity to guess the learning goals whilst watching a video was hard.

5.1.2 The possible faults in the pedagogy employed

There may have been two major pedagogical faults: adaption of a difficult teaching material and inadequate opportunity for students to clarify the learning points. The learning obstacle that Student 13 encountered seems to be a strong element inhibiting learner motivation.

> Perhaps, my level is not good enough, but the activity (to predict learning goals) using the video was difficult to understand. When we were predicting the learning goals, I couldn't think very well. I would have been overwhelmed if the level had become higher.

The other fault may attribute to the inadequate opportunities to share students' uncertain

learning points. Student 5 argued as follows.

> I started to know how well I achieved the demonstrated learning goals. However, at the same time, what I didn't achieve was also made clear. So, I tended to focus on what I didn't still understand then rather than aiming at the higher level.

It is not a negative feedback at all that unachieved learning goals became clear to students, but how this remained problem can be resolved and how teachers can organize the sequence of class activities to spare time for answering the questions are more critical. It is also important to consider how teachers can create a classroom atmosphere where students can share questions freely. Taking into account the aforementioned comment from Student 5, self-assessment and peer-to-peer assessment appear to have focused upon *what* learning goals students could and could not accomplish, but they did not seem to have accentuated *how* unachieved learning goals could have been realized; namely, a failure to revisit the pathways to successful learning.

Two pedagogic approaches could have improved this situation: (1) teacher intervention to the peer-to-peer assessment and (2) teacher-student group forums. The former aims to give students instructions to consult and discuss with peers on the unachieved learning goals and have them teach unclear points to each other. Moreover, it is important to indicate some situational and/or emotional cues such as informing peers of when activity the learning item in question appeared and/or describing how students' emotions during the activity in order to contextualize the learning. In order to compensate for the negative byproduct of clear goal setting, which Student 5 mentioned above, unachieved learning goals could be re-learned by setting a teacher-student group forum in which any peer or teacher could re-teach after teacher-student assessments of presentations. As many EFL teachers in Japan are aware, if

you ask students, “Any questions?”, at best you will get the one-word response “no” to demonstrate their moderate understanding. However, the worst case is that they still have questions, but they are too shy to ask questions publically. Therefore, this needs to be conducted in a casual encouraging manner and, for example, small groups of six are formed to minimize anxiety. Students can start sharing their uncertain learning points autonomously or, if the forum does not go smoothly, teachers may intervene to elicit and re-teach the points.

5.1.3 Summary

Methodologically, three-time CLIL lessons were too short to accustom students with the activity to predict the learning goals. Pedagogically, there were two possible faults: use of difficult material and lack of opportunity to share students’ unresolved questions.

5.2 How well do solvable mysteries enhance learner motivation and understanding?

With reference to learner understanding according to aha experiences overcoming solvable mysteries, it stayed over 4.00 in the post-test, demonstrating that solvable mysteries do enhance learner understanding. However, no major changes of learner understanding were identified between pre- and post-test. Furthermore, counter to my hypothesis, the results showed that students felt more motivated with learning items that are “neither difficult” nor “easy” rather than a “little difficult”. Perhaps this is a cultural affect more than a learning-related neuro-psychological phenomenon, but this cannot be determined with this current data set.

5.2.1 The possible faults in the research methodology

The intended sense of ‘a little difficult’ in the questionnaire was likely to be negatively perceived and biased as equivalent to ‘difficult’ by students as many of them pointed out that the content and level of the three time CLIL lessons were difficult.

> The phrase “a little difficult” in the questionnaire was not clear to me. I wondered how difficult it would be considering the real situation. Then, I ended up marking the same level as mine because it looks safe. (Student 11)

This possible methodological failure is closely-intertwined with the possible pedagogic failure; therefore, it will be further discussed in the next section.

5.2.2 The possible faults in the pedagogy employed

The possible pedagogic faults can be recapitulated twofold: absence of task choices tailored to students’ level and few opportunities to reuse what students learned with aha experience.
As Student 6 stated,

> During the class, the level seems to be flat to me. So, for students who want to try hard tasks, a little challenging tasks can be given. For students who prefer easy tasks, easy tasks can be prepared.

Having had options such as tasks for beginner, intermediate, and upper-intermediate or higher levels, each student could have addressed optimal tasks and would have had more aha experience. Then, students could have perceived ‘a little difficult’ to be a more positive sense.

What the classroom EFL pedagogy can do to cope with few opportunities to reuse learned items will be incorporating a semi-cyclical syllabus. Due to the curricular requirement that the certain number of topics needs to be covered within the course, full cyclical syllabus is unlikely to be neither easy nor practical to implement. Therefore, a semi-cyclical syllabus seems to be a possibility in the future. In doing so, students will be exposed to familiar situations more often, and Student 15's following suggestion can be implemented.

> Aha! moment from the novel things will not remain in the long-term memory because the novel things are unusual and I will seldom find them in the daily life even in the future. I believe that aha! moment from what are familiar to me will remain in my long-term memory.

5.2.3 Summary

Methodologically, a statement in the questionnaire "a little difficult" could not be understood precisely. Therefore, students were negatively biased to perceive the meaning. Pedagogically, there were two possible faults: a vacuum of task choices according to students' level and a rare chance to reuse what students have learned with *aha moments* inside and outside of the class.

5.3 In addition to self-assessment and peer-to-peer assessment, how well does teacher-student assessment (of presentations) enhance learner motivation and understanding?

The results generally demonstrated EG's enhanced learner understanding through teacher-student assessment of presentations in the post-test with the mean scores over 3.5. However, a moderate sense of tension did not seem to lead to learner understanding.

Interestingly, CGs thought that a moderate sense of tension would be useful for enhancing understanding instead. Contrary to my expectations, learner motivation did not show major changes between the pre- and post-tests, whereas the mean scores in the post-test stayed over 3.3, indicating that teacher-student assessment of presentations could be barely perceived to be motivational. When it comes to self- and peer-to-peer assessment, despite no major changes between pre- and post-test, generally both mean scores stayed high, except for #15 due to the possible fault in research methodology. This represents that self- and peer-to-peer assessment are considered to enhance learner motivation and understanding moderately as students originally expected.

5.3.1 The possible faults in the research methodology

The research period was too short to assign all students as presenters. As Student 12 pointed out, this may have influenced the correlation between a sense of tension and understanding. Furthermore, as mentioned in the last section, unusually low mean score results of #15 should attribute to the fault in questionnaire design. Although it was a question regarding self-assessment, only this item directly compared with the effectiveness of peer-to-peer assessment. The questionnaire design of self-assessment appears to have lacked coherence.

5.3.2 The possible faults in the pedagogy employed

Teacher monitoring and instruction was inadequate for students who did not have to give a presentation as Student 1stated.

> [I]f my group is uncooperative, nobody in the group will help me straight after the presenter is decided by

> rock-paper-scissors. […] Everyone feels a sense of tension before rock-paper-scissors. After that, they are relieved.

In order to improve learner motivation and understanding in association with this matter, my proposed pedagogic model will be explained in detail in section 5.4. Teacher intervention to group discussion could have occurred more frequently. As Students 12, 14 suggested, when there were a few opinions from the group members, they became embarrassed or hesitant to give presentations. The teacher could have encouraged the group discussion by providing some examples more often.

5.3.3 Summary

Methodologically, the research period was too short to assign every student as presenters. This may have affected the correlation between a sense of tension and understanding. Pedagogically, there were two possible faults: insufficient attention, especially for the students who did not have presentations, and inadequate teacher intervention using modeling for student groups.

5.4 Proposed pedagogic model reflecting upon the possible faults identified

In this pilot study, contrary to my expectations, the correlation between motivation and understanding could not be positively identified amongst learners. As discussed in previous sections, this is due to some possible faults in pedagogy employed and research methodology. Reflecting upon the possible faults, this section proposes a pedagogic model termed The *Triangular Alignment-Choice Instructional Modulation (TACIM) model* (Figure 5.1).

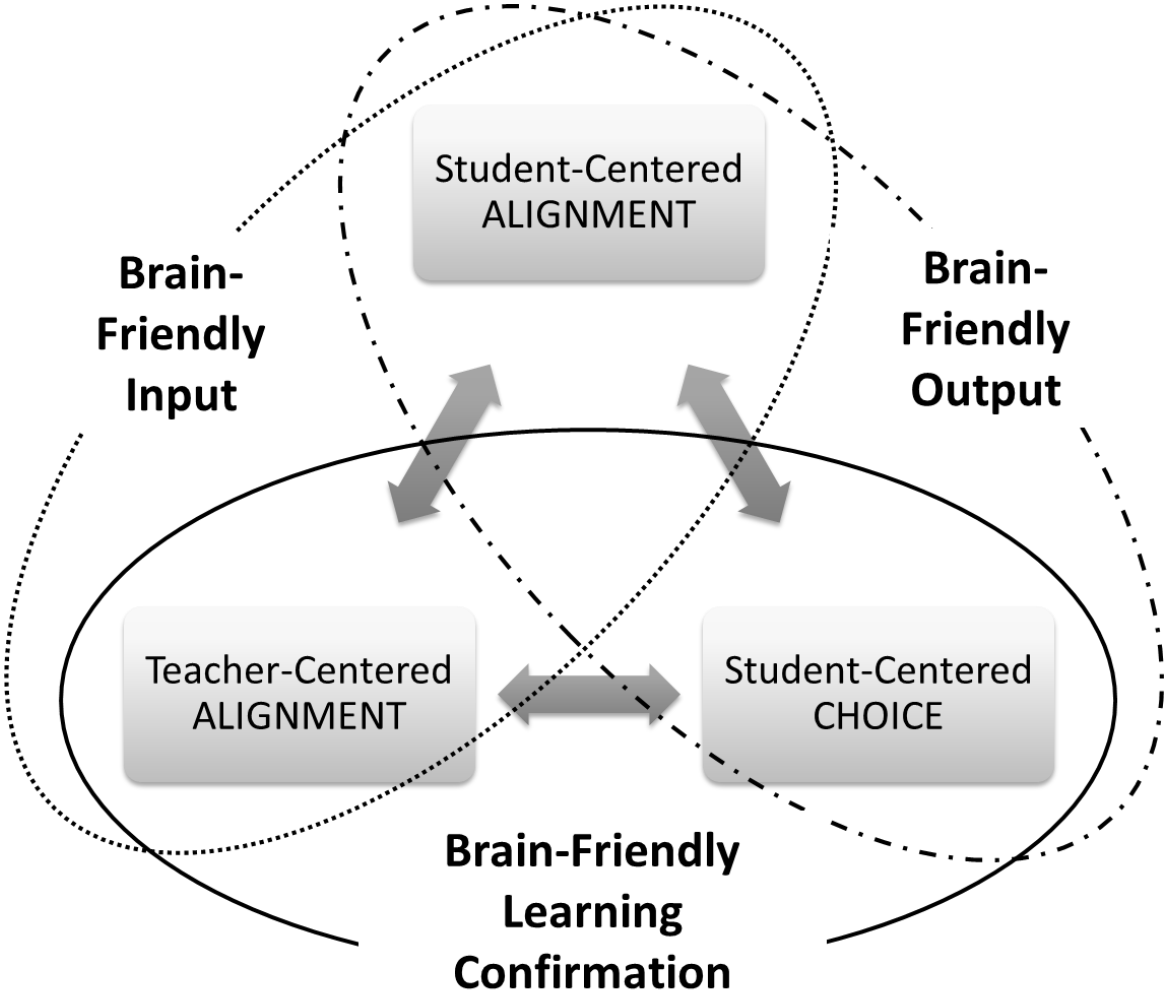


Figure 5.1. Triangular Alignment-Choice Instructional Modulation (TACIM) model

The TACIM model aims to enhance learner motivation and understanding in not only CLIL contexts but also general EFL settings, which subsume students with multiple levels. In order to raise learner motivation and understanding, it will be vital for teachers to provide learners with balanced instructions of *brain-friendly input*, *brain-friendly output*, and *brain-friendly learning confirmation*. Without *brain-friendly input*, understanding will not be initiated. Without *brain-friendly output*, understanding will not be cemented. Finally, without *brain-friendly learning confirmation*, full understanding will not be realized due to the possibility of remaining questions amongst learners. If teachers could adeptly modulate these three elements, learner understanding may improve, and then learner motivation can be enhanced. Teachers should also bear in mind how learners advance their learning in the classroom according to teacher's instructions. If a student is at teacher-centered alignment, he will have two options: either consulting his peers to clarify his remaining questions or going about practicing with task choices. If another student is at student-centered alignment, he will also have two options: either asking his teacher to re-teach him using modeling or moving on to further practice with task choices. If the other student is at student-centered choice, likewise, he will have two options: either directly consulting his teacher or casually asking questions to his peers.

For improved learner understanding, *alignment* will be the key for the successful instructions particularly for the classroom accommodating learners with various English proficiencies. *Alignment* can be categorized into two elements: *teacher-centered alignment* and *student-centered alignment*. *Teacher-centered alignment* stems from recent research findings identifying synchronization between storyteller and listener brains. When the storyteller's insula, a brain region processing emotion, was activated, listeners' same brain region was also activated, and likewise at the time of the storyteller's frontal cortex activation, the same

activation was identified in the listeners (Hassan, cited in Widrich 2012). Furthermore, it is the best way to use simple but heartfelt language and low complicacy for activating the brain regions that enable us to associate with the context in the story (Widrich, 2012). Therefore, it is considered that good teacher instructions and modeling will activate learners' brain regions necessary for learning teaching points and the upcoming tasks.

It is suggested that teacher modeling, timely teacher intervention to peer-to-peer assessment and teacher-student forum should be encouraged. In addition to mere oral instructions before tasks and activities, teacher modeling should be attuned with a neuro-based viewpoint. Whilst observing teacher modeling, learners' MNSs will be activated, and then their pre-motor cortex activation will also be involved due to teacher's kinesthetic representation. Rather than listening to teacher's oral instructions, teacher modeling involves learners' multiple sensory input. Simple oral instructions seem to provide insufficient context compared to the aforementioned storytelling; therefore, teacher modelling may substitute or even supersede the effect of storytelling. As with storyteller-listener interbrain relations, teacher-student alignment may be fostered. Teachers can timely intervene in peer-to-peer assessments when required. The intervention should not end up with a mere oral explanation but needs to include demonstration of examples like teacher modeling to generate teacher-student alignment. I suggest that teacher-student forums should be a brief question-answer session, from students to teachers, conducted just before the wrap up of the lesson, in the casual atmosphere of groups of six. The teacher then elicits questions from each group and re-demonstrates points when necessary to eliminate last-minute uncertainty. This patches learner's missing points and guides them closer to a fuller understanding. In doing so, learners can be motivated to pursue *solvable mysteries* in the next lesson.

Student-centered alignment is grounded in the research finding of brain wave synchronization and interbrain networks constructed between two musicians. When people mutually coordinate their actions, small networks within and between their brains emerge, especially when the activities need exact alignment in time (Sänger, 2012). It is suggested that different people's brain waves also demonstrate synchronization as people reciprocally coordinate their actions in various manners including general human communication with each other (Sänger, 2012).

It is suggested that Simulation of Emotion Attached Mirroring Activity (SEAMA) and peer-teaching should be encouraged. SEAMA is my proposed activity which can be implemented especially during teacher-student assessment of presentations in order to enhance the level of student-student alignment. SEAMA also posits the capacity of MNSs and the aforementioned interbrain networks, which are activated when alignment of activities needs to be well-timed and precise (Sänger, 2012). In order to address the issue raised that unassigned presenters tended to neither attend to the content of presentations nor involve themselves in learning through peer presentations, teachers need to give instructions to have all students involved in the learning process. It is a metacognitive activity with careful instructions. Moreover, it tries to have students simulate and empathize as if they were giving a presentation themselves whilst observing their peer's presentations. Presentations entail not only narratives but also physical performance such as gestures, facial expressions, and eye-contact. Therefore, a similar effect like storyteller-listener interbrain activation and synchronization may occur, and this will lead to student-student alignment. Figure 5.2 illustrates the flow of SEAMA during peer presentations. The central idea for this activity is to bring learner emotions into the learning by means of *emoticons*. As van Geert and Steenbeek (2008) stated, emotion plays an essential role as a guide to successful learning. The

activity should not be too long but should be rather simple and clear. Nevertheless, learner motivation should be carefully attended. To this end, I believe that having students draw *emoticons* would be quick, clear and generates choices that are motivational; therefore, for students who want to write their feelings in sentences, it is optional.

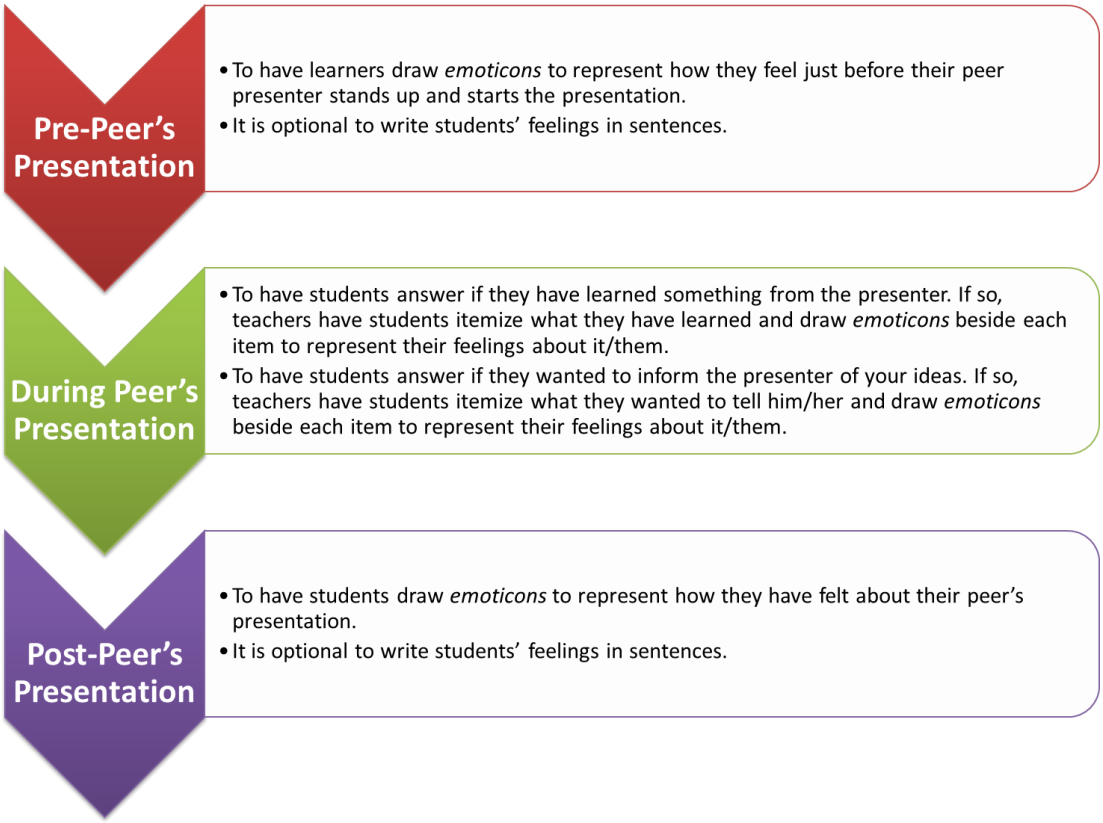


Figure 5.2. Flow of Simulation of Emotion Attached Mirroring Activity (SEAMA) during peer's presentations

For enhanced learner motivation, in light of focus group's feedback that tasks were difficult, it will be motivational to provide students with a choice of the task while considering their perceived proficiency. Motivation is enhanced by providing choices evoking "a feeling of ownership for the chosen activity" (Murphy and Uemura, 2013: 240). Teachers need to attend to the degree of scaffolding to tasks and materials. Graded scaffolding should be implemented to tasks and materials so that improved understanding will lead to enhanced motivation. For

example, learner prediction activities using videos can be improved if graded scaffolding (high, medium, and low/no) is provided with learner materials (Figure 5.3).

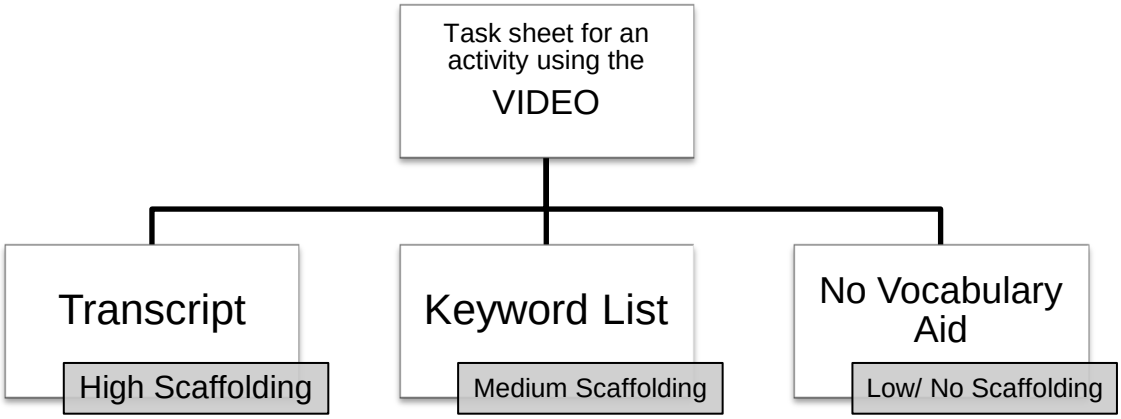


Figure 5.3. Proposed graded scaffolding to materials for learner prediction activity using the video

5.5 Limitations and ideas for the future

5.5.1 Limitations of the pilot study

I must recognize that the period of this research was too short to gain useful data and meaningful outcomes. Due to these time constraints, the students seemed to have been unable to grasp what CLIL is, let alone, the elements of CLIL described in the *three course meal approach*. If students had been engaged in CLIL activities for longer, they could have associated these elements of *neuroELT* and CLIL inside their brains and perhaps would have been motivated to go about each activity with motivation to pursue *solvable mysteries*. Furthermore, the number of subjects was not large enough, and also standardized tests such as

TOEIC® was not available.

5.5.2 Toward a full-year implementation of TACIM and SEAMA

For my future research, the effectiveness of the proposed pedagogical model of TACIM and SEAMA further need examining. This section will propose a full-year implementation of TACIM and SEAMA. As I mentioned earlier, the keywords for TACIM are *alignment* and *choice*. In this proposal, I will limit the scope of the test to *student-centered alignment* and *student-centered choice*. This proposed research will cover the first and second semester. Group A will be set as a CG, and Groups B and C will be set as EGI and EGII, respectively (Table 4.3). Graded scaffolding to materials (*choice*) will be implemented only in the second semester to all groups to compare the differences between the semesters. In Groups A and B, peer teaching involves demonstrations of examples, while Group C does not. SEAMA will be incorporated during teacher-student assessment of presentations in Groups A and B only. In

	FIRST SEMESTER			SECOND SEMESTER		
	Group A Control Group	Group B Experimental Group I	Group C Experimental Group II	Group A Control Group	Group B Experimental Group I	Group C Experimental Group II
Graded Scaffolding	×	×	×	○	○	○
Peer Teaching (with/without example)	○ with example	○ with example	○ without example	○ with example	○ with example	○ without example
SEAMA	○	×	○	○	×	○

Table 4.3. Proposed control group and experimental group allocation

addition to the graded scaffolding, I have designed to incorporate three elements (peer teaching with examples and without examples, and SEAMA) to test if the increased alignment will lead to enhanced learner motivation and understanding. The following comparisons will be conducted: (1) Group A vs. Group B (to examine how well SEAMA will enhance learner motivation and understanding). (2) Group A vs. C (to investigate how well peer teaching with examples will enhance learner motivation and understanding). (3) Group B vs. Group C (to test how well the increased alignment will lead to enhanced learner motivation and understanding.)

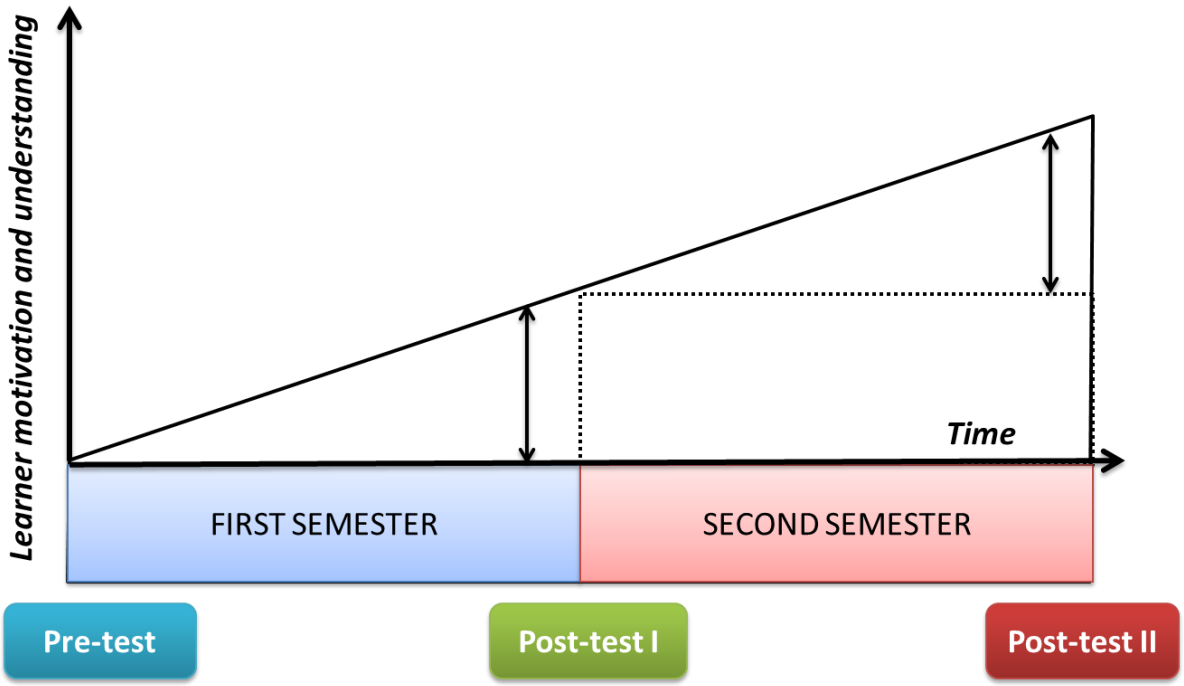


Figure 5.4 Questionnaire administration schedule

Questionnaires will be administered three times: before and after the first semester and after the second semester (Figure 5.4). Then, pre- vs. post-test (first semester) and post-test I vs. post-test II (second semester) results will be compared. Finally, after a full-year course

completion, pre-test vs. post-test II will be compared. Furthermore, TOEIC/TOEIC IP® test will be utilized and compared at the pre-test and post-test II to grasp improvement of learner understanding in a more reliable manner.

CHAPTER 6 CONCLUSION

This pilot study investigated learner motivation and understanding utilizing *neuroELT* maxims regarding learner predictions, solvable mysteries, and teacher assessment of presentations in a Japanese tertiary CLIL context. Overall, counter to my hypotheses, simultaneous realization of enhanced learner motivation and understanding was not identified. Reflecting upon possible methodological and pedagogical faults, the following challenges have been identified: (1) how EFL classes with multiple proficiency levels can be addressed, (2) how learner motivation and understanding can be simultaneously enhanced in a balanced manner, and (3) how presentations can involve listeners in a neuro-based procedure for better learning. A proposed pedagogic model (TACIM) and a proposed metacognitive activity (SEAMA) were demonstrated in an attempt to cope with these issues. It is hoped that, whilst examining the effectiveness of TACIM and SEAMA in the future, the notion of alignment will be more widely recognized and researched in not only CLIL but also general EFL settings.

REFERENCES

Atance, C. and O'Neil, D. (2001) Episodic future thinking. **Trends in Cognitive Science,** 5, pp. 533-539.

Aziz-Zadeh, L., Kaplan, J. and Iacoboni, M. (2009) "Aha!": The neural correlates of verbal insight solutions. **Human Brain Mapping,** 30, pp. 908-916.

Baker, L. (2005) "Developmental Differences in Metacognition: Implications for Metacognitively Oriented Reading Instruction" In Israel, S., Block, C., Bauserman, K., and Kinnucan-Welsch, K. (eds.) **Metacognition in Literacy Learning: Theory, Assessment, Instruction, and Professional Development.** Mahwah: Lawrence Erlbaum Associates. pp. 61-79.

Bar, M. (2011) **Predictions in the brain: using our past to generate a future.** New York: Oxford University Press. pp.13 -26.

Barsalou. L. (2011) "Simulation, situated conceptualization, and prediction." In Bar, M. (ed.) **Predictions in the brain: using our past to generate a future** New York: Oxford University Press pp.27 -39.

Blythe, T. (1998) **The Teaching for Understanding Guide.** San Francisco: Jossey-Bass.

Boud, D. (1995) **Enhancing Learning through Self-assessment.** London: Kogan Page.

Boud, D. and Falchikov, N. (1989) Quantitative studies of self-assessment in higher education: a critical analysis of findings. **Higher Education,** 18, pp. 529-549.

Bowden, E., Jung-Beeman, M., Fleck, J., and Kounios, J. (2005) New approaches to demystifying insight. **TRENDS in Cognitive Science,** 9/7, pp. 322-328.

Brown, H. (2007) **Principles of Language Learning and Teaching.** 5th ed. New York: Pearson Education.

Cahill, L. and Alkire, M. (2003) Epinephrine enhancement of human memory consolidation: Interaction with arousal at encoding. **Neurobiology of Learning and Memory,** 79, pp. 194-198.

CAST (2002-2015) Chapter 2 What Brain Research Tells US About Learner Differences: Strategic Networks. [online]
Available from: http://www.cast.org/teachingeverystudent/ideas/tes/chapter2_5.cfm
[Accessed 9 February 2015]

Centre for Confidence and Well-being (2015) Eight Steps Towards a More Satisfying Life. [online] Available from:
http://www.centreforconfidence.co.uk/pp/techniques.php?p=c2lkPTImdGlkPTMmaWQ9NjQ= [Accessed 20 March 2015]

Coyle, D. (1999) **"**Theory and planning for effective classrooms: supporting students in content and language integrated learning contexts" In Masih, J. (ed.). **Learning Through a Foreign Language.** London: CILT. pp. 46-62.

Coyle, D. (2007) Content and Language Integrated Learning: Towards a Connected Research Agenda for CLIL Pedagogies. **International Journal of Bilingual Education and Bilingualism,** 10/5, pp. 543-562.

Coyle, D., Hood, and Marsh, D. (2010) **CLIL: Content and Language Integrated Learning.** Cambridge: Cambridge University Press.

Cozolino, L. (2013) **The social neuroscience of education: optimizing attachment and learning in the classroom.** New York: Norton & Company.

Csikszentmihalyi, M. (1997) **Finding flow: the psychology of engagement with everyday life.** New York: Basic Books.

Dale, L. and Tanner, R. (2012) **CLIL Activities.** Cambridge: Cambridge University Press.

Dalton-Puffer, C. (2015) Policy and practice of CLIL in Europe and beyond. [online] Available from:
http://www.cliljapan.org/wp-content/uploads/2015/02/Dalton-Puffer-CLIL-Sophia-University-2015.pdf [Accessed 20 March 2015]

de Graaff, R., Koopman, G., Anikina, Y., and Westhoff, G. (2007) An Observation Tool for Effective L2 Pedagogy in Content and Language Integrated Learning (CLIL). **The International Journal of Bilingual Education and Bilingualism,** 10/5, pp. 603-624.

de Kloet, E., Joels, M., and Holsboer, F. (2005) Stress and the brain: From adaptation to disease. **Nature Reviews Neuroscience,** 6, pp. 463-475.

Dochy, F., Segers, M., and Sluijsmans, D. (1999) the use of self-, peer and co-assessment in higher education: a review, **Studies in Higher Education,** 24/3, pp. 331-350.

Falchikov, N. (2007) "The place of peers in learning and assessment." In Boud, D. and Falchikov, N. (eds.) **Rethinking Assessment in Higher education.** London: Routledge. pp. 128-143.

Gibbons, P. (2002) **Scaffolding language, scaffolding learning: teaching second language learners in the mainstream classroom.** Portsmouth: Heinemann.

Goleman, D. (2011) Psychology Today: New Insights on the Creative Brain. [online] Available from: https://www.psychologytoday.com/blog/the-brain-and-emotional-intelligence/201108/new-insights-the-creative-brain [Accessed 24 January 2015]

Griffith, P. and Ruan, J. (2005) "What Is Metacognition and What Should Be Its Role In Literacy Instruction?" In Israel, S., Block, C., Bauserman, K., and Kinnucan-Welsch, K. (eds.) **Metacognition in Literacy Learning: Theory, Assessment, Instruction, and Professional Development.** Mahwah: Lawrence Erlbaum Associates. pp. 3-18.

Hari, R. and Kujala, M. (2009) Brain Basis of Human Social Interaction: From Concepts to Brain Imaging. **Physiological Reviews,** 89, pp. 453-479.

Helgesen, M. (2006) ELT and the "science of happiness". **The language teacher,** 30/7, pp. 28-30.

Helgesen, M. (1 December 2014) Personal communication.

Helgesen, M. (6 February 2015a) Personal communication.

Helgesen, M. (2015b) ELTandHappiness: ELT & the Science of Happiness. [online] Available from: http://www.eltandhappiness.com/ [Accessed 16 March 2015]

Helgesen, M. and Kelly, C. (2014a) DIY NeuroELT: Ways to make your textbook more brain-friendly. [online] Available from: http://www.//tynyurl.com/NeuroELT [Accessed 28 February 2014]

Helgesen, M. and Kelly, C. (2014b) MWIS Newsletter: TESOL session report 4: DIY Neuro-ELT: making your textbook more brain-friendly. [online] Available from: http://newsmanager.commpartners.com/tesolmwis/issues/2014-07-31/7.html [Accessed 28 February 2014]

Ikeda, M. (2011) **Basic Principles of CLIL**. (kuriru-no-kihongenri). Tokyo: Sophia University Press. pp.1-14.

Ikeda, M. (2012) **Princilpe and Pedagogy of CLIL** (kuriru-no-genri-to-shidouhou). Tokyo: Sophia University Press. pp.1-15.

Immordino-Yang, (2008) The smoke around mirror neurons: Goals as sociocultural and emotional organizers of perception and action in learning. **Mind, Brain, and Education,** 2/2, pp. 67-73.

Immordino-Yang, M. and Damasio, A. (2007) We feel, therefore we learn: The relevance of affective and social neuroscience to education. **Mind, Brain, and Education**, 1/1, pp. 3-10.

Immordino-Yang, M. and Faeth, M. (2010) "The role of emotion and skilled intuition in learning." In Sousa, D. (ed.) **Mind, brain, and education: neuroscience implications for the classroom.** Bloomington: Solution Tree Press. pp. 69-82.

Joseph, L. (2005) "The Role of self-Monitoring in Literacy Learning." In Israel, S., Block, C., Bauserman, K., and Kinnucan-Welsch, K. (eds.) **Metacognition in Literacy Learning: Theory, Assessment, Instruction, and Professional Development.** Mahwah: Lawrence Erlbaum Associates. pp. 199-214.

Kelly, C. (1 December 2014) Personal communication.

Kelly, C. and Sandy, C. (2007) Rethinking activities to incorporate theories of learning. **The language teacher,** 31/7, pp. 29-31

Kelly, C. and Sandy, C. (2008) Brain-based learning and the active approach. **The language teacher,** 32/7, pp. 26-28

Kohn, A. (2004) Feel-bad education: The cult of rigor and the loss of joy. **Education Week,** 24/3, pp. 36-44.

Kounios, J. and Beeman, M. (2009) The Aha! Moment: The Cognitive Neuroscience of Insight. **Current Directions in Psychological Science,** 18/4, pp. 210-216.

Kuhlmann, S. and Wolf, O. (2006) Arousal and cortisol interact in modulating memory consolidation in healthy men. **Behavioral Neuroscience,** 120/1, pp. 217-223.

Lasagabaster, (2011) English achievement and student motivation in CLIL and EFL settings. **Innovation in Language Learning and Teaching,** 5/1, pp. 3-18

Lawrence, E., Shaw, P., Giampietro, V., Surguladze, S. Brammer, M., and David, A. (2006) The role of 'shared representations' in social perception and empathy: An fMRI study. **NeuroImage,** 29, pp. 1173-1184.

LeDoux, J. (1996) **The emotional brain: The mysterious underpinnings of emotional life.** New York: Simon & Schuster.

McEwen, M. (1999) Stress and hippocampal plasticity. **Annual Review of Neuroscience,** 22, pp. 105-122.

McDermott, K., Szpunar, K. and Arnold, K. (2011) "Similarities in episodic future thought and remembering: the importance of contextual setting." In Bar, M. (ed.) **Predictions in the brain: using our past to generate a future.** New York: Oxford University Press. pp.83 -94.

Mehisto, P., Marsh, D., and Frigols, M. (2008) **Uncovering CLIL: content and language integrated learning in bilingual and multilingual education.** Oxford: Macmillan Education.

Meltzer, L. (2007) **Executive Function: Theoretical and Conceptual Frameworks.** New York: The Guilford Press. pp. 1-3.

Miall, R. (2003), Connecting mirror neurons and forward models. **NeuroReport,** 14, pp. 2135-2137.

Moran, S. and Gardner, H. (2007) "Hill, Skill, and Will": Executive Function from a Multiple-Intelligences Perspective. In Meltzer, L. (ed.) **Executive Function in Education: From Theory to Practice.** New York: The Guilford Press. pp. 19-38.

Murphy, R. (2009) Models for EFL theory and methodology derived from an SiR-based pilot study on Japanese cognitive development. Published MA Dissertation, University of Birmingham.

Murphy, R. (2011) ELTNEWS.com Get Neuro-Psyched!: connecting the science of the brain, psychology, and health with EFL. [online] Available from: http://www.eltnews.com/columns/neuro_psyched/2011/07/efl_annual_brain_days_fab1_deb.html [accessed on 6 February 2015]

Murphy, R. (2014a) FAB5: Kitakyushu (held in 2014) Annual International neuroELT Conference: The 50 Proposed Maxims for ELT [online] Available from: http://fab-efl.com/page11/page15/index.html [Accessed 28 February 2014]

Murphy, R. (2014b) FAB5: Kitakyushu (held in 2014) Annual International neuroELT Conference: The 50 Proposed Maxims for ELT [online] Available from: http://fab-efl.com/page11/page15/page19/index.html [Accessed 28 February 2014]

Murphy, R. (2014c) FAB5: Kitakyushu (held in 2014) Annual International neuroELT Conference: The 50 Proposed Maxims for ELT [online] Available from: http://fab-efl.com/page11/page15/page17/index.html [Accessed 18 March 2014]

Murphy, R. (2014d) FAB5: Kitakyushu (held in 2014) Annual International neuroELT Conference: The 50 Proposed Maxims for ELT [online] Available from: http://fab-efl.com/page11/page15/page18/index.html [Accessed 28 February 2014]

Murphy, R. (in press) (2015) "How can neuroscience inform language teaching?" In Stillwell, C. (ed) **Language Teaching Insights from other field.** Alexandria: TESOL Press.

Murphy, R. and Uemura, T. (2013) Critical review of coursebook design and Optimal Levels! Series. **BULLETIN: Center for fundamental education, The University of Kitakyushu,** 15, pp. 223-257.

Nauert, R., (2011) How 'Aha' Moments Are Etched in Memory. [online]
Available from:
http://psychcentral.com/news/2011/03/11/how-aha-moments-are-etched-in-memory/24341.html [Accessed 24 January 2015]

Oberman, L. and Ramachandran, V. (2007) The simulating social mind: The role of the mirror neuron system and simulation in the social and communicative deficits of autism spectrum disorders. **Psychological Bulletin,** 133/2, pp. 310-327.

O'Doherty, J. (2004) Reward representations and reward-related learning in the human brain: Insights from neuroimaging. **Current Opinion in Neurobiology,** 14, pp. 769-776.

Preuß, D., Schoofs, D., Schlotz, W., and Wolf, O. (2010) The stressed student: Influence of written examinations and oral presentations on salivary cortisol concentrations in university students. **Stress,** 13/3, pp. 221-229.

Race, P., Brown, S., and Smith, B. (2005) **500 tips on assessment.** 2nd ed. Oxon: Routledge.

Rubin, N. (2011) How 'Aha' Moments Are Etched in Memory. [online]
Available from:
http://psychcentral.com/news/2011/03/11/how-aha-moments-are-etched-in-memory/24341.html [Accessed 24 January 2015]

Salamone, J. and Correa, M. (2002) Motivational views of reinforcement: Implications for understanding the behavioral functions of nucleus accumbens dopamine. **Behavioral Brain Research,** 137, pp. 3-25.

Sambell, K. and McDowell, L. (1997) "The value of self and peer assessment to the developing lifelong learner." In Rust, C. (ed.) **Improving Student Learning: Improving Students as Learners.** Oxford: Oxford Centre for Staff and Learning Development.

Samuels, S., Ediger, K., Willcutt, J., and Palumbo, T. (2005) “Role of Automaticity in Metacognition and Literacy Instruction.” In Israel, S., Block, C., Bauserman, K., and Kinnucan-Welsch, K. (eds.) **Metacognition in Literacy Learning: Theory, Assessment, Instruction, and Professional Development.** Mahwah: Lawrence Erlbaum Associates. pp. 41-59.

Sänger, J. (2012) Max-Planck-Gesellschaft: Making music together connects brains [online] Available from: https://www.mpg.de/6634785/music-connects-brains? [Accessed 4 March 2015]

Seligman, M. (2011) **Flourish: A visionary new understanding of happiness and well-being.** New York: Atria paperback.

Schacter, D. and Addis, D. (2007) The Cognitive Neuroscience of Constructive Memory: Remembering the Past and Imagining the Future. **Philosophical Transactions: Biological Sciences,** 362, pp. 773-786.

Skeet, J. and Tanner, R. (2014) Aiming for CLIL. CLIL Magazine, Fall edition, pp. 18-19.

Smith, P. (2005) “A Window Into a Thinking Classroom,” In Israel, S., Block, C., Bauserman, K., and Kinnucan-Welsch, K. (eds.) **Metacognition in Literacy Learning: Theory, Assessment, Instruction, and Professional Development.** Mahwah: Lawrence Erlbaum Associates. pp. 261-276.

Somervell, H. (1993) Issues in assessment, enterprise and higher education: the case for self-, peer and collaborative assessment. **Assessment and Evaluation in Higher Education,** 18, pp. 221-233.

Sousa, D. and Tomlinson, C. (2010) **Differentiation and the brain: How neuroscience supports the learner-friendly classroom.** Bloomington: Solution Tree.

Swain, M. (2000) “The output hypothesis and beyond: mediating acquisition through collaborative dialogue,” In Lantolf, J. (ed.) **Sociocultural Theory and Second Language Learning.** Oxford: Oxford University Press. pp. 97-114.

Szpunar, K. and Tulving, E. (2011) “Varieties of future experience.” In Bar, M. (ed.) **Predictions in the brain: using our past to generate a future.** New York: Oxford University Press. pp.3 -12.

Tomasello, M. (2014) **A natural history of human thinking.** Cambridge: Harvard University Press.

Uemura, T. (2013) Implementing content and language integrated learning (CLIL) approach to TOEIC preparatory lessons. **Asian EFL Journal,** 15/4, pp. 305-323.

van Geert, P. and Steenbeek, H. (2008) Brains and the dynamics of “wants” and “cans” in learning. **Mind, Brain, and Education,** 2/2, pp. 62-66.

Vygotsky, L. (1978) **Mind in society: the development of higher psychological processes.** Cambridge: Harvard University Press.

Widrich, L. (2012) The Science of Storytelling: Why Telling a Story is the Most Powerful Way to Activate Our Brains [online] Available from: http://lifehacker.com/5965703/the-science-of-storytelling-why-telling-a-story-is-the-most-powerful-way-to-activate-our-brains [Accessed 4 March 2015]

Willis, J. (2006) **Research-based strategies to ignite student learning: insights from a neurologist and classroom teacher.** Alexandria: ASCD.

Willis, J. (2008) **How your child learns best: brain-friendly strategies you can use to ignite your child’s learning and increase school success.** Naperville: Sourcebooks, Inc.

Willis, J. (2010) “The current impact of neuroscience on teaching and learning.” In Sousa, D. (ed.) **Mind, brain, and education: neuroscience implications for the classroom.** Bloomington: Solution Tree Press. pp. 45-66.

APPENDIX I. The 50 Proposed Maxims for ELT (adapted from Murphy 2014)

Maxims 1-10

1. “Emotion” drives learning
2. “Intelligence” is overrated
3. “Cognition” is context dependent.
4. “Learning” is not understanding.
5. “Understanding” is the synthesis and application of learning.
6. “Reflexes” compound into action skills.
7. “Action Skills” compound into representations, and then abstract thoughts.
8. “Cognitive development” is age dependent and domain specific.
9. "Knowledge" is non-transferable.
10. “Memory” is a process, a myth, and a metaphor

Maxims 11-21

11. “Teaching” should be differentiated and conducted in high support contexts.
12. “Regression” is a natural component of growth.
13. “Choices” fuel learner motivation.
14. “Prediction” is a tremendously powerful tool
15. “Realtime feedback” is at the core of cognitive development
16. “Aha moments” enhance neural networks.

17-A. “Plastic” is the brain, and why we learn

17-B. “Lose” what you don't use

18. “Alignment” delivers us from chaos.
19. “Happy students” learn better.
20. “Sleep” is necessary for memory.
21. "Sleeping on a problem” raises your chances of solving it.

Maxims 22-30

22. No "bias”? No learning!
23. "Solvable mysteries" are the building blocks of understanding.
24. "Performances of Understanding” are essential for good assessment.
25. "Assess" in three ways.
26. "Comforting" solutions are the chosen solutions, even if they are false.
27. "Needs" are unknown; stay flexible.
28. "Rigidity" produces dissonance, the root of stress.

29. "Varying" helps recall.

30. "Creativity" delivers us from ruts.

Maxims 31-50

31. "Surprise" me; surprise yourself.

32. "Graphically" organize.

33. Decide upon "top-down" and "bottom-up" teaching ratios.

34. "Personalize" the content to captivate students.

35. “Room temperature” matters!

36. “Lighting conditions” matter!

37. "Healthy" bodies make healthy brains; healthy brains make healthy bodies.

38. Establish "Active" break times.

39. "Meditate" for better learning; go into default mode.

40. "Spice" up your classroom by engaging other senses

41. Encourage "mistakes”; celebrate mistakes.

42. Teach for the "DATC”.

---- The Newer Maxims:

43. The earlier, the better. Monolingualism is the minority.

44. Balanced bilinguals have an L1 self and an L2 self.

45. Bilinguals use different neural networks per language, but there is overlap.

46. Shy does not mean introvert; introvert does not mean shy.

47. Collaboration boosts levels of cognition.

48. The "labeling" of high-level concepts is a double-edged sword..

49. Don’t forget to “Rhyme”.

50. Language is an "emergent property"; It is a tool for equilibrium with the world in which we navigate.

APPENDIX II. Informed Consent for Focus Group Interview (English)

Informed Consent

Researcher: Takashi Uemura

Purpose: The purpose of this group interview is to explore the following.

- How learner's predictions exert an influence on learning whilst setting their learning goals in class.
- How the difficulty levels of the learning goals affect learner's motivation and learning.
- How learner's motivation and understanding will change by implementing self-assessment, peer-to-peer assessment, and teacher-student assessment in the classroom activity.

Please read the following information and indicate your response as appropriate:

YES ☐ NO ☐	I confirm that the purpose of this study has been explained and that I have understood it.
YES ☐ NO ☐	I have had the opportunity to ask questions and they have been successfully answered.
YES ☐ NO ☐	I understand that my participation in this study is voluntary and that I am free to withdraw from the study at any time, without giving a reason and without consequence.
YES ☐ NO ☐	I understand that all data are anonymous and that there will not be any connection between the personal information provided and the data.
YES ☐ NO ☐	I understand that there are no known risks or hazards associated with participating in this study.
YES ☐ NO ☐	I consent to an audio file of my participation being recorded and understand that no identifying factors will be connected with my participation.
YES ☐ NO ☐	I consent to my data being transcribed and understand that I will be referred to anonymously..

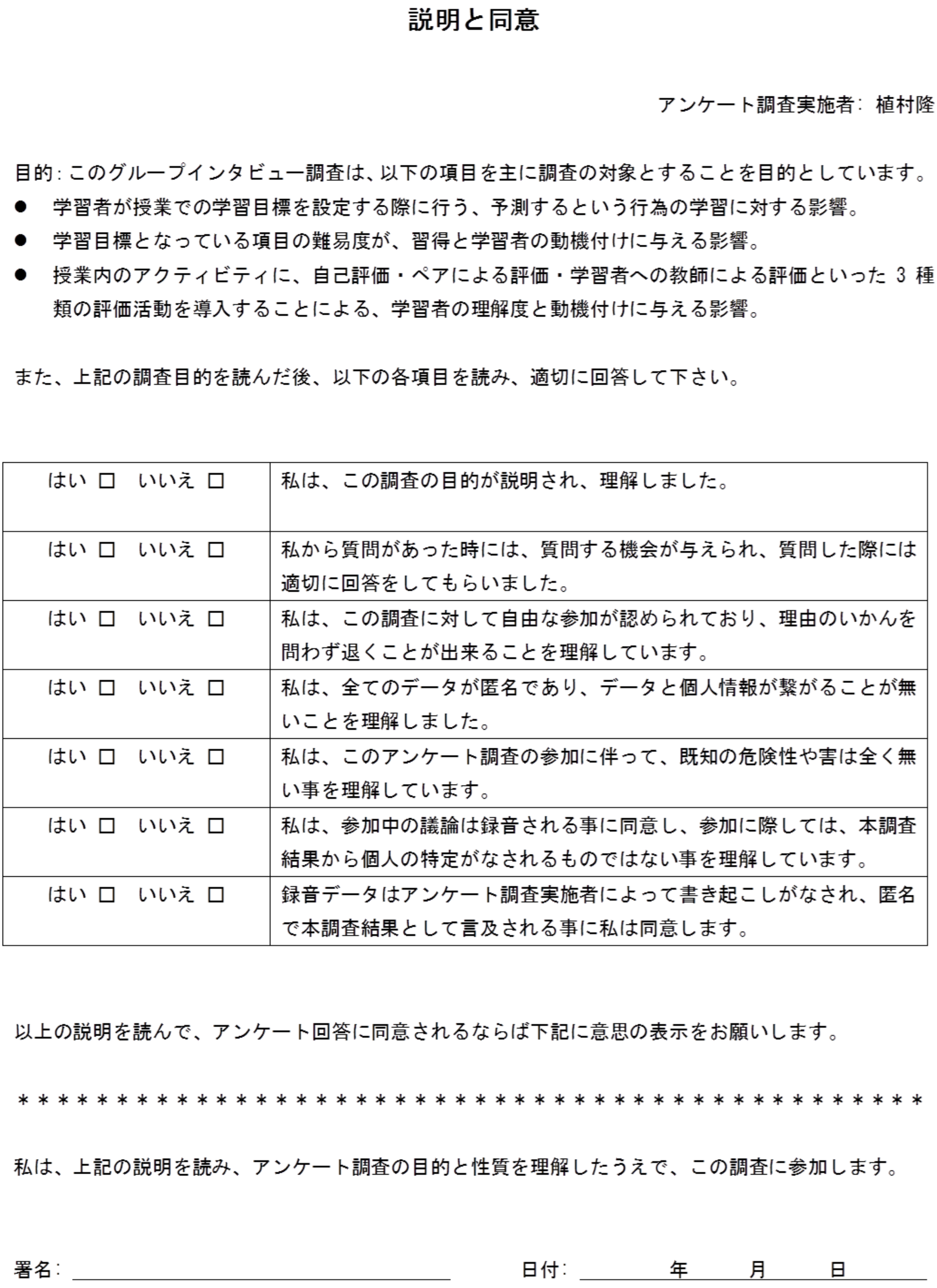
After reading this, if you agree to participate in this study, please sign your name below.

＊＊

I have read the above explanation and understood the content and am willing to participate in this study.

Signature: _____ Date: _____/_____/_____

APPENDIX III. Informed Consent for Focus Group Interview (Japanese)



説明と同意

アンケート調査実施者: 植村隆

目的: このグループインタビュー調査は、以下の項目を主に調査の対象とすることを目的としています。

- 学習者が授業での学習目標を設定する際に行う、予測するという行為の学習に対する影響。
- 学習目標となっている項目の難易度が、習得と学習者の動機付けに与える影響。
- 授業内のアクティビティに、自己評価・ペアによる評価・学習者への教師による評価といった 3 種類の評価活動を導入することによる、学習者の理解度と動機付けに与える影響。

また、上記の調査目的を読んだ後、以下の各項目を読み、適切に回答して下さい。

はい □　いいえ □	私は、この調査の目的が説明され、理解しました。
はい □　いいえ □	私から質問があった時には、質問する機会が与えられ、質問した際には適切に回答をしてもらいました。
はい □　いいえ □	私は、この調査に対して自由な参加が認められており、理由のいかんを問わず退くことが出来ることを理解しています。
はい □　いいえ □	私は、全てのデータが匿名であり、データと個人情報が繋がることが無いことを理解しました。
はい □　いいえ □	私は、このアンケート調査の参加に伴って、既知の危険性や害は全く無い事を理解しています。
はい □　いいえ □	私は、参加中の議論は録音される事に同意し、参加に際しては、本調査結果から個人の特定がなされるものではない事を理解しています。
はい □　いいえ □	録音データはアンケート調査実施者によって書き起こしがなされ、匿名で本調査結果として言及される事に私は同意します。

以上の説明を読んで、アンケート回答に同意されるならば下記に意思の表示をお願いします。

＊＊

私は、上記の説明を読み、アンケート調査の目的と性質を理解したうえで、この調査に参加します。

署名: ____________________　　日付: ______年　　月　　日______

APPENDIX IV. Pre-test questionnaire (English)

Questionnaire Survey on the Technical Communication Class I

Part 1: Effect of predicting the learning content (neuroELT Maxim 14)

The following items are the statements on how learning goals, which learners set at the beginning of the lesson, will exert an influence on learners in terms of the level of understanding and affect. Please circle the most appropriate number.

1:Disagree	2:Somewhat disagree	3:Neither agree nor disagree	4:Somewhat agree	5:Agree

<Influence on understanding>

#1	Learning is enhanced because we have enough time and an activity to think about what to learn at the beginning of the class.	1	2	3	4	5
#2	Although I have not been able to achieve the learning goals provided by the teacher at the beginning of the lesson, I have accomplished my personal goals.	1	2	3	4	5
#3	Learning is enhanced more when the activity is implemented to anticipate the learning goals of the day than when the learning goals are provided by a teacher at the beginning of the class.	1	2	3	4	5

<Influence on learner motivation>

#4	I become motivated whilst setting goals by relating them to my prior knowledge and what is relevant to myself.	1	2	3	4	5
#5	When I could accomplish my personal goals or the learning goals provided by a teacher, I want to achieve a little more challenging learning goals in the next class.	1	2	3	4	5
#6	I become motivated to learn the subsequent content of the day because we have enough time and an activity to think about what to learn at the beginning of the class.	1	2	3	4	5

Part 2: Effect of the difficulty level of learning items to learners (neuroELT Maxim 23)

The following items are the statements on how the difficulty level of various learning items will exert an influence on learners in terms of the level of understanding and affect. Please circle the number you agree with.

1:Disagree	2:Somewhat disagree	3:Neither agree nor disagree	4:Somewhat agree	5:Agree

<Influence on understanding>

#7	Although my initial understanding is vague, the learning items remain relatively for a long time given that there is a moment when I could understand.	1	2	3	4	5
#8	When I comprehend the learning items which require certain effort, I remember them well after the lesson.	1	2	3	4	5
#9	I understand well what I have learned with a feeling of “aha!”.	1	2	3	4	5

<Influence on learner motivation>

#10	I feel motivated when learning items are a little difficult in the lesson.	1	2	3	4	5
#11	I feel motivated when learning items are a little easy in the lesson.	1	2	3	4	5
#12	I feel motivated when learning items are neither difficult nor easy in the lesson.	1	2	3	4	5

Part 3: Effect of assessment to learning (neuroELT Maxim 25)

The following items are the statements on how self-assessment, peer-to-peer assessment, and teacher-student assessment will exert an influence on learners in terms of the level of understanding and affect. Please circle the number you agree with.

1:Disagree	2:Somewhat disagree	3:Neither agree nor disagree	4:Somewhat agree	5:Agree

Self-assessment

<Influence on understanding >

#13	By looking back on my learning process in the self-assessment, it helps me think of ways to better understand the subsequent lessons.	1	2	3	4	5
#14	My understanding is enhanced because I can clarify what to learn in the self-assessment.	1	2	3	4	5
#15	It is more effective to check understanding whilst discussing in pairs or groups than to have time to check understanding alone.	1	2	3	4	5

<Influence on learner motivation>

#16	I am more conscientious of managing my own learning.	1	2	3	4	5
#17	Because I can grasp my learned state of the times, I become motivated to learn the items which I have not reached understanding.	1	2	3	4	5
#18	I want to have time to check my understanding on my own before discussing in a pair or a group.	1	2	3	4	5

Peer-to-peer assessment

<Influence on understanding>

#19	Because I can feel an affinity to my classmate's feedback, my understanding is enhanced.	1	2	3	4	5
#20	By discussing in a pair with my classmate, my learning is enhanced because of a new input from my classmate.	1	2	3	4	5
#21	I can contribute to mutual learning with my classmate by giving my ideas to him/her in a pair setting.	1	2	3	4	5

<Influence on learner motivation>

#22	It is fun to have an opportunity to discuss in pairs with a classmate.	1	2	3	4	5

#23	It is meaningful to participate in a pair discussion because I have an opportunity to express my ideas to my classmate.	1	2	3	4	5
#24	By discussing my classmate in a pair, I become more aware of pursuing the shared learning goals with my classmate.	1	2	3	4	5

Teacher-student Assessment (Presentation in class to teacher)

<Influence on understanding>

#25	By giving a presentation to my teacher in class, my understanding is enhanced.	1	2	3	4	5
#26	During the course of the preparation for a presentation in a group, I can organize what I have learnt in the lesson.	1	2	3	4	5
#27	Because presentations entail a moderate sense of tension, my learning does not get sluggish, but is enhanced.	1	2	3	4	5

<Influence on learner motivation>

#28	I feel a sense of achievement after giving a presentation to my teacher in class.	1	2	3	4	5
#29	Because I get nervous when I give a presentation in this class, presentations are unnecessary.	1	2	3	4	5
#30	Because I give a presentation after sharing and confirming the knowledge in a group, I feel comfortable to give a presentation to my teacher in class.	1	2	3	4	5

APPENDIX V. Pre-test questionnaire (Japanese)

テクニカルコミュニケーション基礎 授業に関する質問紙調査 I

Part 1: 習得内容の予測行為がもたらす効果 (neuroELT Maxim 14)

以下の項目は、授業の初めに設定する学習目標が、学習者に与えるであろう影響を理解度と情意面の二つの側面から記述してあります。それぞれの項目に対して、該当する番号に〇印を付けてください。

1:反対	2:どちらかというと反対	3:どちらとも言えない	4:どちらかというと賛成	5:賛成

〈理解度への影響〉

#1	授業の最初に、何をその授業の中で習得するべきなのかについて考えるアクティビティと時間が充分にあるので学習効果が上がる。	1	2	3	4	5
#2	授業の最初に示された到達目標が達成出来なくても、個人で設定した目標は達成出来ている。	1	2	3	4	5
#3	授業の最初に、教師の方から学習目標を提示するより、その日の学習目標を推測するアクティビティを行った方が学習効果は上がる。	1	2	3	4	5

〈情意面への影響〉

#4	自分が持っている知識や自分に関連した事柄と結び付けながら、その日の授業で達成したい目標を立てることで意欲が湧く。	1	2	3	4	5
#5	到達目標もしくは個人目標を達成出来た授業の次の回の授業では、もう少し高いレベルの学習目標を達成したくなる。	1	2	3	4	5
#6	授業の最初に、何をその授業の中で習得するべきなのかを考えるアクティビティと時間が充分にあるので、その後の授業内容について学習意欲が湧く。	1	2	3	4	5

Part 2: 学習項目の難易度が学習者に与える影響 (neuroELT Maxim 23)

以下の項目は、授業で扱う様々な学習項目の難易度が、学習者に与えるであろう影響を理解度と情意面の二つの側面から記述してあります。それぞれの項目に対して、該当する番号に○印を付けてください。

1:反対	2:どちらかというと反対	3:どちらとも言えない	4:どちらかというと賛成	5:賛成

〈理解度への影響〉

#7	ある学習項目が初めは分かりにくくても、その後の授業の中で理解出来た瞬間があった時は、その項目は比較的長く記憶に残っている。	1	2	3	4	5
#8	ある程度の努力をしなければ習得出来ない項目を理解した時、授業後その項目のことをよく覚えている。	1	2	3	4	5
#9	「なるほど」という感情を伴って学習した項目は、よく理解している。	1	2	3	4	5

〈情意面への影響〉

#10	授業の中では、少し難しいくらいの項目を学習する方が意欲的になれる。	1	2	3	4	5
#11	授業の中では、少し簡単なくらいの項目を学習する方が意欲的になれる。	1	2	3	4	5
#12	授業の中では、難しくも簡単でもない項目を学習する方が意欲的になれる。	1	2	3	4	5

Part 3: 評価方法の学習への効果(neuroELT Maxim 25)

以下の項目は、授業の中で行う self-assessment (自己評価)、peer-to-peer assessment (クラスメイトとペアで行う評価)、teacher-student assessment (教師による学習者への評価)が学習者に与えるであろう効果を理解度と情意面の二つの側面から記述してあります。それぞれの項目に対して、該当する番号に○印を付けてください。

1:反対	2:どちらかというと反対	3:どちらとも言えない	4:どちらかというと賛成	5:賛成

Self-assessment

〈理解度への影響〉

#13	自分自身で学習した経緯を振り返ることで、その後の授業の理解の仕方を工夫する役に立っている。	1	2	3	4	5
#14	何を理解しなければならないのかポイントがはっきりするので、理解が深まる。	1	2	3	4	5
#15	一人で知識を確認する時間を持つよりも、ペアやグループで話し合いながら理解度を確認した方が効果的である。	1	2	3	4	5

〈情意面への影響〉

#16	自分の学習を自分で管理していこうという意識が高まる。	1	2	3	4	5
#17	その時々の自分の習得状況が分かるので、達成出来ていない項目について、習得意欲が湧く。	1	2	3	4	5
#18	ペアやグループで話し合う前に、まず自分で理解度を確認する時間が欲しい。	1	2	3	4	5

Peer-to-peer assessment

〈理解度への影響〉

#19	クラスメイトからの意見は親近感があって受け入れやすいので、理解が深まる。	1	2	3	4	5
#20	クラスメイトとペアで話し合うことで、クラスメイトから新たに学ぶことがあり、理解が深まる。	1	2	3	4	5
#21	自分のアイディアをペアのクラスメイトに述べることで、お互いの学習への貢献になる。	1	2	3	4	5

〈情意面への影響〉

#22	クラスメイトとペアで話し合う機会があるので楽しい。	1	2	3	4	5
#23	ペアのクラスメイトに自分のアイディアを伝える機会があるので参加意義を感じる。	1	2	3	4	5
#24	クラスメイトとペアで話し合うことで、同じ学習目標達成を目指しているという意識が高まる。	1	2	3	4	5

Teacher-student assessment

(Presentation in class to teacher)

〈理解度への影響〉

#25	クラスの中で教師にプレゼンテーションをすることで理解が深まる。	1	2	3	4	5
#26	プレゼンテーションをグループで準備する過程で知識の整理ができる。	1	2	3	4	5
#27	プレゼンテーションは、適度な緊張感があるので、だらだらとした学習にならず、理解がはかどる。	1	2	3	4	5

〈情意面への影響〉

#28	クラスの中で教師にプレゼンテーションした後は、達成感(充実感)を感じる。	1	2	3	4	5
#29	このクラスの中でのプレゼンテーションは緊張するのでプレゼンテーションは不要である。	1	2	3	4	5
#30	グループで知識の共有と確認を行った後に、クラスの中で教師にプレゼンテーションをするので、発表しやすい。	1	2	3	4	5

APPENDIX VI. Informed consent for questionnaires (English)

Informed Consent

Researcher: Takashi Uemura

Purpose: The purpose of this questionnaire is to explore the following.

- How learner's predictions exert an influence on learning whilst setting their learning goals in class.
- How the difficulty levels of the learning goals affect learner's motivation and learning.
- How learner's motivation and understanding will change by implementing self-assessment, peer-to-peer assessment, and teacher-student assessment in the classroom activity.

Please read the following information and indicate your response as appropriate:

YES ☐ NO ☐	I confirm that the purpose of this study has been explained and that I have understood it.
YES ☐ NO ☐	I have had the opportunity to ask questions and they have been successfully answered.
YES ☐ NO ☐	I understand that my participation in this study is voluntary and that I am free to withdraw from the study at any time, without giving a reason and without consequence.
YES ☐ NO ☐	I understand that there will be a two-time questionnaire so that accurate information can be reflected during the research period.
YES ☐ NO ☐	I understand that all data are anonymous and that there will not be any connection between the personal information provided and the data.
YES ☐ NO ☐	I understand that there are no known risks or hazards associated with participating in this study.

After reading this, if you agree to participate in this study, please sign your name below.

＊＊

I have read the above explanation and understood the content and am willing to participate in this study.

Signature: _____ Date: _____/_____/_____

APPENDIX VII. Informed consent for questionnaires (Japanese)

説明と同意

アンケート調査実施者：植村隆

目的：このアンケート調査は、以下の項目を主に調査の対象とすることを目的としています。

- 学習者が授業での学習目標を設定する際に行う、予測するという行為の学習に対する影響。
- 学習目標となっている項目の難易度が、習得と学習者の動機付けに与える影響。
- 授業内のアクティビティに、自己評価・ペアによる評価・学習者への教師による評価といった 3 種類の評価活動を導入することによる、学習者の理解度と動機付けに与える影響。

また、上記の調査目的を読んだ後、以下の各項目を読み、適切に回答して下さい。

はい □　いいえ □	私は、この調査の目的が説明され、理解しました。
はい □　いいえ □	私から質問があった時には、質問する機会が与えられ、質問した際には適切に回答をしてもらいました。
はい □　いいえ □	私は、この調査に対して自由な参加が認められており、理由のいかんを問わず退くことが出来ることを理解しています。
はい □　いいえ □	私は、調査対象期間の正確な情報を反映させるため、この調査に関するアンケート調査は合計 2 回実施することを理解しました。
はい □　いいえ □	私は、全てのデータが匿名であり、データと個人情報が繋がることが無いことを理解しました。
はい □　いいえ □	私は、このアンケート調査の参加に伴って、既知の危険性や害は全く無い事を理解しています。

以上の説明を読んで、アンケート回答に同意されるならば下記に意思の表示をお願いします。

＊＊

私は、上記の説明を読み、アンケート調査の目的と性質を理解したうえで、この調査に参加します。

署名：＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿　　日付：＿＿＿＿年＿＿＿月＿＿＿日＿＿＿＿

APPENDIX VIII. Post-test questionnaire (English)

Questionnaire Survey on the Technical Communication Class II

Part 1: Effect of predicting the learning content (neuroELT Maxim 14)

The following items are the statements on how learning goals, which learners set at the beginning of the lesson, will exert an influence on learners in terms of the level of understanding and affect. Please circle the most appropriate number.

1:Disagree	2:Somewhat disagree	3:Neither agree nor disagree	4:Somewhat agree	5:Agree

<Influence on understanding>

#1	Learning was enhanced because we had enough time and an activity to think about what to learn at the beginning of the class.	1	2	3	4	5
#2	Although I could not achieve the learning goals provided by the teacher at the beginning of the lesson, I accomplished my personal goals.	1	2	3	4	5
#3	Learning was enhanced more when the activity was implemented to anticipate the learning goals of the day than when the learning goals were provided by a teacher at the beginning of the class.	1	2	3	4	5

<Influence on learner motivation>

#4	I became motivated whilst setting goals by relating them to my prior knowledge and what was relevant to myself.	1	2	3	4	5
#5	When I was able to accomplish my personal goals or the learning goals provided by a teacher, I wanted to achieve a little more challenging learning goals in the next class.	1	2	3	4	5
#6	I became motivated to learn the subsequent content of the day because we had enough time and an activity to think about what to learn at the beginning of the class.	1	2	3	4	5

Part 2: Effect of the difficulty level of learning items to learners (neuroELT Maxim 23)

The following items are the statements on how the difficulty level of various learning items will exert an influence on learners in terms of the level of understanding and affect. Please circle the number you agree with.

1:Disagree	2:Somewhat disagree	3:Neither agree nor disagree	4:Somewhat agree	5:Agree

<Influence on understanding>

#7	Although my initial understanding was vague, the learning items remained relatively for a long time given that there was a moment when I was able to understand.	1	2	3	4	5
#8	When I comprehended the learning items which require certain efforts, I remembered them well after the lesson.	1	2	3	4	5
#9	I understood well what I leaned with a feeling of "aha!".	1	2	3	4	5

<Influence on learner motivation>

#10	I felt motivated when learning items were a little difficult in the lesson.	1	2	3	4	5
#11	I felt motivated when learning items were a little easy in the lesson.	1	2	3	4	5
#12	I felt motivated when learning items were neither difficult nor easy in the lesson.	1	2	3	4	5

Part 3: Effect of assessment to learning (neuroELT Maxim 25)

The following items are the statements on how self-assessment, peer-to-peer assessment, and teacher-student assessment will exert an influence on learners in terms of the level of understanding and affect. Please circle the number you agree with.

1:Disagree	2:Somewhat disagree	3:Neither agree nor disagree	4:Somewhat agree	5:Agree

Self-assessment

<Influence on understanding >

#13	By looking back on my learning process in the self-assessment, it helped me think of ways to better understand the subsequent lessons.	1	2	3	4	5
#14	My understanding was enhanced because I was able to clarify what to learn in the self-assessment.	1	2	3	4	5
#15	It was more effective to check understanding whilst discussing in pairs or groups than to have time to check understanding alone.	1	2	3	4	5

<Influence on learner motivation>

#16	I became more conscientious of managing my own learning.	1	2	3	4	5
#17	Because I was able to grasp my learned state of the times, I became motivated to learn the items which I had not reached understanding.	1	2	3	4	5
#18	I wanted to have time to check my understanding on my own before discussing in a pair or a group.	1	2	3	4	5

Peer-to-peer assessment

<Influence on understanding>

#19	Because I could feel an affinity to my classmate's feedback, my understanding was enhanced.	1	2	3	4	5
#20	By discussing in a pair with my classmate, my learning was enhanced because of a new input from my classmate.	1	2	3	4	5
#21	I was able to contribute to mutual learning with my classmate by giving my ideas to him/her in a pair setting.	1	2	3	4	5

<Influence on learner motivation>

#22	It was fun to have an opportunity to discuss in pairs with a classmate.	1	2	3	4	5

#23	It was meaningful to participate in a pair discussion because I had an opportunity to express my ideas to my classmate.	1	2	3	4	5
#24	By discussing my classmate in a pair, I became more aware of pursuing the shared learning goals with my classmate.	1	2	3	4	5

Teacher-student Assessment (Presentation in class to teacher)

<Influence on understanding>

#25	By giving a presentation to my teacher in class, my understanding was enhanced.	1	2	3	4	5
#26	During the course of the preparation for a presentation in a group, I was able to organize what I had learned in the lesson.	1	2	3	4	5
#27	Because presentations entailed a moderate sense of tension, my learning did not get sluggish, but was enhanced.	1	2	3	4	5

<Influence on learner motivation>

#28	I felt a sense of achievement after giving a presentation to my teacher in class.	1	2	3	4	5
#29	Because I got nervous when I gave a presentation in this class, presentations were unnecessary.	1	2	3	4	5
#30	Because I gave a presentation after sharing and confirming the knowledge in a group, I felt comfortable to give a presentation to my teacher in class.	1	2	3	4	5

APPENDIX IX. Post-test questionnaire (Japanese)

テクニカルコミュニケーション基礎 授業に関する質問紙調査 II

Part 1: 習得内容の予測行為がもたらす効果 (neuroELT Maxim 14)

以下の項目は、授業の初めに設定する学習目標が、学習者に与えるであろう影響を理解度と情意面の二つの側面から記述してあります。それぞれの項目に対して、該当する番号に○印を付けてください。

1:反対	2:どちらかというと反対	3:どちらとも言えない	4:どちらかというと賛成	5:賛成

〈理解度への影響〉

#1	授業の最初に、何をその授業の中で習得するべきなのかについて考えるアクティビティと時間が充分にあったので学習効果が上がった。	1	2	3	4	5
#2	授業の最初に示された到達目標が達成出来なくても、個人で設定した目標は達成出来た。	1	2	3	4	5
#3	授業の最初に、教師の方から学習目標を提示するより、その日の学習目標を推測するアクティビティを行う方が学習効果は上がった。	1	2	3	4	5

〈情意面への影響〉

#4	自分が持っている知識や自分に関連した事柄と結び付けながら、その日の授業で達成したい目標を立てることで意欲が湧いた。	1	2	3	4	5
#5	到達目標もしくは個人目標を達成出来た授業の次の回の授業では、もう少し高いレベルの学習目標を達成したくなった。	1	2	3	4	5
#6	授業の最初に、何をその授業の中で習得するべきなのかを考えるアクティビティと時間が充分にあったので、その後の授業内容について学習意欲が湧いた。	1	2	3	4	5

Part 2: 学習項目の難易度が学習者に与える影響 (neuroELT Maxim 23)

以下の項目は、授業で扱う様々な学習項目の難易度が、学習者に与えるであろう影響を理解度と情意面の二つの側面から記述してあります。それぞれの項目に対して、該当する番号に○印を付けてください。

1:反対	2:どちらかというと反対	3:どちらとも言えない	4:どちらかというと賛成	5:賛成

〈理解度への影響〉

#7	ある学習項目が初めは分かりにくくても、その後の授業の中で理解出来た瞬間があった時は、その項目は比較的長く記憶に残った。	1	2	3	4	5
#8	ある程度の努力をしなければ習得出来ない項目を理解した時、授業後その項目のことをよく覚えられた。	1	2	3	4	5
#9	「なるほど」という感情を伴って学習した項目は、よく理解出来た。	1	2	3	4	5

〈情意面への影響〉

#10	授業の中では、少し難しいくらいの項目を学習する方が意欲的になれた。	1	2	3	4	5
#11	授業の中では、少し簡単なくらいの項目を学習する方が意欲的になれた。	1	2	3	4	5
#12	授業の中では、難しくも簡単でもない項目を学習する方が意欲的になれた。	1	2	3	4	5

Part 3: 評価方法の学習への効果(neuroELT Maxim 25)

以下の項目は、授業の中で行う self-assessment (自己評価)、peer-to-peer assessment (クラスメイトとペアで行う評価)、teacher-student assessment (教師による学習者への評価)が学習者に与えるであろう効果を理解度と情意面の二つの側面から記述してあります。それぞれの項目に対して、該当する番号に○印を付けてください。

1:反対	2:どちらかというと反対	3:どちらとも言えない	4:どちらかというと賛成	5:賛成

Self-assessment

〈理解度への影響〉

#13	自分自身で学習した経緯を振り返ることで、その後の授業の理解の仕方を工夫する役に立った。	1	2	3	4	5
#14	何を理解しなければならないのかポイントがはっきりするので、理解が深まった。	1	2	3	4	5
#15	一人で知識を確認する時間を持つよりも、ペアやグループで話し合いながら理解度を確認した方が効果的であった。	1	2	3	4	5

〈情意面への影響〉

#16	自分の学習を自分で管理していこうという意識が高まった。	1	2	3	4	5
#17	その時々の自分の習得状況が分かるので、達成出来ていない項目について、習得意欲が湧いた。	1	2	3	4	5
#18	ペアやグループで話し合う前に、まず自分で理解度を確認する時間が欲しいと思った。	1	2	3	4	5

Peer-to-peer assessment

〈理解度への影響〉

#19	クラスメイトからの意見は親近感があって受け入れやすいので、理解が深まった。	1	2	3	4	5
#20	クラスメイトとペアで話し合うことで、クラスメイトから新たに学ぶことがあり、理解が深まった。	1	2	3	4	5
#21	自分のアイディアをペアのクラスメイトに述べることで、お互いの学習への貢献になった。	1	2	3	4	5

〈情意面への影響〉

#22	クラスメイトとペアで話し合う機会があるので楽しかった。	1	2	3	4	5
#23	ペアのクラスメイトに自分のアイディアを伝える機会があったので参加意義を感じた。	1	2	3	4	5
#24	クラスメイトとペアで話し合うことで、同じ学習目標達成を目指しているという意識が高まった。	1	2	3	4	5

Teacher-student assessment

(Presentation in class to teacher)

〈理解度への影響〉

#25	クラスの中で教師にプレゼンテーションをすることで理解が深まった。	1	2	3	4	5
#26	プレゼンテーションをグループで準備する過程で知識の整理が出来た。	1	2	3	4	5
#27	プレゼンテーションは、適度な緊張感があるので、だらだらとした学習にならず、理解がはかどった。	1	2	3	4	5

〈情意面への影響〉

#28	クラスの中で教師にプレゼンテーションした後は、達成感（充実感）を感じた。	1	2	3	4	5
#29	このクラスの中でのプレゼンテーションは緊張するのでプレゼンテーションは不要であると思った。	1	2	3	4	5
#30	グループで知識の共有と確認を行った後に、クラスの中で教師にプレゼンテーションをするので、発表しやすかった。	1	2	3	4	5

APPENDIX X. Focus Group Interview Transcripts (English)

Class 1 (CG)

Question 1

Student 5: They (learning goals) weren't demonstrated before, so they (learning goals) were decided based on my motivation. Because they were made clearer (in the CLIL lessons), I was able to understand. But, when it comes to achievement, I didn't reach those levels, so I guess it (learner motivation) dropped. I started to know how well I achieved the demonstrated learning goals. However, at the same time, what I didn't achieve was also made clear. So, I tended to focus on what I didn't still understand then rather than aiming at the higher level. Therefore, learner motivation dropped. I tended not to pursue the upper level but to manage tasks at hand.

Student 3: Learning goals were shown at the beginning, and I thought, "Oh, do I have to do that much?" They seemed overwhelming, so learner motivation could have dropped.

Student 2: Everyone may have been careful learners. They may have preferred to learn steadily instead of keeping moving on.

Student 5: It is similar to the exams. We tend to feel we have answered well just after the exam, but we realize we had a lot of mistakes when the exam results come back to us. Learner motivation will drop while thinking we couldn't pass 60% in the mid-term exam, let alone, in the final exam.

Question 2

Student 5: I think students enjoy learning with aha! moment only that day, but I don't think they review the lesson. In the first semester, I was instructed to put more emphasis on preparation than review, whereas, of course, review is also important. However, the following negative cycle was taking place. I checked (what I previewed), understood, but forgot. I did understand at that time, but I was satisfied with grasping the learning process to understanding. My motivation reached a peak at the time of understanding, so it neither increased dramatically nor decreased sharply later.

Student 2: Few opportunities to review might be one of the reasons why our memory and motivation are reset.

Student 4: Once I attended the lesson in a week, I recognized I forgot what I had learned in the previous week. One week is long enough to forget what I have learned.

Student 5: What I really recognized as the similar case was the classroom English encouraged to use by the teacher at the beginning of this course. If we use it twice or three times, we'll learn it easily. But almost nobody has used the classroom English. This may reflect the reality.

Student 2: Depending on the department, this course is a non-credit course. Priority of the English studies will be low if this course is non-credit. That will be the major factor.

Student 3: My major subjects have become more and more difficult recently, so, practically, I am not so pressured to study English (in comparison with the major subject studies).

Question 3

Student 2: Basically, I don't think it was necessary. If self-assessment involves writing, I tend to be self-indulgent. Without self-assessment, I know about myself and I know how well I understand. If I quantify my understanding, I will be indulgent to my scores.

Student 1: Personally, I roughly mark assessment sheet, but, as for the section which requires writing, I become motivated to write at least 3 to 4 sentences because I will miss the chance to write English for a week if I don't write anything. Content of my writing seems to be meaningless, but I personally feel more motivated to write something in English than just marking my level of understanding.

Student 5: Rather than attempting to keep my motivation, I am writing comments in English just because I want to be aware that I am studying English. In regards to the upper part (self-assessment scales), my responses always tend to be the same like in the questionnaire administered at the end of other subject classes. My responses to the self-assessment don't change a lot according to my motivation in every class. Personally, I like the section which requires writing because I can make variations in every class.

Question 4

Student 5: I think it should have derived from the class member difference according to the department. In my department (Civil and Environmental Engineering Department), we have a special English class in which English presentations are required. If the department offers classes which raise awareness of English

presentations, presentations to a teacher will be perceived to be more necessary and enhance understanding.

Student 3: In Mechanical Engineering Department, there is a class in which we are required to give presentations on what we have researched, so awareness of presentations is high.

Student 2: In the field exercise, we are often told to give a presentation; therefore, regardless of English or Japanese, there will be a lot of Mechanical Engineering major students who are aware of the importance of giving presentations.

Student 5: I have an impression about the Perceptual Science and Design Engineering Department with high domestic demands (after the students' graduation). Environmental Science and Engineering looks like focusing more on thesis writing than presentations because I have an impression that they try to develop researchers.

Student 4: Information Science and Engineering Department has a class to give a presentation in Japanese. However, we have been instructed that we will need to give a presentation in business meetings in English once we start to work at a company, which expands their business overseas. So, the awareness of the presentations are high in my department.

Question 5

Student 1: It should be because the presenter is always one student from each group, shouldn't it? Imagine we have decided a presenter by rock-paper-scissors, and I became a presenter. If my group is cooperative, I can share ideas with other classmates and give a presentation. On the other hand, if my group is uncooperative, nobody in the group will help me straight after the presenter is decided by rock-paper-scissors. Students know the reality, so it will be meaningless in the latter case. As for CGs, they didn't give presentations, so I guess their understanding would have improved if they had done something else. Everyone feels a sense of tension before rock-paper-scissors. After that, they are relieved.

Student 2: If everybody had had to give presentations, the results would have been different. If I cannot escape from the presentation, I cannot help doing it seriously.

Question 6

Student 2: It may be considered that the content itself wasn't suitable for presentations.

Student 5: I remember there was an email writing activity. If students thought they wanted to improve email writing skills, they would have prioritized email writing tasks to presentations.

Student 4: Determined by the curriculum, EG naturally felt it was necessary to give presentations. On the other hand, CGs were satisfied with the lesson style without presentations, so CGs felt that everything would be fine as long as we just followed the lesson.

Student 1: This is my guess. Until the first questionnaire was administered, the lesson style had been the same. From the following week after the first questionnaire, the lesson style dramatically changed, didn't it? Students might have realized that the lesson style changed reflecting the questionnaire results. Therefore, if we had answered presentations were effective in the second questionnaire, we would have thought that we would have to give presentations later. That's why presentations would have been perceived to be less necessary in CGs.

Student 5: I think presentations are necessary, but I'm not good at giving a presentation even in Japanese. Even worse in English.

Student 1: It is a critical matter to standing in front of people, but I know that it is an effective learning to give a presentation. Having said that, once I am told to do it, I will become hesitant.

Student 5: I think it will be uncomfortable to be compared with better presenters.

Student 2: Anyways, I will need to spend a lot of energy and I think presentations will be stressful.

Class 2 (CG)

Question 1

Student 8: I'd like to talk about why learner understanding improved. When I only looked at the demonstrated learning goals, I couldn't read everything because they were written in English. So, it was hard for me to remember what learning goals there were. There was a list distributed in the three-time CLIL lessons, wasn't there? (While doing activities to guess learning goals), we chose today's learning goals will be this and that in the list. That means I chose them as I understood the meaning of the learning goals. It was the last three-time CLIL lessons that made learning goals clear.

Student 6: The reason for the decreased motivation may derive from the fact that lesson style was completely new and students didn't get used to it. There seems to be a lot more activities, so the lesson looked a bit overwhelming and demotivated students a little. There may have been some positive effects, though. Since students didn't have familiarity with the activities, they seemed to have been overwhelmed to go about new activities one after another.

Student 7: I understand that students try their best to understand the learning goals. However, there may have been some students who missed them. Unlike the students who look like they understand the learning goals, those who missed the point appear to have lost their motivation being confused about what to focus on.

Student 8: Although I understood learning goals after the (prediction of learning goals) activities, I didn't accomplish them. Therefore, the lessons were challenging enough at that time, and I didn't think I wanted to try the upper level. Then, learner motivation dropped.

Question 2

Student 10: Although I understand, there is nowhere to utilize that knowledge. However, when it comes to math, I can apply the knowledge gained in the next exercise immediately. As for English, I cannot find anywhere I can utilize what I have learned.

Student 9: I think our understanding will improve if there is a place where we can utilize what we have learned with aha! experience repeatedly. I guess our motivation to the next step will be enhanced.

Student 6 and 9: It's wasting because of nowhere to utilize what we have learned.

Student 7: Basically, there are few fluent English speakers in class, aren't there? Therefore, students should be feeling that they want to understand at their readable level of English. In that sense, I think students should be looking for their optimal level.

Student 9: I cannot become confident if I cannot perform well. I feel happy about the level at which I can understand. So, I think students marked their answers honestly although I believe everyone will be ambitious. I also think they marked their answers honestly because of the anonymity of the questionnaire.

Student 6: Also, I thought generally tasks are not too complicated or too easy. During the class, the level seems to be flat to me. So, for students who want to try hard tasks, a little challenging tasks can be given. For students who prefer easy tasks, easy tasks can be prepared. I would be happier if tasks for high, low, and intermediate levels were prepared to match the levels of students.

Question 3

Student 9: Peer-to-peer assessment looked like we were testing to each other, didn't it? Students might have thought it was effective. If I am asked to answer by other person, I think well enough to respond to him or her. In comparison with pair-work, I think it (#15 result of self-assessment) dropped.

Student 6: I think self-assessment itself was necessary. Self-assessment included a task to write the vocabulary learned in the lesson, didn't it? But, compared to oral peer-to-peer assessment, self-assessment is less reliable because peer-to-peer assessment is an evaluation by others. Personally, I think a small test-like comprehension check test should have been prepared to give scores to a partner. When the results return, I can grasp what expressions I can use precisely. For my reference, it is easier for me to grasp my understanding using scores.

Student 7: I don't think it's a good idea to connect understanding to scores. If you can't answer, you cannot get a score. That's not good. Using ○× will be OK, instead.

Student 8: I don't think self-assessment requires much time because it is done individually. Rather than spending time on self-assessment, I think it's better to spend time for peer-to-peer assessment. We had about five learning goals each time during three time CLIL lessons, didn't we? I was not able to achieve all of them. I was not really sure about the assessment criteria, either. If I had stick to think what the exact criteria should be, I would have needed to spend much time. The time management was difficult for me. I would have been happier if we had spent more time on peer-to-peer assessment.

Student 9: I felt a little awkward to assess my classmate by percentage of understanding.

Student 7: Grading scales shouldn't have been divided every 10%, but should have been divided approximately every 20% to make them more ambiguous (for facilitating marking).

Question 4

Student 6: This English class is allocated according to the department, so perception of presentations will differ depending on whether or not students often have chance to give presentations including other classes. Applied Chemistry department only sometimes requires us to give a presentation, so we don't regularly give a presentation.

Student 7: Let alone in English…

Student 9: Some students might have misunderstood what the presentations to a teacher mean. They might have thought that having leaders in groups answer teacher's question would be the presentations to a teacher.

Student 8: For example, considering the situation where we have a leader in a group give a presentation, if the class size is small (like in EG), I think there will be less opinions. With a few opinions after group discussion, I don't want to give a presentation. On the other hand, with many opinions derived from various classmates, I feel like giving a presentation. Personally, I think that they (EG) would have felt unhappy about needing to present a few opinions.

Question 5

Student 6: EG should have thought that a sense of achievement was (more) helpful (than a sense of tension) because of their familiarity to presentations, while CG tended to get nervous because of their unfamiliarity to presentations and felt that they would need to prepare well. Therefore, CG should have thought that a sense of tension was helpful to enhance understanding.

Student 9: A sense of tension relates to the number of audience. The more people there are, the more tension I feel. Because there are fewer students in EG, they might have built good relationship.

Questions 6

Student 10: In the course of three time CLIL lessons, CG might have found something more important than presentations. CG knows that presentations are important, but comparatively some other skills could have outweighed.

Student 7: The three time CLIL lessons were completely different from previous lessons, weren't they? CG could have been attracted to the novelty of the three time CLIL lessons. They could have been so impressive that CG didn't think presentations would be really necessary.

Class 3 (EG)

Question 1

Student 15: Basically, I think the level of the class content was high.

Student 13: Perhaps, my level is not good enough, but the activity (to predict learning goals) using the video was difficult to understand. When we were predicting the learning goals, I couldn't think very well. I would have been overwhelmed if the level had become higher.

Student 16: Prediction activity was difficult for me.

Student 11: Speaking of English studies, it will be fun if we can understand, won't it? If we don't understand, studies are boring in general. The phrase "a little difficult" in the questionnaire was not clear to me. I wondered how difficult it would be considering the real situation. Then, I ended up marking the same level as mine because it looks safe.

Student 15: For example, although my level is at a moderately high level this week, my level after the lesson will be declining because I don't have chance to use English outside this English class. Although the level of the lesson is raised little by little, the gap will remain (between the expected level of the next lesson and my declined level in a week). Therefore, I think I feel a bit nervous.

Student 16: In terms of understanding, the level could be a little difficult in order to enhance learning. On the other hand, motivationally, it is hard to try difficult levels, so it is good for me to learn the content which I can barely understand. I believe that understanding will be a different element from motivation.

Student 12: Speaking of vocabulary, it is fine for me just to learn a little difficult vocabulary. However, if the learning involves activities such as considering pros and cons, the vocabulary expected to use becomes difficult. It takes a long time to think in the following cases: if the topic to discuss is difficult, if higher language proficiency and vocabulary are expected, if pros and cons need considering like in debating. Then, I thought it would be better to use the vocabulary with the standard level if we try debating, which we don't usually have chance to do. This way, it will be easier to give presentations in English. The classroom activities are so novel and fresh, which other subject classes don't have such as discussing with peers in a group, thinking about the sentences collaboratively, considering pros and cons and etc… Since we don't have such an opportunity even in Japanese, I feel a little hard to go about the activities in English… But, the activities are really fun, so I don't want you to eliminate the activities! (Everyone laughed).

Question 2

Student 15: Aha! moment from the novel things will not remain in the long-term memory because the novel things are unusual and I will seldom find them in the daily life even in the future. I believe that aha! moment from what are familiar to me will remain in my long-term memory.

Student 14: Anyways, unless we learn repeatedly and review, we won't be able to remember things. Although I have aha! moment, it will not lead to learning without revisiting it again and again. It occurs just once.

Student 11-16: We think there are few students who review the lesson outside the classroom.

Student 16: If I come across too many aha! moments in one unit, it will be hard to remain in my memory. I think the number of memorable things will be limited. The fewer aha! moments we have, the more we can remember.

Student 14: It is certain that I personally feel happy when I have aha! moment. But, when I encounter the next difficult item, I need to struggle again, don't I? I feel it's a little threatening. I tend to feel a sense of threat rather than pleasure.

Student 15: Exactly! Aha! moment is instantaneous. It is like taking a fighting stance because "it is coming" rather than being threatened.

Student 16: I think that it will be easier to learn with aha! experience from what is familiar to us.

Question 3

Student 14: It is difficult to quantify using percentage. I have abstract assessment in mind, but it is hard to quantify. Instead, we can change the way of assessment such as implementing ○△×.

Student 11: Figures used in the peer-to-peer assessment was originally set high. Imagine there are five things to answer. Even if my partner could answer only two items, it would be difficult for me to mark "50% or less". One grade should have accommodated wider range such as 80% to 100% so that we can feel easier to assess.

Student 14: Psychologically, it is difficult to mark low scores.

Student 15: I think it's meaningful as long as what we are doing is decent although the figures seem meaningless.

Student 14: The act of reflection upon one's learning itself is important; therefore, I don't think quantifying performance is necessary. It is anxiety-provoking for me to make assessment.

Student 14: I think we should do self-assessment, but we don't need to do it individually because anyways elements of self-assessment is also included in peer-to-peer assessment. During peer-to-peer assessment, I am also thinking about my own assessment. It is obviously meaningful to assess my own performance, but I don't think we have to separate self-assessment from peer-to-peer assessment as long as the self-assessment is done once.

Student 15: If I only do self-assessment just before the end of the class, I roughly mark my level of understanding without thinking carefully because I want to leave the classroom to relax as soon as possible. However, if I have to do peer-to-peer assessment, I will need to review from the first learning goal in order to ask my partner's level of understanding. Peer-to-peer assessment gave me a chance to think again at the end.

Question 4

Student 12: After I saw this handout, I thought this class (EG) has shy students the most out of three classes. That should be the main reason.

Student 15: It is hard to start speaking in a quiet classroom atmosphere.

Student 11-16: There are many shy students in this class.

Student 12: If there is someone speaking a lot beside me, I can start speaking. But, with many shy students, I tend to think that I need to be harmonious with other classmates.

Student 11: We sometimes had silence (after the teacher asked a question to the class), didn't we? Nobody answered then, so it is clear that there are many shy students (in this class).

Question 5

Student 13: There is only one presenter (from each group), isn't there? Personally, I felt more nervous when I was discussing in a group in an attempt to share each other's wisdom fully. When I gave a presentation, I was actually just reading what we discussed. So, I didn't feel a sense of tension that much.

Student 12: When I gave a presentation, I just presented prepared ideas that we discussed. So, it was just a matter of who would do it. I felt it was more meaningful for me to use my brain fully in the group discussion before the presentation task. For example, I used my brain much more when I needed to think of the common sentences in email writing.

Student 15: In terms of a sense of tension, I think it should be the same to give a presentation to the teacher and to my classmates.

Student 14: I thought, perhaps, group discussion before the presentation was more meaningful rather than a presentation itself or a sense of tension. That said, we did a group discussion assuming the upcoming presentation, so presentation was thought to be especially helpful. I didn't think a sense of tension was helpful.

Student 12: If we had known that we didn't need to give a presentation, we wouldn't have used our brains so much. Only one student was selected as a presenter (from each group), but he or she would become determined to use the brain fully to give a presentation. So, eventually, he or she gained a lot of things. Therefore, I think the correlation (between a sense of tension and understanding) was different within the EG.

Question 6

Student 11: CGs didn't know how their learning would be after giving a presentation. If they had had to give a presentation, they would have felt uncomfortable to do it.

Student 12: I don't want to give a presentation if good ideas didn't come up during the discussion because of the difficult content. Or it is fine to think well because the content has become a little difficult, but I (lose confidence and) get embarrassed to give a presentation.

APPENDIX XI. Focus Group Interview Transcripts (Japanese)

クラス１（CG）

質問 1

学生５：今まで提示されてなかったから、今までモチベーションが自分の気分で設定されていたにもかかわらず、それが明確にされてしまったから、理解は出来たけど、前回より明確だから。だけどそれを今回果たせてたかっていうと、やっぱりまだこのレベルには達していないって思って下がったんじゃないか？提示された目標は自分がどれだけ達成できたかは分かるようになったけど、でも、どれが達成出来ていないかもわかってしまった。だから、上を目指すってよりも、今わからないことを補うって事に重きが置かれるからモチベーションが下がる。上じゃなくって今を何とかしようってなる。

学生３：目的を最初に見せられたからここまでせなあかんのか？ってなって、それでモチベーションがちょっと下がっているかもしれない。

学生２：みんな慎重派だったとか。先へ先へじゃ無くて自分の周りを固めていった方がいいんじゃないかって思ったのでは。

学生５：テストと同じでやったあとは結構できたと思ったけど、返ってきたらあれもダメこれもダメって分かったのに似ているかも。今回中間テストで６割も越えられなかったのに期末テストで越えられんやろってモチベーションが下がるようなもの。

質問 2

学生５：なるほどは、その日だけで、事後学習は図られていないと思う。前期で感じていたのは復習も大事だけどこの授業では予習の方が大事ですよっていわれてた。授業中に確認しました、はいわかりました、理解しました、でも覚えていないというサイクルが発生している。理解はするけど、そのシステムを把握したからもう満足みたいな。で、モチベーションもその時がピークだから、いいや、現状維持。

学生２：それほど頻繁に復習がないっていうのも、記憶もモチベーションもリセットされちゃう一つの理由かなあ。

学生４：いざ一週間たった後に授業受けてみると、前の授業でやったこともう忘れていたり、一

週間は忘れるのに十分な期間だと思う。

学生５：特にそれを思ったのが、最初に先生にクラスルームイングリッシュ英語でやってくださいって、それって２回も３回もすれば分かるじゃないですか。でも結局のところいまでも使ってない人多いじゃないですか。そういうことじゃないですかねえ。

学生２：必ずしも学科によっては、卒業に必要な科目ではないから、その中で優先度が低いっていうのはデカいって思う。

学生３：専門科目がどんどん難しくなっているし。英語の必要に迫られ度が違う。

質問 3

学生２：そもそも無くてもよかったのではないか？どうしても書くとなると自分に甘くなるし、でもその裏で、自分がどれだけわかっているかは自分しかいないわけだから、しなくても、自分がせっぱつまっているのかどうかは自分が良くわかっているのではないか？かといって数値化するとなるとみんな自分に甘くなると思うから、少なくとも自分はそうです。

学生１：個人的には評価のところは、いつも大体適当に書くけど、授業の感想を英文で書くところは、普段英語に接する機会が無いので、ここだけはかかないとまた一週間書くときないしなあみたいな。とりあえず３から４文はぎっしり書きたいなっていうのがあって、内容がないような文章を書いているんですけど、評価を付けるってよりは自分はそうゆう方がそっちにすぐ行く！って感じになってます。

学生５：モチベーションの維持っていうよりは、英語学習を続けているっていう感覚で一番下は書いていて、一番上は、どうしても書く授業の最後に取るようなアンケートの書き方のようになってしまって、似たような傾向になってしまう。ん毎回のモチベーションによってアンケートが変わっているかっていわれたらそんなに変わらない。だから一番下のコメント欄が一番変化を自分から出せていい。

質問 4

学生５：学科の構成の違いから出ていると思う。僕の学科では、英語の特別な授業が別に設けられていて、英語のプレゼンをしている授業があるんですけど、そういう英語を意識させられるような学科が存在していたらその割合も増えるんじゃないかって思います。

学生３：機械工学科は、山口と世界っていう授業で調べたことを英語で発表をさせられる授業があるのでそれでちょっと高いのかなって思います。

学生２：今受けている実習でも、英語じゃないけど最終的にはプレゼンしなさいっていわれてるので、英語であってもなくてもプレゼンしなきゃいけないっていう意識の学生は機会に多いんじゃないかなあ。

学生５：感性デザインなんかはどちらかというと、国内に需要があるようなイメージがあって、循環もどちらかというと研究職に近いのかなあというイメージがあります。プレゼンというよりは論文を書くって事を中心に行っているイメージがあります。

学生４：知能情報は、山口と世界っていう授業もありプレゼンテーションもやってきたんですけど、それは日本語だったんですけど、自分たちが就職した時に、海外に進出したってなったときに企画会議とかっていうのは英語を使ってプレゼンするって事が必要になってくるから英語でプレゼンする意識っていうのは高いと思います。

質問 5

学生１：一人だからじゃないですか？じゃんけんで例えば一人決めちゃったとしたら、一緒に考えてくれる班であれば、一緒に考えて、発表する様な日もあれば、また違う日に非協力的なメンバーになってしまった時は、リーダーがじゃんけんで決まった直後から誰も何もしないっていう風になっちゃう気がするんですよ実際やってみると。実際を知っているからこそ、あんまり意味ないのかなって思って、でも、プレゼンやってない方は、やっていないから違うことをやればもうちょっと伸びるんじゃないかっていう希望的観測がまだ残ってるのかなって思う。緊張感はじゃんけんの前までみたいな。じゃんけんが終われば、緊張から解き放たれるみたいな。

学生２：これが全員プレゼンするっていうんであればまた結果が違うって思うんですけど。どっちみち逃げられないんだったらちゃんとしなきゃみたいな。

質問 6

学生２：授業内容自体にプレゼンをしなければいけないような需要を感じなかったとも考えられると思います。

学生５：メールを書かなきゃいけないようなアクティビティがあったから、本人がメールの方を優先的に書かなきゃいけないって感じたのだったら、プレゼンよりも密接な関わりあいのあるメールの方が重要じゃないのって見たのかもしれない。

学生４：カリキュラム的にこっちはプレゼンしなきゃいけないっていうのがあって、今の授業スタイルで満足しているっていうかプレゼンをしなくてもそのまま従っておけば大丈夫っていう意識もあったんじゃないか？

学生１：あくまで予想ですけど、最初のアンケートをする前までは同じようなパターンの授業が続いていて、アンケートが終わったら次の週くらいから授業変わったじゃないですか？あれで、アンケートの結果が反映されて変わったんだって気づいて、あれこのままプレゼンいいなって書くと、プレゼンさせられるかもって思って、２回目のアンケートが来て、このままプレゼンいいって書くと次の授業はプレゼンだなって思い、チョット減ったっていうことも考えられる。

学生５：プレゼン必要だと思うけど、プレゼン自体苦手だから、日本語ですら苦手なのに英語なら尚更。

学生１：人前に立つってのがそもそも多い。でも、やれば効果があるっていうのは分かっているんだけど、いざやれって言われるとチョットなっていう心理は確かにあるかな。

学生５：うまい人と比較されるのも嫌だろうなと思う。

学生２：なんだかんだ言ってかなりキャパ割かなきゃいけないし、ストレスになるんじゃないかって思う。

クラス２（CG）

質問１

学生８：理解度が深まったっていうのは、提示されたものだけを見ていると、英語で提示されるので全部読み切れないんですよ。それでどんな目標があったかっていうのは分かりづらい。自分で目標を、一覧があったじゃないですか、目標これだこれだっていう自分で意味を理解して選んでるって事なんで。目的っていうのが何かっていうのがはっきりと分かったのは後半の三回の授業だった。

学生６：モチベーション下がったのは、新しいことやると、慣れていないから手続きが増えて行って、効果はあったかもしれないけど、ウーンってモチベーションがなってしまったのでは？慣れっていうのがないから、まだ新しいことあるんだって。

学生７：学習の目的が分からないから頑張って理解しようっていうのはわかるんですけど、もしかしてそれが裏目に出て、何をやればいいのかが分からないから、周りと違ってやる気が落ちたってのは分かる気がする。何に集中すればいいか分からないっていうか。

学生８：目標はアクティビティをやって分かっているけど、それを自分が達成出来ていない。だから、今の自分のレベルには十分すぎるのに、上を目指そうっていうのは、チョット違うんじゃないかって、で下がったんじゃないか。

質問２

学生１０：理解しても他に活用する場所が無くて、数学だと次の問題で活用出来たりすると思うんですけど、活用する場面が見当たらない。

学生９：なるほどって思った事を繰り返し使える場があれば、理解が上がるんじゃないかな。次へのモチベーションも上がるんじゃないかな。

学生６、９：活かす場が無いからもったいない。

学生７：基本的に英語がペラペラっていう人が多いわけではないじゃないですか。自分が読める程度で理解したいという気持ちがあるので、そういう意味で適正レベルを求めていると思う。

学生９：自分が余りにも出来なかったら自身に繋がらないから、自分が出来ると思う様なレベル

が嬉しいし、正直に丸してしまったと思う。ホントは皆さん向上心があると思うんですけど、匿名のアンケートだし、正直に書いてしまったんじゃないかな。

学生６：あと、ある問題があって大体まあそんなに複雑でもなければ、ものすごい簡単なやつもない。大体授業の中で平坦なレベルになっていると思うので、もうちょっと波というか、難しいのが欲しい人にはもうちょっと難しいものを用意して、もうちょっと簡単な方がいいって人には、簡単な例も用意する、出来る人、出来ない人、中間の人、レベルに合った内容があるともっといいかなって思った。

質問３

学生９：ペアで評価しあったやつはお互いにテストするような感じだったじゃないですか？それが効果が高いと思ったんじゃないですかね。一人でやるより、やっぱり、他人に聞かれると、答えなきゃいけないと思うと自分でそれなりに考えるし、ペアとやるとちゃんとするので下がったんじゃないか。

学生６：セルフアセスメント自体は必要だった。授業で習った語彙とか言い回しとかを書く欄があるじゃないですか、あれをするよりは、お互いの口頭で確認する方があれが一番他人からの評価なんで、ちゃんとしてるというか、逆に確認の小テストみたいなものを用意して、それを問題通り聞いて行って答えたら点を付けるっていった方が、でそれを返すと、自分ここが出来てないんだって、この表現とか言い回しは確実にできるより正確に自分でせいかくなやつがでるなあと思いますね。目安として点があった方が自分の理解度が分かりやすい。

学生７：点に結び付けるっていうのはどうかと思う。出来ないと点にならないって思っちゃうと、〇✖っていうのは良いかもしれないけど、点にするっていうのは良くないと思う。

学生８：セルフアセスメントって自分でやるのでそんなに時間は必要ないと思うんですよ。それよりも、他の人と一緒にやる時間をもっと取った方がいいのかなって思う。三回授業やって五つくらい目標があったじゃないですか、あれ全部を出来た覚えがない。聞かれたときにどの程度こたえられればどの程度の評価を与えて言いかって言うのもわからないし、こだわり過ぎてると時間が無いし、丁度その辺の兼ね合いが分かんなかったし、出来れば、もうちょっとペアでやる方の時間をとってくれたら助かってたと思います。

学生９：友達にパーセントで評価をするのは非常にやりにくい。〇△✖とかならまだよかったかな。

学生７：10%くらいずつでは無くて、20%ずつ位で大体この辺て印を付けるくらいの方が、大体でいい。

質問４

学生６：まずクラス編成は学科ごとなので、英語に限らず他の授業でも日頃プレゼンをやってるかやってないかで、プレゼンに対する意義を考えることは違うかなと思う。応化は、実験のプレゼンがあるが、数えるくらいしかプレゼンをやっていないから日常的に毎週毎週やってるわけではない。

学生７：しかも英語でやっているわけではないし。

学生９：教師へのプレゼンて、グループごとにリーダーに当てるじゃないですか。そのことを勘違いして教師へのプレゼンと思ってるんじゃないですか？

学生８：例えば、グループで一人のリーダーを決めてその人にプレゼンをしてもらうっていったときに、人数が少ないって事はそれだけ意見の数も少ないと思うんですよ。そうするとその中で自分が意見を発表しなければいけないっていう、自分的にはやだ。やっぱり人数が多くて色んな所から意見が出てくれば発表しても良いってなるんですけど少ない意見を無理やり発表するっていうのが個人的にはやだったのかなっておもいます。

質問５

学生６：慣れがあるから、達成感的なものにプレゼンをやった方は効果があったと思っていて、プレゼンない方は、緊張どうしてもするので、やら無きゃっていう方に。どちらかっていうとやり遂げるって事の方に効果を見出したんじゃないかって思います。慣れてない方ない方は、緊張するから、ちゃんと備えようって、それなりに学習するからそれは効果があったんじゃないかなって思います。

学生９：緊張感とかんけいするのが、人数の多さ。人数が多いとやっぱり緊張する。人数少ないから仲良くなったのかもしれない。

質問６

学生１０：三回のレッスンのうち何かしら大切なことが見つかって、相対的にプレゼンの大切さが下がって出たのではないか？プレゼン大切な事は理解しているけど、他の大切さが見つかって相対的に。

学生７：この三回でやった授業というのは、これまでの授業と丸っきりちがうじゃないですか？そういう新しさに惹かれたというか、その三回の授業の印象が強すぎて、プレゼンが必要？ってなったのかも。

クラス３（EG）

質問１

学生１５：そもそもの授業の内容のレベルが高かったからでは？

学生１３：力が足りないだけかも知れ無いんですけど、ビデオ難しくて分からなかった。全然推測する時も、考えれてなかったかなと思って、これ以上難しくなるって思うのは怖い。

学生１６：推測するの難しかったです。

学生１１：英語とかって、分かったら楽しいじゃないですか？分からんと勉強とかでもつまらない。これ分からんからつまらんってなって今ので分かっても、
質問紙上で、やや難しいっていっても、実際どのくらい難しいかって分からないっていうのもあって、今の自分と同じくらいにしておけば同じくらいがいいんじゃないかなって思ったと思います。

学生１５：自分の英語の実力がその週がそこやったとしても、触れる機会が授業でとってるとはいえ、ないぶん、やっぱり低下していくかなっていうのがあるからそこで授業のレベルを少しずつ上げてたところで、そこのギャップが生まれてくるんじゃないかなって若干の恐怖があるんじゃないですかね。

学生１６：理解はちょっと難しいくらいが身について良いかもしれないけど、モチベーション的には、難しいのってなかなか挑戦しにくって、自分がギリギリ理解出来るレベルの方が、取り組み易いっていうか、理解とはチョット違うって思います。

学生１２：ボキャブラリーがちょっと難しかったりすると、学ぶだけだったらいいんですけど、例えば、メリットとデメリットを考えるとか、なんか何かをするってことになると使う単語が難しかったりして、考える議題が難しいってなったときに、英語更に自分のレベルよりも更に上にレベルを求められたら、普段やっていないディベートみたいにメリットとデメリット考えてしかも英語も自分よりチョット上のボキャブラリーとか使って考えるってなると、チョットうーって考える期間が長いからそれなら普段やったことのないディベートとかをやるけど英語のボキャブラリーは普通のレベルでやるってのが、発表もしやすいかなって思ったときもあるんですけど…アクティビティは新鮮なんですよ、ほかの授業でやら無い事ばっかり、みんなで話したりとか、これについて文章を考えますとか、メリット、デメリット考えますとか、日本語でもそんなに機会が無いんで、それプラスってなるとチョット、でも面白いんでなくして欲しくない(全員笑)。

質問２

学生１５：真新しいものの aha!だったとしたらそもそも出会ったのが初めてだったら、やはり慣れてる物の中から見つけた aha!moment だったら長期的に残るかもしれないけど、普段あんまり見ないような物からってなっても、その先普段生活している中でまた見つけることも少ないと思うので。

学生１４：まあ、結局反復しないと残らないって思うんです。一回見て、あって、なっても、一回だけなんで何回も見ないと定着しないかなと思います。

学生１１－１６：復習している学生は少ないと思います。

学生１６：一回のユニットで、aha!がいっぱいあったら、在りすぎると残りにくいんで、本当に印象に残る物は限度があるかなみたいな。少ない方が印象に残り易いと思います。

学生１４：確かに、aha!ってなったら個人的には楽しいんですけど、その前は分からないわけじゃないですか。分からなくて、う一ってなって、分かって楽しいなってなるけど、結局次難しいのしようってなったら、また分からない状態で行くわけじゃないですか。チョット怖いなっていう。楽しいより怖いって方があるんじゃないかって。

学生１５：確かに aha!は一瞬やもんね。怖いというより、構える、来るっていう。

学生１６：もっと身近な物からの aha!っていうのがあった方が、習得しやすいかなっておもいます。

学生１４：パーセントって数値にしにくいじゃないですか。自分の中の抽象的な評価っていうのはあるけど、数値にはしにくい。やり方っていうのはあるかも知れないです。○とか△とかの方がまだ良いかもしれない。

学生１１：ペアの時の数値あるじゃないですか。数値が高いかなって。仮に答えなきゃいけないのが五個あったとして、二個しか答え無くても、50%以下っていうのは相手につけづらい。一つの評価単位が、100-80 位に広い方が相手につけやすい。

学生１４：低いのって心理的につけにくい。

学生１５：相手が自分で付けたのを見て、それよりワンランク上を付けるくらいの感覚でやって

しまう。数値自体に意味は無くてもやってることがちゃんとしてるなら。

学生１４：評価をする時に振り返るその行為自体が大切で、それが意義があるってだけで、数値にするとかじゃ無くて単純に振り返るって事が重要なのかなって思いました。評価付けるって怖いので余り乗り気ではなかった。

質問３

学生１４：ペア同士でやるときにセルフもやる感じだから、セルフはやる必要はあるけど、それを特別枠をとってやる必要はないって事じゃないですか？ペアでやるときに、途中、結局自分の評価も考えると思うんですよ。だから、自分評価するのは意味あるけど、分けて考える必要無くて、セルフ一択で充分なんじゃないかって。

学生１５：セルフ帰り間際にやるじゃないですか。授業がチョット押してるってなったら早く出ようって、パッパッッパってくらいでしか考えへんままに書いて出してって一人だけだったらなる。でもペアであるとしたら、相手の理解度を聞くためにもう一回復習するわけじゃないですか。一番最初のラーニングゴールの項目から。最後にもう一回考える時間があったっていうのはそっちかなって。

質問４

学生１２：これ見て思ったのが、シャイな人がこのクラス一番多いというのが原因だと思う。

学生１５：静かな感じだと発言しにくい。

学生１１－１６：シャイな人がこのクラスは多いと思う。（同意）

学生１２：そばに発言してくれる人がいると、言えるけど、シャイな人が周りに多いと、合わせなきゃいけないかなあとなっちゃって、ケンちゃんみたいな人がいると、なんか喋らなきゃいけない雰囲気を醸し出しているんで、はい、喋りますみたいになる。

学生１１：空欄があるときあるじゃないですか？その時誰も答えないじゃないですか？それからも、シャイな人が多いっていうのが分かる。

学生１１－１６：パーソナリティ的な要因が大きい（同意）。

質問５

学生１３：発表するのって一人じゃないですか？その前の友達同士で話す時の方が、一生懸命知恵を出し合っていて、発表する時には出来たものを読んでいるので、そんなに緊張感は無いかなって思ってました。

学生１２:伝える時はそんなに考えずに出来上がった物を言うんで、誰が言うかってなるだけで、前の段階のディスカッションで考えれって時、例えば文章をメールとかをを考えれって時の方がもっと使うんで、自分の身にはなってるかなって感じました。

学生１５：緊張感って意味では一緒なのかなって。教師に対するだけじゃ無くて、友達に言うって言うことも。

学生１４：緊張感っていうか、プレゼン自体よりも、その前の話し合いの方が、多分、有意義だと思ったけど、それはプレゼンが前提であるわけだから特にプレゼンが有意義っていう意見があって、緊張感はそんな有意義じゃないと思います。

学生１２：プレゼンがあるっていうのが無かったら、その前のディスカッションの段階ではそこまで考え無いから、一人の人がなってしまったけど、でも発表するからこそ、考えるっていうので、そこでの自分で得るものは大きい。だから相関関係が違うのかなって。

質問６

学生１１：単にプレゼンがやだ。やってないから分かんないけど、仮にやるとしたらやだなって考えたんじゃ無いかなって思います。

学生１２：内容が難しすぎて、ディスカッションの段階で発表したいって思うまでのものが出なかったから、発表はしたく無い、ちょっと内容が難しかったから、考えるのはいいけれど、発表するのは恥ずかしくなった。もしディスカッションの段階だけでちゃんと理解して無くて、いいものが出てこなかったら発表すると恥ずかしい、と自分なら思うかなって思いました。