The Effects of Learning Design Through Intercultural Exchange Based on Variation Theory

Mayumi Kubota
Kansai University
mkubota@kansai-u.ac.jp

The purpose of this study is to examine the effects of learning design through intercultural exchange among Chinese, Korean, and Japanese graduate students who participated in the Asian Students Seminar Round Table (ASSERT) from the perspective of variation theory. At Assert, one objective was to learn how to present in English. To conduct the analysis, the personal attitude construct (PAC) method is introduced to capture individual experiences. Although ASSERT is a useful event to observe the variations in English presentations, the participants were more concerned about their own presentation styles and they compared their performance with their own past experiences. The usefulness of PAC analysis is discussed along with the experiences of three individual cases.

Keywords: intercultural exchange, learning design, phenomenography, the personal attitude construct (PAC) method, variation theory

Introduction

In higher education, the knowledge that each student acquires is highly variable. Thus, in a class, although the lecture given is uniform, some students master content thoroughly but others cannot. Therefore, Marton and Booth (1997) explored the relationship between learning and awareness and defined learning in terms of awareness as well as experience. And they proposed the variation theory based on a phenomenographic research tradition. In variation theory, learning is seen as an expansion in awareness, and the task of the teacher is to provide a variety of critical aspects of a disciplinary concept, skill or practice. Let the students be exposed to the variation of critical aspects and acquire the abilities to compare, contrast, discern, and fuse the critical aspects of a disciplinary concept. Variation in understanding a concept is thus posited as due to variation in awareness of the aspects that make up the concept.

According to Akerlind (2015), at the beginning, the variation theory of learning based on a phenomenographic approach was developed through an extensive series of research on curriculum design. Thus variation theory is used as an instructional design tool for teaching subjects like mathematics (Kullberg, Kempe & Marton, 2017), welding (Kilbrink & Asplund, 2019), computing education (Suhonen, Thompson, Davies & Kinshuk, 2008), business and management subjects (Cheng, 2016), and laboratory work like programing activities (Eckerdal, 2015). The key element of variation theory is to enhance the students' ability to discern the critical aspects of the phenomena by comparing and contrasting a variety of critical aspects. Thus, variation theory is a useful instruction design principle for the teachers and instructors. Much of this research has focused on how to vary critical aspects of the disciplinary concepts based on variation theory.

However, although teachers followed the variation theory principle, some students could not learn adequately. Kullberg, Kempe & Marton (2017) acknowledged that "there is not one-to-one correspondence between teaching and learning." (p. 567). In addition, it is not easy to capture how the students learn a concept and what the students actually learned in relation to previous experiences. Kilbrink & Asplund (2019) used video and audio recordings to collect data in welding classes and analyzed it with conversation analysis along with variation theory. However, even these methods cannot capture students' learning in relation to their previous experiences. Therefore, it is also necessary to think about the methodology used to capture students' learning.

Literature Reviews

Variation Theory

The key theoretical element of variation theory is its relational epistemology among the aspects of the concepts to enhance the students' ability to discern the invariable aspects and capture the right concepts through their own

experiences. Akerlind (2015) explains as follows.

> The implication of learning of this relational perspective is that students' understandings of disciplines and disciplinary concepts are seen as constituted on the basis of their experience. However, as any experience (and associated understanding) is relational, students' understanding of a disciplinary concept cannot be predicted from their exposure to the disciplinary content alone; it will be a relation between the student (and all of their past experience) and the content to which they are exposed. This means that an understanding of disciplinary knowledge *as experienced by* students becomes vital in an understanding of how best to teach and learn disciplinary concepts. (Akerlind, 2015, p. 13)

Based on the notion of the intertwining of learning and awareness, the following four patterns are proposed for variation theory for teachers to present various aspects of the concepts.

1. Contrast: in order to experience a phenomenon, we must experience something else to compare it with.
2. Generalization: in order to fully understand a phenomenon, we must experience varying instances of the same phenomenon.
3. Separation: in order to experience particular aspects of a phenomenon and to be able to separate these aspects from other aspects of the phenomenon, we need to experience these aspects varying while other aspects remain invariant.
4. Fusion: in order to take all of the critical aspects of a phenomenon into account at the same time, they must be experienced as varying simultaneously in relation to each other.

<div align="right">(Marton, Runesson, & Tsui, 2004, as cited in Akerlind, 2017, p. 5)</div>

The object of learning is first determined followed by preparing the variation of features related to it. The object of learning is the target concept, phenomenon, or experience at the heart of a learning event, and there are three objects of learning: the *intended object of learning*, the *enacted object of learning*, and the *lived object of learning*.

1. The *intended object of learning*

   The intended object of learning is bound by the teacher's sphere of knowledge and experience.

   The appropriate question will be, "what did the instructor intend for students to learn?"

2. The *enacted object of learning*

   What one intends to teach and what actually happens in the classroom are often different.

   The appropriate question will be, "What is possible for the students to learn?"

3. The *lived object of learning*

   The "way students see, understand, and make sense of the object of learning when the lesson ends and beyond" (Marton & Tsui, 2004, p. 22).

   The appropriate question will be, "What did students actually learn?"

Learning will take place in the space where the teachers and the students interact around the object of learning. Knowledge of all three aspects of an object of learning can be particularly useful to instructors who wish to improve their instructional materials or practices (e.g., Marton & Tsui, 2004). However, in variation theory research there is little attention to investigate the lived object of learning, since it is due to the methodological difficulties to capture the students' experiences.

Aspect of Experience

Marton and Booth (1997) defined learning in terms of awareness as well as experience. However, their definition was not sufficiently developed in terms of methodology in order to capture the phenomena. Rovio-Johansson and Ingerman (2016) pointed out that "Methodological discussion during the last decade has been more diverse, but much focus has gone into theoretical development of variation theory and methodological discussion of learning studies, while the phenomenographic basis is to a large extent taken for granted" (p. 264). Thus, in this paper, I propose the use of the personal attitude construct (PAC) method developed by Naito (1997) to capture an individual's "experience".

In Japanese language, there are two words associated with the English word "experience," one is "taiken (体験)" and the other is "keiken（経験）." In German, "taiken" is "erleben" and "keiken" is "erfahrung." According to Bollnow (1971), "erleben" emphasizes the "emotion experienced by a person" (p. 178) while "erfahrung" is the "basic concept of accurate thinking" (p. 178). The former focuses on the feelings of enjoyment while the latter focuses on the phenomena that is experienced by a person. Since "erfahrung" makes the phenomena experienced by a person objective, it is close to reality, thus becoming the "basic concept of accurate thinking," because the facts are rigid. "Erfahrung" changes based on the situational context. "Erleben" is only for yourself. In the end "erleben" will be left as a memory in your mind. On the contrary, "erfahrung" will "continuously make a difference" (p.179).

Yano (2003) proposed to distinguish "education as generation" based on "taiken" and "education for progress" based on "keiken." "Education for progress" based on keiken is constructed as per the model of labor. A person will experience efficiently, and once a person experiences something, then it will become a tool to experience the next step, thus it will never end. Therefore, living itself cannot be a goal (Yano, 2003, p. 18). Thus, Yano (2003) stated that a person cannot live with only "keiken," but they need to also possess "taiken." Therefore, although the word "experience" is used as a key concept in variation theory, it is better to incorporate the Japanese concepts of "taiken" and "keiken" and the German concepts of "erleben" and "erfahrung."

In Japan, intercultural exchange programs are popular among students who seek to experience a foreign culture and learn English. In this case, the word "taiken" is used to denote experiencing a new culture. Maeda (2017) conducted research on the structure of learning with four students who had been to Canada or Malaysia for one semester to enhance their English ability. She used PAC method and revealed that what the students imbibed most was not English language per se, but the ability of intercultural adaptation as well as an understanding of different cultures.

Nakagawa (2012) also used PAC analysis for Japanese college students who went to the USA for a year to investigate the change of self-image at the time of pre-departure, on-site and post-study abroad. Then, data was discussed in terms of the students' identity. PAC method is a useful methodology to capture the inner state of a person. Especially, PAC can reveal unknown (unconscious) aspects of the subject's attitude. That is the part of "taiken."

In Japan, learning English is mandatory at elementary, junior and senior high school. Even at the universities, English is mandatory depending on the universities. However, the students are not motivated enough to learn English to become a global citizen. In the Japanese EFL (English as a foreign language) context, Yashima (2001) found "international posture" is an important variable to capture the language learners' attitude toward different cultures, international profession and the people with whom learners can communicate with in English. In her model, "international posture" influences motivation, which, in turn, influences proficiency in English. In Japan, the students do not use English in a society although they learn it at school. Thus, motivation to learn English is first influenced by "international posture." Therefore, it is necessary to investigate students' experiences of learning English by using PAC analysis in order to understand what students learn in a given constructed situation based on variation theory.

About ASSERT

Since 2006, ASSERT is organized every year by one of four universities—South China Normal University, Beijing Normal University, Hanyang University (Korea), and Kansai University. It is one day of round table presentations, where graduate students who major in informatics present their informatics-related papers in English. Professors from the four universities also attend the presentations and provide feedback—selecting and awarding several best presentations at the end. Besides presentations, the students also eat together and go sightseeing with the host students before or after the round table presentations. Thus, students are expected to share their knowledge about informatics through English.

Learning Design

ASSERT is designed based on situated learning. Lave & Wenger (1991) proposed situated learning as when the learner moves from the periphery to the center of the community of practice. Thus, learning is the change of identity. Social interaction is the crucial component of situated learning. It is assumed that students are more inclined to learn by actively participating in the learning experience. Table 1 shows different learning paradigms by comparing "acquisition metaphors" with "participation metaphors."

Learning at ASSERT is explained in terms of "participation metaphors." To attend ASSERT, Japanese students prepared their articles and slides two months in advance. They practiced their English presentation in front of other

students and a native English speaker at least once a week for a month. Therefore, at least for Japanese graduate students, learning occurs not only at ASSERT, but also during the preparation period prior to ASSERT.

At ASSERT, Japanese students meet other graduate students from China and Korea and present their papers in English. By attending ASSERT, students are expected to exchange ideas and increase their knowledge, such as the effects of massive open online courses (MOOCs), instructional design for developing materials, learning designs for higher education, thinking tools for collaborative learning.

Table 1
Different learning paradigms

Comparison of Learning Metaphor		
Acquisition Metaphor		Participation Metaphor
a wealth of individual knowledge	learning goal	construction of community
acquire something	learning	become participants of a community
receivers of knowledge	students	peripheral participants of a community
provider of knowledge	teachers	mastered participants
possession	knowledge, concepts	practice, narrative, action in a community
to possess	about knowing	to participate in a community and to communicate

The learning environment of ASSERT was designed based on three components proposed by Miwa and Yamauchi (2005)—namely "space," "activity," and "community." In the case of ASSERT, space represents the place where ASSERT occurs, activity is exchanging knowledge and ideas through English presentations as well as questions and answers at the round tables, and a community forms through formal discussion and informal gatherings at all other times. However, the learning at ASSERT is based on participation metaphors—students are expected to get involved as much as possible on their own initiative. Therefore, in order to design ASSERT based on variation theory, the *intended object of learning* is to acquire the best English presentation skills. Although the contents of the student papers are quite diverse among four universities, all of the professors think that ASSERT is a good place for the graduate students to present their papers in English. The *enacted object of learning* is to gain confidence in one's own presentation. Then, this study will reveal *the lived object of learning*.

In terms of variation in an English presentation, ASSERT is designed as follows.

1. Contrast
   ASSERT is where round table presentations of about 25 graduate students from China, Korea, and Japan take place and is a small scale international conference. It is different from academic international conferences in the number of participants and the type of conference rooms. Even the presentation style is different. Students present at a table to their assigned group members.

2. Generalization
   All of the presentations are conducted in English but in Chinese English, Korean English, and Japanese English. All of the presentations are thus conducted in certain varieties of English.

3. Separation
   In the round table presentations, a participant can compare different kinds of English pronunciation, if she does not focus on the presenter's attitude. Alternatively, a presenter can compare different presentations with regards to facial expressions, hand gestures, and tone of voice without paying attention to the presentation contents.

4. Fusion
   A student is exposed to see a variety of presentations in terms of the attitude and pronunciation of the presenters, layout of the content in the slides, speed, and answers to questions. The knowledge gained through those observations can be fused to create a framework for a good English presentation.

Objectives

The purpose of this study is to examine the effectiveness of learning design of ASSERT in terms of variation theory by using PAC method.

Research Question: In what ways/to what extent is ASSERT an effective learning event for each participant in terms of the "lived object of learning" proposed in variation theory?

Method

Personal Attitude Construct (PAC) Method

The PAC method (Naito, 2002) was used to investigate the meaning of student learning through an individual framework, following which the data was interpreted using the variation theory of learning (Marton & Booth, 1997; Akerlind, 2017). The PAC is an analytical method developed by Professor Naito (1997) used in the fields of social science, counseling, sociology, Japanese language, and international education. The PAC method is based on the assumption that an individual has three components:

1. a part that is shared with everyone else,
2. a part shared with people in a given group, and
3. a part that is unique to them.

Therefore, in analyzing an individual thoroughly, researchers can identify not only the idiosyncrasy of the individual but also something universal, which is how individual shares with people surrounding them (Sueda, 2014, p. 83). The PAC method is a hybrid of quantitative and qualitative methods. An in-depth interview is conducted by referring to the results of a cluster analysis, which is produced based on the numeric data obtained when research participants rate cards in pairs. Cards are rated based on the degree of closeness of their key words to their connotative meaning. This method is based on the idea that phenomenology and psychology can reveal intersubjective meaning. Thus, "researchers identify not only factors for a given phenomenon but also the relationships among the factors, which cannot be achieved by conventional in-depth interviews" (Sueda, 2014, p. 83).

By following the sequential steps—which are explained in the next section—the structure of an individual's personal attitude or image is measured and analyzed qualitatively. The basic characteristic of PAC is its blended method of free word-association, hierarchical cluster analysis, and phenomenological data interpretation. Thus, it becomes possible to analyze people individually, instead of treating people as a blended unit or deriving averages.

The merit of PAC analysis is that the framework of interpretation of a dendrogram is given not by the researcher but by the subject. Even the subjects can assess themselves by analyzing their own dendrogram, which is produced after the cluster analysis. The disadvantage of PAC analysis is that it is a time-consuming process.

Steps for PAC Method

The PAC method follows certain specific steps (Naito, 1997, 2002; Sueda, 2014). To conduct it, first stimulating questions were developed. The questions I asked were: "Please recall what kind of learning you have noticed by participating in ASSERT 2018. You may slowly reflect on the period of preparation, the presentation at the site, and the three-day stay in Guangzhou. List the words that are important and meaningful in describing the situation. Think of as many words as possible and put one word on each card in the order that the words occurred to you." This stimulus sentence was shown to the participants and how the sentence was stated is very important.

For PAC analysis the following sequence is followed in each instance: 1) The subjects are asked to rearrange the cards according to their importance and the numbers recorded. 2) Two cards are chosen at random and the subjects are asked to decide on the degree of similarity between the two words written on the cards using a 7 point scale (1 denoting extremely alike and 7 meaning extremely different, while 3 implying undecided). 3) A cluster analysis is conducted using the above data and the results presented in a dendrogram. 4) The subjects are asked to interpret the clusters by themselves and then the researcher interactively helps them interpret the dendrogram. The dendrogram may show the deep inner psychology that even the subjects have not realized about themselves and the situation, so it is necessary for the researcher to be patient and support the subjects to interpret the information themselves. The researcher can observe the subjects' behavior as well.

The Participants

In this study, the participants were 10 Japanese graduate students who presented papers in English at ASSERT 2018.

Results

Table 2 shows a summary of the results obtained through the PAC analysis of the 10 participants. The cluster analysis was performed with SPSS version 23 using the Ward method. It shows gender, age, number of clusters, names of each cluster, and the summary of clusters. The names of each cluster and the summary of clusters are the final version of the researchers' interpretation of each dendrogram, concluded after the discussion with the participants, who first interpreted the dendrogram. On the right side of Table 2, there are columns named "plus," "minus," and "zero." They correspond to the meaning of each item—namely "positive", "negative," or "neutral"—as stated by the participants. The word "positive", "negative," or "neutral" does not represent the connotative meaning of each word, but is the image of each word that the participants viewed. The degree of conflict noted in the right column is the result of the following calculation. The absolute value of the difference between the number of positive items minus the number of negative items plus one is the denominator, while the number of positive items plus the number of negative items is a numerator (Naito, 1997, p. 20). The degree of conflict depicts the state of the participants. The feeling of conflict will be stronger if the difference between the two sets of items is smaller or the total number of the items is larger.

Table 2
The summary of PAC analysis obtained from ten students

①	②	③	④		Names of cluster	Summary	⑤	⑥	⑦	⑧	⑨
#A 1	F	22	2	C1	intention of writing an article in English	attitude of checking previous experiences	7	5	2	0	1.75
				C2	inheritance of management						
2	M	22	2	C1	anxiety toward different culture that cannot solve by myself	assuming responsibility for learning	8	5	2	1	1.75
				C2	self responsibilities of English ability and ability of writing an article						
#B 3	F	23	3	C1	feeling of preparation of presentation done until last minutes	sense of satisfaction after overcoming anxiety	10	7	1	2	1.14
				C2	overcoming anxiety of initial issues						
				C3	awareness after the presentation						
4	M	22	3	C1	process of writing an article	feeling that I don't know any	13	10	1	2	1.1
				C2	different food and environment noticed by comparing Japan and China						
				C3	difference in ability noticed by comparing Japan and China						
5	M	24	3	C1	difficulty in interpretation	learned how to use verbal and nonverbal messages	12	10	0	2	0.9
				C2	adaptive action in the first place						
				C3	making friends through verbal and nonverbal communication						
6	M	23	3	C1	change of stereotypic views by comparison	found my own intention through interaction with others	10	9	1	0	1.11
				C2	I noticed how to learn through active action						
				C3	rediscovery of my core belief						
7	M	24	3	C1	problems found among Japanese friends	tasks that became clear	7	2	4	1	2
				C2	getting rid of stereotype						
				C3	problems with my own article						
#C 8	F	51	4	C1	my challenge rewarded (joy)	challenge and impressed of writing an English article	10	8	2	0	1.42
				C2	acquisition of presentation skills						
				C3	problems of writing an article						
				C4	interests of intercultural exchange of three countries						
9	F	22	5	C1	lack of my efforts	learning from different targets	11	5	6	0	5.5
				C2	lack of my communication ability						
				C3	have a certainty by doing						
				C4	presence of Japanese friends						
				C5	action with Japanese friends						
10	M	23	6	C1	myself that I cannot really get it	I found writing an article is enjoyable.	17	7	7	3	14
				C2	low level of English ability						
				C3	low level of motivation toward intercultural exchange						
				C4	first experience of presentation at the conference						
				C5	writing an article						
				C6	actions taken according to the circumstance						

① Participant's ID, ② Gender, ③ Age, ④ No. clusters, ⑤ No. items, ⑥ Plus, ⑦ Minus, ⑧ Zero, ⑨ Degree of conflict

Among ten participants, six are male and four are female. All of them just enrolled in April and are in the first year of the master's degree program. Two are Chinese students. One works as a Chinese interpreter between Japanese and Chinese students when they have any difficulties in using English. The other helps students coming from other universities to adjust to the implicit norms of graduate school. Thus, their learning about presentations are from these points of view. Three male participants, who went to China for the first time, had difficulty downloading WECHAT on the way to China from Japan. Then one student worried about losing a tool for contacting others. This anxiety

influenced his dendrogram.

As Table 2 shows, all of the participants commented about presenting in English at ASSERT in their dendrogram. However, their episodes about presenting in English vary and are related to their strong concerns at that time, as I briefly described above.

Because of limited space, I chose to present the results of three dendrograms in this paper. They are #A, #B, and #C out of ten participants. The reason why I chose these three participants was that they are different in their concerns about English presentation, and yet, they acquired knowledge about English presentation by participating in ASSERT with the modest state of the feeling, in other words, the lower degree of conflict.

Dendrogram

The dendrogram is the result of cluster analysis and may show the deep inner psychology that even the participants did not realize about themselves and the situation. Thus, the researcher took time to listen to the participants' interpretation of the information that appeared in the dendrogram. At the same time, the researcher observed the participants' behavior.

Figure 1 shows the dendrogram provided by participant #A. There is a specific format for a dendrogram report (Naito, 1997, 2002; Sueda, 2014). Generally, there are five steps: (1) The participant interprets the dendrogram. (2) The participant interprets the relationship between clusters and names the group of clusters. (3) The participant clarifies the meaning of each item when the researcher asked. (4) The researcher verifies the participant's interpretation by asking a question to understand the meaning of participant's interpretation as much as possible. (5) Finally, the researcher names each cluster and the summary of clusters. At this moment, the researcher can refer to the background knowledge of the study (research questions.). However, it is important to state here that the interpretation of a dendrogram has to be done by a participant himself at first. The researcher should be supportive during the whole session of interpreting the dendrogram.

#A's Interpretation of the Clusters (CLs)

Participant #A is a female student at the age of 22 years old. She came from a university different from K university. She wants to be a primary school teacher after graduation.

1. Each cluster
CL1 included six items. They are 'importance of checking by others (D/professors),' 'design of PowerPoint slides,' 'how to write an article,' 'getting to know various methodologies,' 'academic English,' and 'how to ask a question.' #A said that CL1 is related to writing her article. CL2 included one item, that is, 'preparing the necessary items by checking previous experience.' The six items in CL1 depicted #A's concern about her presentation. Specifically, she focused on how to write an article since she mentioned this item is the most important item among seven items. (Number on the left side of the dendrogram indicates the order of importance for a participant.). This item connected 'get to know various methodologies' and they connected to both 'importance of checking by others (D/professors),' 'design of PowerPoint slides.' So it is important to see how six items in cluster 1 is laid out in order to interpret #A's image of learning. Finally, these four items are connected to 'academic English,' and 'how to ask questions. Although the item 'how to ask a question' is a negative image for her, she learned it at ASSERT. In CL2, #A noticed that nobody prepared any souvenir this time, thus the item was 'prepare the necessary items by checking previous experience.' She felt uneasy because she believed that some students who attended ASSERT the previous year should provide advice beforehand. She thus wanted to know about exchanging souvenirs beforehand.

2. Relationships between the clusters
#A mentioned that she first separated the items related to writing her article from others. However, she noticed their commonalities. Even when writing an article, she needs to check the previous literature. This is identical to checking the previous experience of ASSERT from someone in order to better adjust to the current situation. So in the end, she divided seven items into two clusters as shown in her dendrogram.

3. Questions on items
A elaborated on part of the items as below.
Importance of checking by others (D/professors): D refers to the doctoral students.

Design of PowerPoint slides: Before attending ASSERT, she prepared one PowerPoint slide and showed one figure to other students and a native English teacher. Then, they commented that the figure was not clear enough to understand. Thus, she revised it. Therefore, at ASSERT, she paid attention to all figures in slides presented by others.

Get to know various methodologies: There was a lot of quantitative research and she could not understand their methodologies. Thus, she realized that she needs to familiarize herself with a variety of methodologies.

How to ask a question: She assumed that the questions would be about the results. However, there were also questions concerning the methodologies. Thus, she realized that a variety of questions can arise pertaining to the presentation.
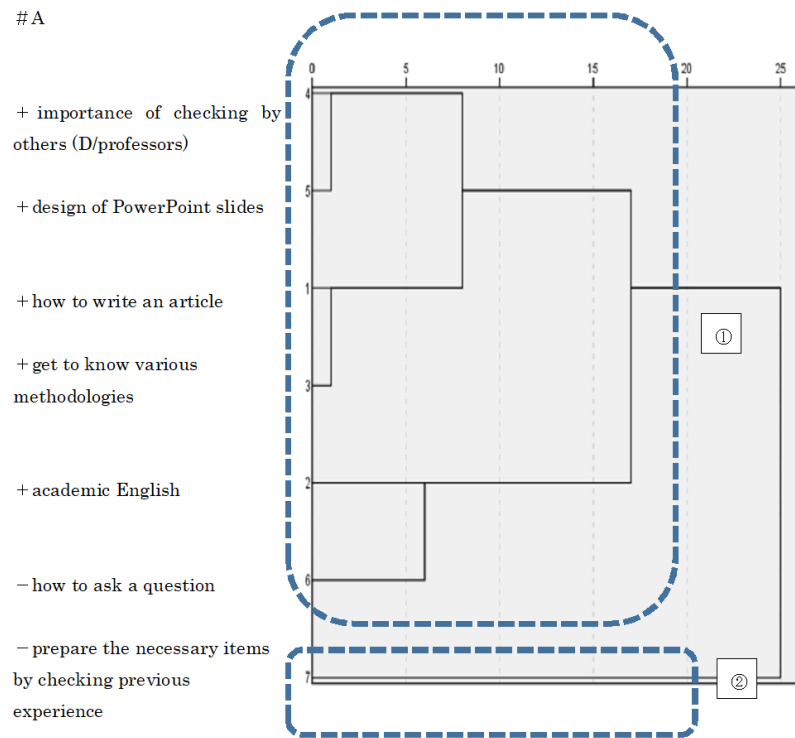

Figure1   Dendrogram of #A
（The numbers on the left indicate the order of importance）

Figure 1. The dendrogram of Participant #A

4. The overall interpretation of #A's data and conclusion by the researcher

Of the seven items, five were positive. Thus, the degree of conflict is 1.42. Since there are many positive items, her feelings or attitudes toward ASSERT are positive. CL1 was named 'intention of writing an article in English.' CL2 was named 'inheritance of management.' The overall interpretation of #A's data is the 'attitude of checking previous experiences', because #A learned the importance of "succession" in checking previous papers to aid her own, and also for managing ASSERT in the future. For example, #A had difficulty in drawing the appropriate figure to present in a slide before attending ASSERT as mentioned in section 3. Thus, she focuses on observing figures presented in the slide by others. By explaining her dendrogram to the researcher, she realized that she compared her experience with her previous experiences, such as that of writing paper in English, writing figures, and preparing souvenirs. Thus, in the case of #A, the important finding is her attitude to compare and contrast her experience to her previous experiences.

The Cases of #B's and #C's

Because of the limited space, only the researcher's overall interpretations are provided here.

Participant #B

Participant #B is a female student at the age of 23 years old. She came from K university and wants to be a high school teacher after graduation.

There are ten items in the dendrogram of #B. Seven are positive, one is negative and two are neutral. Thus, she has generally a positive feeling towards ASSERT. #B divided these ten items into three clusters. They are named as follows. C1: feeling of preparing a presentation at the last minute, C2: overcoming anxiety of initial issues, C3: awareness after the presentation.
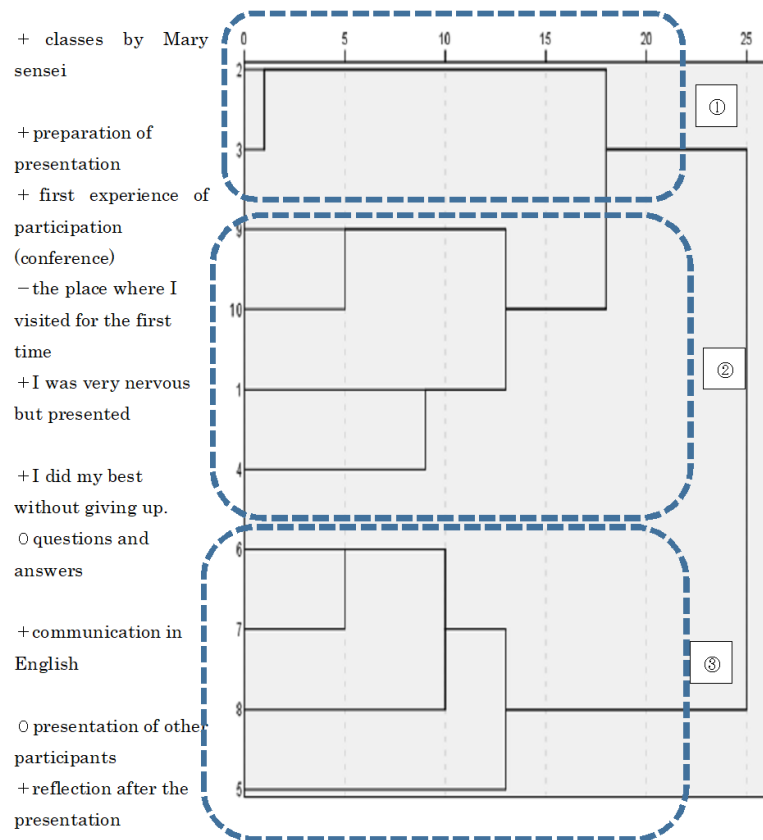
Figure 2   Dendrogram of #B

Figure 2. The dendrogram of Participant #B

In the case of #B, she revised her paper again at the last moment without giving up. She felt very tired but decided to revise her article again at the last moment by referring to comments given by Mary (item 2). This experience gave her courage and confidence to present at ASSERT. The most important item for her was "I was very nervous but presented." For her, it was the first experience to participate in an international conference as well as going to China, however, she overcame anxiety with strong will. That gave her determination to learn at the site of ASSERT, that is shown items in C3 such as 'questions and answers,' 'communication in English,' and 'presentation of other participants.' and 'reflection after the presentation.' After a discussion with #B, the researcher summarized her experience as a 'sense of satisfaction after overcoming anxiety.'

Participant #C

Participant #C is a female student at the age of 51 years old. She is a primary school teacher.

There are ten items in the dendrogram of #C. Eight are positive, two are negative. Thus, she also has a positive feeling towards ASSERT. #C divided these ten items into four clusters. They are named as follows. C1: my challenge rewarded (joy), C2: acquisition of presentation skills, C3: problems of writing an article, C4: interests of intercultural exchange of three countries.

#C felt that it is challenging to write her paper in English because she is not good at English and struggled her paper during the preparation period. However, she received an award at ASSERT that made her very happy and gained confidence. In this case, the situation itself (ASSERT) made her learn about presenting in English, such as using simple key words, were useful to communicate and to realize that the discussion part of her paper was not perfect. Thus, the researcher summarized this dendrogram as 'challenge and impressed of writing English article.'
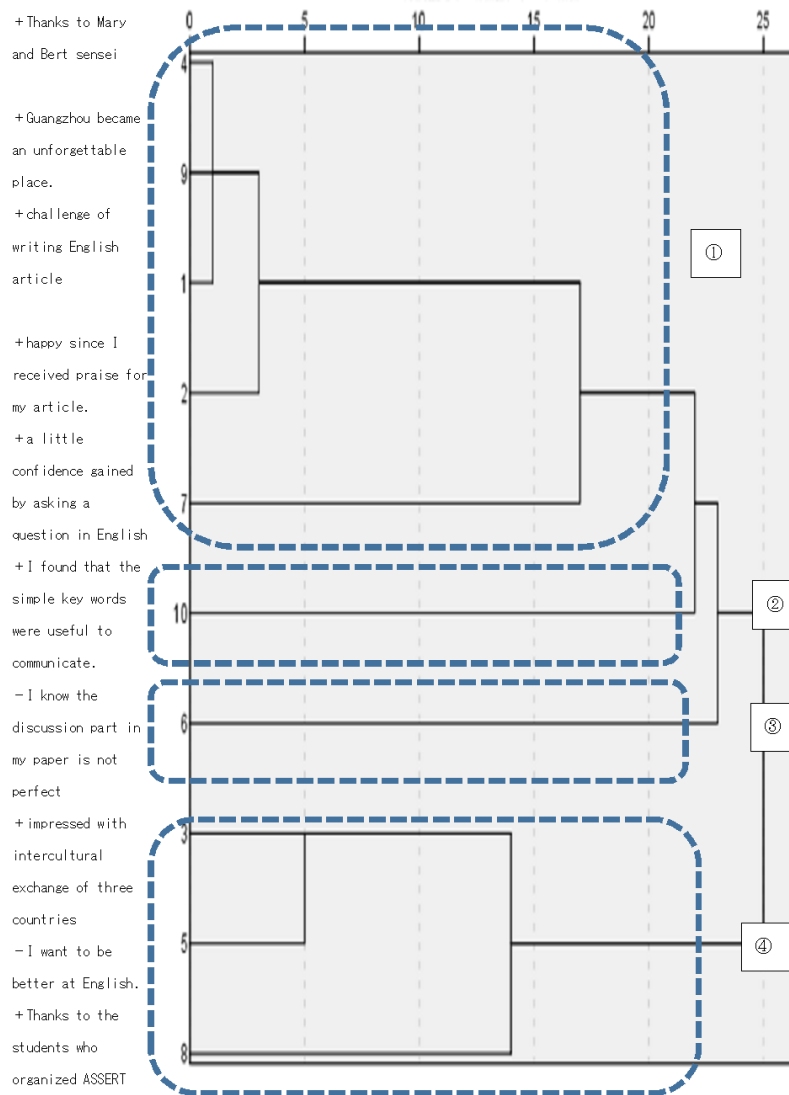

Figure 3. Dendrogram of #C

Figure 3. The dendrogram of Participant #C

The results of three dendrograms show that the students' "concern" enabled them to focus on their learning and capture the variation of the different aspects of learning at ASSERT. It was not merely picking up the best English presentation and modeling it, but rather their choice of critical aspects of English presentation differed depending on their "concern." #A learned from the comparison between her own previous experience and her experience at ASSERT. #B could learn because she could overcome her anxiety at ASSERT. #C learned because she challenged and was praised at ASSERT.

Discussion

ASSERT is a useful and meaningful learning space for graduate students from China, Korea, and Japan, with greatly varying knowledge of information technology and levels of English presentation skills.

By giving round table presentations, the students noticed weaknesses in their papers, recognized their attitudes towards presenting, and enhanced their reflective thinking skills. Variation theory views learning as an expansion of awareness, in which students recognize critical aspects of a disciplinary concept, skills, or practice (Akerlind, 2017). In that sense, ASSERT is a good learning design for the graduate students to be exposed to different patterns of variation in the critical aspects of whatever concerns them about their presentation.

Furthermore, the PAC method touches upon the students' intersubjective meaning and reveals students' recognition in relation to their own past experiences. In other words, students did not necessarily notice the aspects of phenomena by comparing and contrasting a variety of presentations at ASSERT, but by comparing and contrasting their own behavior and attitudes during the preparation period before attending ASSERT as well as at ASSERT. Thus, the students' "concern" in their minds will be another important factor in the development of their awareness regarding the critical aspects of disciplinary phenomena such as presenting in English.

Figure 4 shows the space of learning. The teacher has the intended object of learning and grasped the enacted object of learning. The lived object of learning relates time. The student can refer their own past experience to discern the critical feature of the concept. That is because each student has their own "concern."
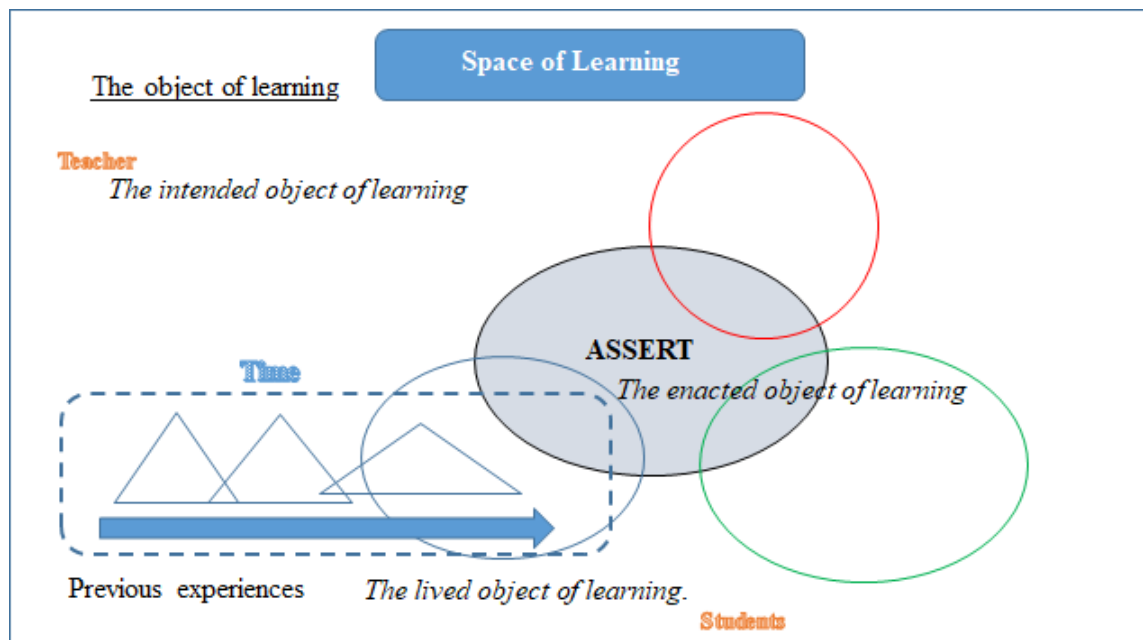

Figure 4. Space of learning

In the education setting, Dewey (1938, p. 44) mentioned that the two principles of continuity and interaction are not separate from each other. They intercept and unite. They are, so to speak, the longitudinal and lateral aspects of experience. Different situations succeed one another, but because of the principle of continuity, something is carried over from the earlier to the later ones. This notion corresponds to that of Yano (2003). Dewey (1938, p. 44) also mentioned that what is "learned in the way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with the situation which follows." However, the researcher think, these explanations are based on 'keiken' but not 'taiken' in Japanese, since, like German language "erfahrung," it is the "basic concept of accurate thinking" (Bollnow, 1971,p. 178). The situated learning set up at ASSERT is also closely related to 'taiken' that is emotion experienced by a participant. The participants' 'taiken' motivated to learn. As explained in the examples of three dendrograms, PAC analysis revealed this continuity of learning in each participant's attitude in terms of 'keiken' and 'taiken'.

Conclusion

ASSERT is a useful and meaningful learning space for graduate students from China, Korea, and Japan with greatly varying knowledge of information technology and levels of English presentation skills.

The PAC analysis revealed that the students' "concern" is an important factor in developing their awareness regarding the critical aspects of disciplinary phenomena. Variation theory can be used for situated learning; however, it is necessary to use special methodologies such as PAC analysis to capture the critical aspects of the phenomena, because the learning of participation metaphor has to be treated not empirically but qualitatively, too. In this way, the lived object of learning is captured. It will help to understand the object of learning more holistically.

References

Akerlind, G. (2017). What future for phenomenographic research? On continuity and development in the phenomenography and variation theory research. *Scandinavian Journal of Educational Research*. 1-10. doi:10.1080/00313831.2017.1324899

Bollnow, O. F. (1971). *Ningengakuteki ni mita kyoikugaku* [Education from the perspective of humanistic] Tokyo, Japan: Tamagawa publication.

Chen, E. W. (2016). Learning through the variation theory: A case study. *International Journal of Teaching and Learning in Higher Education,* 28(2), 283-292.

Dewey, J. (1938). *Experience & education*, New York, NY: Touchstone.

Eckerdai, A. (2015). relating theory and practice in laboratory work: a variation theoretical study. *Studies in Higher Education*, 40:5, 867-880. doi: 10.1080/03075079.2013.857652

Kibrink, N. & Asplund, S. (2019). Using CAVTA (Conversation Analysis and Variation Theory Approach) in a learning study on welding. University of Malta. 269-276.

Kullberg, A., Kempe, U. & Marton, F. (2017). What is made possible to learn when using the variation theory of learning in teaching mathematics? *ZDM Mathematics Education*, 49, 559-569. doi: 10.1007/s11858-017-0858-4

Maeda, H. (2017). Personal attitude construct analysis on learning in Japanese students study abroad. *Mejiro University Education Research,* 23, 1-10.

Marton, F. & Booth, S. (1997). *Learning and awareness*. Hillsdale, NJ: Lawrence Erlbaum.

Marton, F., Runesson, U., & Tsui, A. (2004). The space of learning. In F. Marton & A. Tsui (Eds.), *Classroom discourse and the space of learning* (pp. 3-40). Hillsdale, NJ: Lawrence Erlbaum.

Marton, F. & A. Tsui (Eds.). (2004). *Classroom discourse and the space of learning*. Hillsdale, NJ: Lawrence Erlbaum.

Mima, N. & Yamauchi, Y. (2005). *Miraino manabi wo dezain suru* [Designing learning for the future] Tokyo: Tokyo University.

Naito, T. (1997). PAC bunseki jisshi nyuumon-Ko wo Kagaku suru shingiho eno shotai [Implementation of PAC analysis: Invitation to new scientific tool to investigate individual] Kyoto, Japan: Nakanishiya.

Naito, T. (2002). PAC bunseki jisshi nyumon (kaiteiban) "ko" wo kagakusuru shingiho eno shotai [Practice of PAC analysis (revised version) Invitation to a new method to research "an individual"] Kyoto, Japan: Nakanishiya.

Rovio-Johansson, A. & Ingerman, A. (2016). Continuity and Development in the Phenomenography and Variation Theory Tradition. *Scandinavian Journal of Education Research*, *60*(3), 257-271.

Sueda, K. (2014). *Negotiating multiple identities: Shame and pride among Japanese returnees*. New York, NY: Springer.

Yano, T. (2003). "Keiken" to "taiken" no kyoikuningengakutekikosatsu-Jyunsui zoyo toshiteno borantea katsudo- [Discussion on "keiken" and "taiken" from Educational perspective---Volunteer activities as pure gift] In Ichimura, T., Hayakawa, M., Matsuura, Y. & Hiroishi, H. (Eds.). Keiken no imi sekai wo hiraku-kyoiku nitotte keiken toha nanika- [*Exploring New Horizon of Experience: What is the meaning of Experience in education?*] 33-54. Tokyo, Tokyo: Toshindo.