

First-year students' learning experiences of problem-based learning tutorials in Japanese higher education

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In Japan, a problem-based learning (PBL) pedagogical approach was firstly incorporated into a tertiary-level curriculum in 1990 at a private medical college (Kozu, 2006). Since its initiation, the number of Japanese medical schools implementing PBL has increased to 63 out of the 79 schools to date (Association of Medical Japanese Colleges, 2005). Notwithstanding the great interest in using this student-centred learning approach in Japanese higher education, there is little qualitative research on PBL curriculum from a perspective of students' learning process. In particular, the previous studies have tended to emphasise the need for investigating the pedagogical effectiveness of PBL, whereas they seem to somewhat downplay the importance of understanding students' approaches to learning in PBL. From a perspective of classroom discourse analysis, the main focus of this paper is on exploring the nature of Japanese students' participation in this radically different learning environment from their prior learning experiences. In order to better understand the educational phenomenon, the analysis of students' interactions is underpinned by Eggins and Slade's (1997) speech functional framework. Of a variety of speech functions classified in this analytical framework, the opening and developing moves are regarded as pivotal linguistic contributions in PBL tutorials. This study randomly selected two PBL groups at a Japanese medical university, and conducted the video-recordings of these PBL sessions in May, 2010. By demonstrating the speech functions produced by the participants during the discussions, this paper provides a general picture of the ways in which students negotiate and construct meanings through their interactions in PBL. Specifically, the results indicate that the difference in the number of the opening and developing moves made by the students can partially determine the 'quality of discussion' of these PBL groups. The findings also suggest that the reasons why the different discourse patterns emerged in these two PBL tutorials can be worth exploring further.

Keywords: Problem-based learning, classroom discourse, Japanese higher education

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Introduction

Problem-based learning (PBL) is characterised by small group collaborative learning, with a strong emphasis on the development of students' autonomous learning, problem-solving, and critical thinking skills. These competencies are regarded as the key generic skills which need to be acquired in higher education. Since its initiation of employing a PBL method in McMaster University in the late 1960s, the implementation of it subsequently has been widely adopted in higher education curricula in various countries.

In Japan, a PBL pedagogical approach was firstly incorporated into a tertiary-level curriculum in 1990 at a private medical college (Onishi & Yoshida, 2004; Kozu, 2006). Currently, the number of Japanese medical schools implementing PBL has increased to 63 out of the 79 schools to date (Association of Medical Japanese Colleges, 2005). Notwithstanding the great interest in using this student-centred learning approach in Japan, there is little qualitative research on PBL curriculum from a perspective of students' learning process. A better understanding of how Japanese students negotiate meaning in PBL which has been developed in the Western cultural contexts can be pivotal to enhancing student learning experience in higher education.

Of particular interest to this study is to explore the nature of Japanese students' participation in this radically different learning environment from their prior learning experiences. Specifically, this study provides a fine-grained analysis of PBL classroom discourse where two groups of first-year students have identified their knowledge gap and learning objectives. Therefore, to accomplish the major objective, the characteristics of PBL classroom interactions will be examined in this study.

Research contexts

A private medical university in Japan agreed to be involved in this research. With a purpose of training medical experts who fully understand the importance of team medicine, an 'interdisciplinary' PBL curriculum has been implemented in the first-year educational programme. This PBL is basically characterised by general education for the purpose of developing students' generic skills through the discussions on medical subjects. Each PBL group typically consists between seven and nine students from the different faculties with a facilitator. 15 students in two PBL groups which were randomly selected were willingly involved in the data collection. The participants are referred to by pseudonyms. Table 1 provides a snapshot of the participants and their backgrounds.

Table 1: Participants in the PBL

Group 1				
Name	Gender	Age	Faculty/School	Role in PBL
Hide	M	21	Medicine	Participant
Yukari	F	19	Medicine	Participant
Masa	M	18	Dentistry	Participant
Maiko	F	18	Dentistry	Participant
Nao	M	19	Pharmaceutical sciences	Participant
Miyuki	F	18	Pharmaceutical sciences	Chair
Aya	F	18	Physical Therapy	Scribe
Group 2				
Mitsu	M	22	Medicine	Participant
Hajime	M	18	Dentistry	Scribe
Yoshi	M	19	Pharmaceutical sciences	Participant
Mie	F	18	Pharmaceutical sciences	Participant
Kaori	F	20	Pharmaceutical sciences	Participant
Aki	F	18	Nursing	Participant
Natsu	F	18	Nursing	Chair
Mami	F	18	Occupational Therapy	Participant

Each theme is completed in two tutorial sessions over two weeks, and the duration of each tutorial is approximately three hours. In Session 1, students are encouraged to identify their learning objectives based on information from a scenario. Session 2 is undertaken to share the results of their independent learning. In this paper, students' interactions in Step 3 will be examined from a perspective of discourse analysis. A summary of the PBL process at the university is provided in Table 2.

Table 2: PBL process in the first-year education

<u>Session 1 – 3hrs</u>	
Step 1	- Read the scenario.
Step 2	- Select keywords or interesting information.
Step 3	- Identify the points in question and knowledge gaps.
Step 4	- Draw up a mind-map to outline the mechanisms that relate each selected keyword.
Step 5	- Identify the learning issues.
<u>Self-directed learning</u>	
Step 6	- Individually study the allocated learning objectives using a variety of resources.
	- Submit summaries of independent learning to the PBL web system.

- Step 7 - Share the results of independent learning.
- Reach an understanding of what has been shared in the presentations.
-

Data collection and analysis procedures

Video-recordings of the PBL tutorials were undertaken in May 2010 with the consent of the students and facilitators in this study. The video segments where students in two groups identified their knowledge gap were transcribed to investigate the breadth of their perspectives on the subject and the depth of their discussion. Since Japanese is the medium of instruction in this university, the first author translated the educational materials and students' classroom interactions into English. The scenario entitled "Late night snack" contains medical, nutritional and physiological problems (see Appendix).

The transcriptions of students' interactions were analysed for classroom discourse patterns. In this study, a move is regarded as "a unit of analytical discourse organisation that a speech functional pattern expresses" (Eggins & Slade, 1997). A new turn occurs when transferring from one speaker to another in a conversation, and one turn can encompass one or more moves. Turns and moves were numbered, and then the only moves which are related to the 'content' that builds the substance of the teaching-learning activity were coded by using the category of speech functions (Eggins & Slade, 1997). As Figure 1 shows, main classes of moves are classified in relation to the discourse sequences.

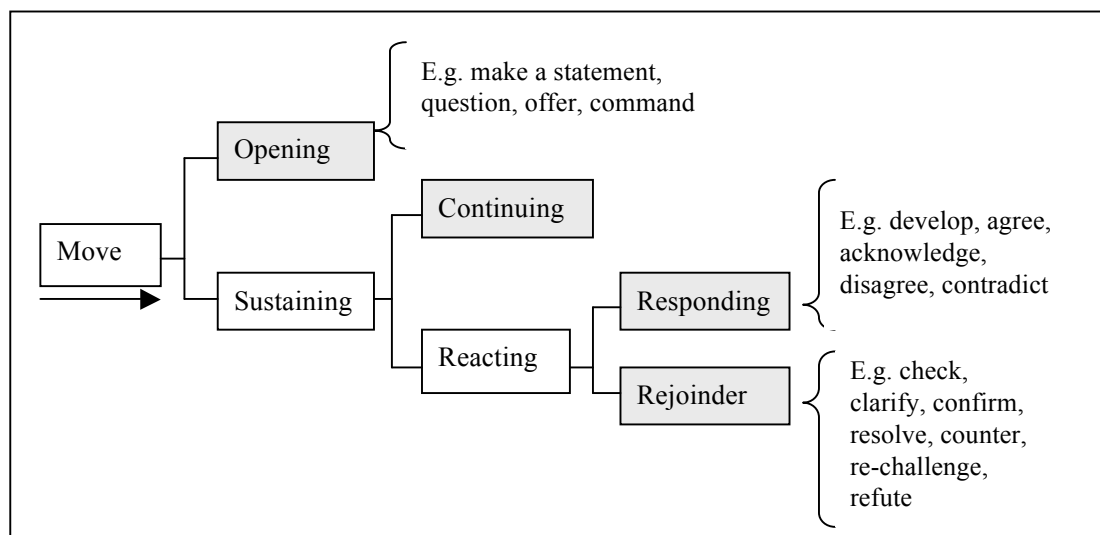


Figure 1: Speech functions in classroom discourse (Eggins & Slade, 1997)

Opening moves function to initiate talk through the introduction of a new proposition by making a statement or questioning. On the other hand, the sustaining moves function to

continue negotiation of the same proposition. The sustaining moves can be classified into two sub-groups. On the one hand, a continuing move is achieved by the speaker who has been holding the floor. On the other hand, a reacting move is achieved by another speaker taking a turn. In other words, this speech functional option is available when turn transfer occurs. The reacting move can be further classified into two patterns. First, responding occurs when a speaker intends to complete the negotiation of a proposition, such as develop, agree, acknowledge, disagree and contradict. Second, rejoinder occurs when the move exchange under the same proposition is prolonged to the next move, such as confirm, clarify, and re-challenge.

Overview of discussions in Groups 1 & 2 – Opening moves

Step 3 where students are required to identify the gaps between what they know and what they do not know is a key stage for the PBL tutorials in that the points of question revealed in this step will be subsequently developed for formulating their learning objectives. That is, it is important for students to spend plenty of time discussing in this step. In Table 3 which clearly indicates what kinds of topics students in Groups 1 and 2 discussed, the students in Group 1 took 25 minutes to complete the discussions in Step 3, whereas students in Group2 took 65 minutes. Furthermore, Group 2's discussion has the higher density of propositions in each main theme slot than Group 1. In other words, the PBL learning in Group 2 can be considered as having been achieved through 'higher quality of discussion'.

Table 3: Overview of the flow of discussion in Groups 1&2

	Group 1	Group 2
Main theme	Propositions	Propositions
Dietary Supplements	Effectiveness(Turns166-181) Proper ways of intake (Turns194-201) Differences between meals & supplements (Turns222-234), Absorptivity (Turns296-300) Difference between medicine & supplements (Turns301-311), Types/Forms (Turns312-356)	Difference between meals & supplements (Turns33-46), Mastication and health (Turns47-52), Effectiveness (Turns145-147), The origin (Turns 148-151), Types/Forms (Turns152-157, 162-171), Differences between Chinese medicine & supplements (Turns158-161, 172-176), Difference between medicine & supplements (Turns177-182), Absorptivity (Turns183-196), Raw materials (Turns197-202), Excessive intake of nutrition (Turns203-210), Proper ways of intake (Turns504-515), Necessities (Turns549-553)
Osteoporosis	Causes (Turns202-214)	Symptoms (Turns 58-60), Points in common with beriberi (Turns 61-71), Causes (Turns 72-74), A high incidence rate in old aged female (Turns 75-76), Prevention(Turns 80-83), An incidence rate in female & pregnancy (Turns 90-99)
Low-calorie foods	Definition/standard (Turns62-64, 79-82), Differences in calories contained among foods (Turns65-73), Relationship between calorie & sugar (Turns74-78), Artificial sweetening (Turns82-86), Regulation of labeling (Turns87-104)	Regulation of labeling (Turns109-113), Necessity (Turns114-123), Definition/standard (Turns124-128, 141-144), Artificial sweetening (Turns129-134), Taste (Turns135-140)
Nutritional balance		Nutritionally balanced meals (Turns211-222) Nutritional balance in a student dining hall (Turns223-230), Ideal & minimal necessary daily intake of nutrition (Turns231-239), Ways of calorie counting (Turns240-245)
A late-night snack or supper	Definition (Turns249-264)	Relationship between supper & obesity (Turns274-281) Gender difference in obesity (Turns282-288), A process of obesity(Turns289-296), Physical constitution & fatness (Turns297-302), Healthy supper (Turns 303-308), Healthy eating habits (Turns309-314), Necessities (Turns315-331)
Breakfast	Importance (Turns265-274)	Importance (Turns332-342)
Calcium	Necessary intake of calcium (Turns215-221) Osteoporosis and calcium (Turns275-289) Functions in the body system	Calcium deficiency & elderly people (Turns343-355), Nutritional balance and strength of bone (Turns356-368), Bone density (Turns369-376), Calcium & formation of bone (Turns377-389),

Calcium	Necessary intake of calcium (Turns215-221) Osteoporosis and calcium (Turns275-289) Functions in the body system (Turns379-385)	Calcium deficiency & elderly people (Turns343-355), Nutritional balance and strength of bone (Turns356-368), Bone density (Turns369-376), Calcium & formation of bone (Turns377-389), Diseases caused by calcium deficiency (Turns390-393), Osteoporosis & calcium (Turns394-395), Efficient ways of intake (Turns396-403)
Obesity & slimming	Appearance (Turns370-378)	Subcutaneous fat & visceral fat (Turns404-411), Gender difference in concept of slimming (Turns412-418), Appearance (Turns419-425), Standards (Turns426-431), Body fat ratio (Turns432-437), Changes in weight in a day(Turns438-451)
Meals & time slot		Time slots to easily get fat (Turns492-503), Time of meals and digestion (Turns516-537), Balance between supplements and meals (Turns538-548)
Soybean flour & brown sugar	Raw materials (Turns 357-360) Healthy or not (Turns361-369)	Healthy or not (Turns457-461)
Konjac jelly	Calorie of konjac (Turns125-129), Feeling of plenitude (Turns130-133), Raw materials(Turns134-143), Glucomannan (Turns152-165)	
Cup noodles	Health(Turns235-248), Salinity(Turns386-393), New product (Turns394-409)	
Total	28 propositions = opening moves	52 propositions = opening moves

The differences in the ‘quality’ of learning between these groups probably relate to students’ usage of the opening move which functions as an introduction of new proposition. By actively making the opening moves, more different viewpoints on a topic are provided in discussions. That is, the number of propositions introduced through the opening moves may correspond to the number of perspectives from which students discussed each main theme in PBL.

Table 3 shows that only 28 opening moves in 10 main themes were made by the students in Group 1, whereas the students’ in Group 1 took 52 opening moves in 10 main themes. The statistical data indicates that students in Group 2 possibly had more various viewpoints on each theme. For example, according to Table 3 above, in the discussion of osteoporosis in Group 1, the students have discussed only symptoms and causes of this disease. In Turn 203, with regard to osteoporosis, Masa started a discussion by introducing his factual knowledge that human bones become brittle. Subsequently, other members in Group 2 did no more than

conclude that they need to study why bones become brittle in the medical condition of osteoporosis.

On the other hand, for instance, Table 3 shows that in Group 2, by making more opening moves, six propositions were introduced in the discussion of osteoporosis. Excerpt1 below indicates their opening moves in this topic.

Excerpt 1

- Turn 58 Mie Do you think that the intake of calcium might be effective for osteoporosis? Like, *relationship between calcium and osteoporosis* (Open: Question)
カルシウム摂取が骨粗しょう症に効くのか。カルシウムと骨粗しょう症の関係みたいな
- Turn 61 Hajime If you are suffering from osteoporosis, your bones will become brittle because of the deficiency of calcium. I remember *beriberi is also caused by the deficiency of something* (Open: Statement)
骨粗しょう症ってカルシウム不足で骨が弱くなる。脚気も何かの不足でなるんだよね。それとは違うのか。
- Turn 72 Aki *Why do people get the osteoporosis?* (Open: Question)
なんで骨粗しょう症になるんだろう？
- Turn 75 Aki Often, it is often said that *more female patients are suffering from it, such as old women* (Open: Statement)
よくさ、女性に多たってよく聞くよね。おばあちゃんとか。
- Turn 80 Mie If *calcium* works well against the osteoporosis, it can be *one of the ways of dealing with it* (Open: Statement)
カルシウムが効くんだったら、対処法でカルシウムが効くのかっていうのを
- Turn 90 Kaori I heard that a reason why there are more *female patients (of osteoporosis)* might be related to the fact that when they are *pregnant*, calcium is sometimes supplied for an unborn baby from their own bones (Open: Statement)
女性に多たって妊娠するときとかに子どもに栄養がいくから自分の骨のカルシウムをとられるって

In Turn 61, Hajime drew a connection between osteoporosis and beriberi in that they are caused by the deficiency of a certain nutritional element. Furthermore, in Turns 90, Kaori introduced a new proposition that a higher incident rate of osteoporosis in female might be attributed to the pregnancy. In other words, these instances clearly indicate that students in Group 2 have analysed a subject of osteoporosis from more various angles than Group 1, such as relationship between calcium and osteoporosis, the diseases caused by the deficiency of nutritional elements, causes, female patients, ways of dealing with it, and relation between osteoporosis and pregnancy.

Depth of discussion - Developing in responding move

In relation to the importance of sharing different viewpoints, it is also significant to urge students' to more deeply discuss a subject so as to produce the successful learning outcomes in PBL. In this regard, students' effective use of the developing move, which is subclassed into responding move, is related to obtaining a better understanding of the theme in PBL, because this move basically functions as a response that expands on a previous speaker's contribution by adding further details, a conditional qualification, or giving examples (Eggin & Slade, 1997).

In Group 1, 41 developing moves in total were taken during Step 3, whereas in Group 2, 109 developing moves were made. In conjunction with their use of the developing moves, Excerpts 1 and 2 below respectively show the discussions of the students in Groups 1 and 2 about the relationship between meals and supplements. Excerpt 2 shows that the students in Group 1 only focused on discussing whether supplements can be substituted for meals in daily life which was started by Hide's opening move in Turn 222. In Turn 231, Hide made a developing move to share his idea that people can survive only by having the supplements, because energy supplement foods serve to get sufficient calorie. After all, this discussion was closed by Miyuki's acknowledgement in Turn 232. This discussion in which only one aspect of the relationship between meals and supplements has been observed may result from the fact that other members have tended to not build collective knowledge by sharing additional information but indicate their agreement or acknowledgement to Hide's remarks.

Excerpt 2

222	Hide	Why do we need to have meals every day? なんでご飯食べなきゃいけないんだろう？	Open: question
223	Masa	Eh? え？	Rejoinder: check
224	Nao	Yeah, haha. うん。ははは。	Respond: agree
225	Hide	Yeah, because we have food supplements. うん、だからその、サプリがあるから For example, if we can take all nutrition including calorie, why these students in the scenario discuss this matter? 例えばカロリーも必要な栄養分も全部サプリで取れるんだったら、なんでこいつら((このことについて話してるんだろう？))	Continue: append Continue: append
226	Miyuki	I see. うん	Respond: acknowledge
227	Nao	Because these supplements cannot cover the functions of getting sufficient calories, I think. サプリだけじゃ、カロリー摂れないからでしょ。	Respond: answer
228	Masa	Yeah, sufficient daily calories cannot be taken from them.	Respond: agree

229	Hide	うん。カロリーは摂れない。 We may find this type of supplement for calorie. Oh, how about “Calorie-Mate*”? そういうのあるかもしれないじゃん。あ、カロリーメイトでいいじゃん。	Rejoinder: re-challenge
230	Maiko	Yes, “Calorie-Mate” contains high calories. あ、カロリーメイト、カロリー高いね、あれ	Respond: acknowledge
231	Hide	That’ why we can eat “Calorie-Mate”, and take the necessary nutrition from the supplements. If we do so, we don’t need to have meals. だから、それを食って、栄養素はサプリでとか。そしたらご飯を食べる必要はない	Respond: develop
232	Miyuki	If like this, I prefer having meals, haha. そしたらご飯食べればいいのに、ははは	Respond: acknowledge

*Product name of Japanese energy supplement foods

On the other hand, Excerpt 3 indicates that the students in Group 2 were more thoroughly discussing this topic by effectively making developing moves. For example, with regard to the relationship between meals and supplements, in Turn 34 Kaori stressed the importance of understanding the difference between these foods. Furthermore, in Turn 35 Mie pointed out that absorptivity of supplements might be less efficient than having meals. Subsequently, in Turns 36 and 39, Kaori and Mie assumed that artefacts and chemical substances which are contained in supplements might negatively affect the health. In Turn 42, Aki gave another perspective that the regular intake of supplements may negatively influence the body system. Finally, the students developed the discussion on the reasons why supplements should be supporting role of meals.

Excerpt 3

33	Natsu	I wonder it is possible for us to substitute intake of food supplements for usual meals in terms of nutritional balance? I don’t think it is good idea. サプリを食べてて、普段ご飯を食べないってことはいいいのか、まあよくないんだけど	Open: statement
		but, from a perspective of nutritional balance, and without the consideration of getting sufficient calorie, I think we can survive only by taking the supplements. Umm, but, it seems, not enough calorie なんかバランスだけ考えてカロリーを気にせず、バランスばっかを考えて食べれば、サプリメントだけでもOK だと思うけど、なんかその、カロリーが少なすぎて	Continue: extend
34	Kaori	The meals and supplements contain the same nutritional elements, don’t they? We need to know what the differences between them are 摂る栄養素は同じなんでしょ、ご飯食べるのとサプリって。何が違うのかわからないね	Respond : develop
35	Mie	The nutrient in a supplement is a natural object, isn’t it? I wonder if it is easily absorbed into the body system なんか自然物なのかな。その栄養素みたいな。体に吸	Respond : develop

36	Kaori	取されやすいのかな All supplements may be artifacts . サプリは全部人工的ってことかも	Respond : develop
37	Mitsu	(As a substitution for meals) we can take various types of supplements, can't we? その分さ、サプリをいっぱいとればいいっていう話じゃだめなの？	Rejoinder : clarify
38	Natsu	Yes, うん。 So, we can take all nutrients from food supplements. だから栄養素は全部サプリでとって	Respond: affirm Continue: enhance
39	Mie	In the process of making such supplements, some chemical substances may be used. So, I assume if you take it too much, it is not healthy. そういうサプリを作るときって化学物質もちょっとはいつてるから、とりすぎると良くない	Respond : develop
40	Kaori	You mean, like, a side-effect ? 副作用ってこと？	Rejoinder : clarify
41	Mie	Not exactly “a side-effect”, but I think it's unhealthy. 副作用まではいかないけど、まあよくない	Rejoinder : resolve
42	Aki	If you get into a habit of excessively taking the supplement, it becomes hard to absorb nutrition from proper foods. (6”) That's the point. でもなんかサプリを食べ過ぎると自分で食べたものから栄養を吸収しにくくなる。(6”) そこだよ	Respond : develop
43	Mie	It is said that dietary supplements should be used as a supporting role of meals . あくまでサプリは補助的なものっていうよね	Respond : develop
44	Aki	Why do we need to regard them as supplementary functions of meal? なんで補助的っていわれなきゃいけないのっていう話だよ	Rejoinder : clarify
45	Kaori	In fact, do you think that nutrition usually ingested from breakfast and meals can be taken only from the supplement? ほんとにサプリで朝食、食事全般がとれないのかな	Rejoinder : clarify
46	Natsu	Umm, I don't think so. うーん、とれないよね	Respond: contradict

Therefore, the active sharing of additional information, knowledge, or new perspective is pivotal to the in-depth discussion in PBL.

Distribution of opening and developing moves made by students in Groups 1 & 2

The difference in the ‘quality’ of discussion between these groups is partially associated with distribution of members who made the opening and developing moves in a group. Figure 2 shows that the discussions in Group 1 have been led by a part of students.

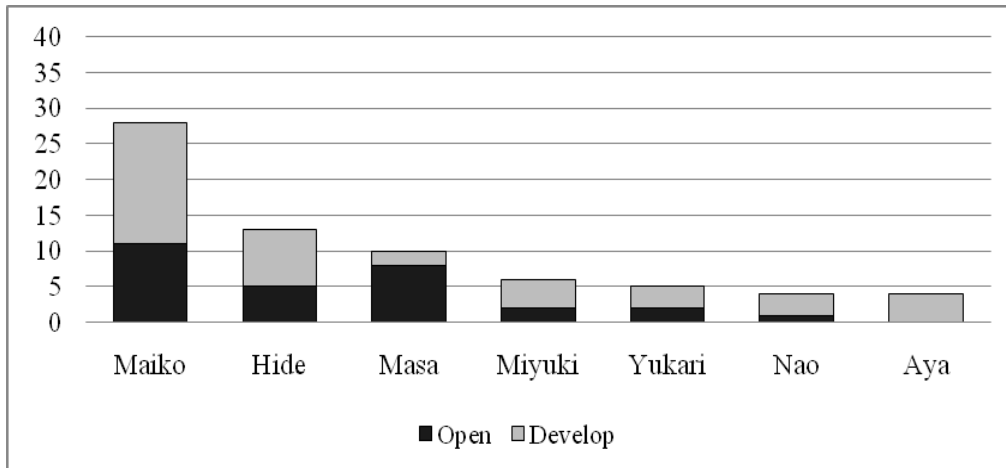


Figure 2: The number of opening and developing moves in Group 1 during Step 3

The number of opening moves which were taken by Maiko, Masa and Hide in Step 3 accounts for 82.7% of all these moves in Group 1. Because the active participation of only a few members causes the limited focus of collective observation, it will be probably difficult for students to analyse the problems from broad perspectives in the subsequent steps of PBL. Likewise, in addition to the small number of the developing moves as whole in Group 1, these moves were mainly made by the limited members, namely, Maiko and Hide.

On the other hand, as Figure 3 indicates, although Mitsu, Mami and Yoshi can be regarded as the quiet members in Group 2, there are comparatively more active members who made both opening and developing moves.

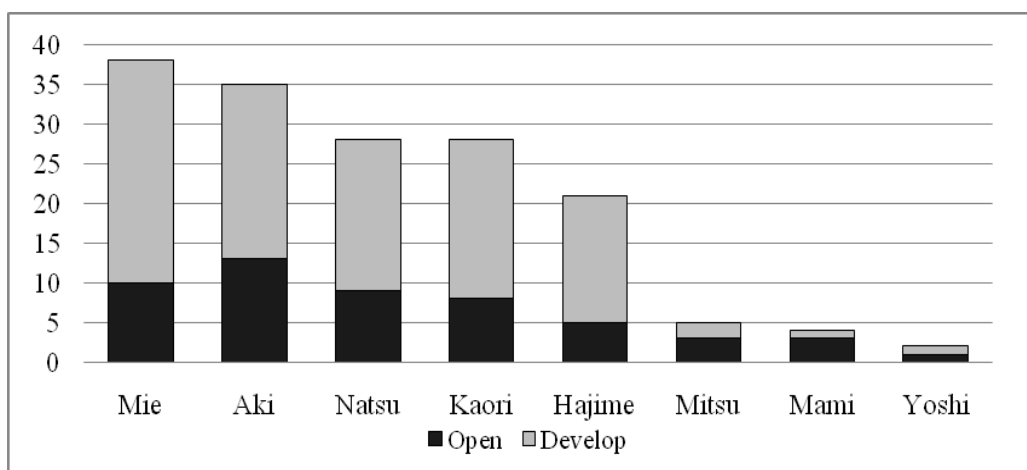


Figure 3: The number of opening and developing moves in Group 2 during Step 3

Therefore, the fact that all members' viewpoints can be shared is strongly associated with the effective collaborative learning in which one subject is discussed from different points of view.

Conclusion

This discourse analytical accounts of one segment of PBL stages in a context of Japanese higher education provided how meanings were co-constructed and negotiated among Japanese students from a speech functional perspective. In this comparative study of students' participation between two PBL groups, the opening and developing moves are essential speech functions to the students' adequate discussions. Moreover, the subjects can be thoroughly discussed from a variety of perspectives when all members are evenly involved in this collaborative learning. For educators, the findings suggest that how students can be encouraged to make these moves is one of the pivotal challenges to effectively facilitating students' learning in PBL.

Furthermore, even though the students in Group 1 made less opening and developing moves, it does not necessarily mean that the PBL approach is unsuitable for their learning. Because this study conducted at the early stage of their higher education, as they experience PBL over time, they might successfully deal with several factors negatively affecting their participation in PBL, such as their prior learning experience, cultural interpersonal communication styles, perceptions of learning environments in PBL, and power relations amongst members (Prosser, 2004; Remedios, 2005; Imafuku, 2007; Forthcoming). In this regard, in order to encourage all students to be involved in the PBL, the reasons why the different discourse patterns emerged in these PBL tutorials in this study can be worth exploring further.

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Appendix: Scenario

Late night snack

(After dinner, students enjoy having a late-night snack in a student-hall)

Chie: This *shingen-mochi is yummy, isn't it? Moreover, its soybean flour and brown sugar are good for health and beauty.

Ai: I don't want to get fat, so I'm gonna have a low-calorie grape-flavored jelly. Ha-ha.

Hitomi: You are so slim! What are you concerned about?

Jun: (Jun is coming with dietary supplements). Hey all. Do you know this? It is said that this supplement is so healthy.

Hitomi: Jun, I know dietary supplements are good for health. However, if you don't take nutritionally balanced meals, your bones will grow brittle in the future.

Jun: What do you mean by nutritionally balanced meals? This supplement contains rich calcium. It's said that it can be effective against an illness.

Ai: Does it also work against osteoporosis? I wanna give it to my grandma.

Chie: Anyway, how about trying this cup noodles? That's new product.

Hitomi: Wow, but, every night we have supper. Is it OK?

Chie: Don't worry. It's ok if we don't take breakfast tomorrow.

*Japanese confectionery- rice cake powdered with sweetened soybean flour and dark molasses

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