Trajectory of Full Participation in Research Projects at a Graduate School*

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This study used the community of practice theory to investigate how graduate students join and participate in collaborative research projects with other universities and organizations such as local elementary schools and private companies. Qualitative research methodology, namely, the semi-structured interview, was adopted for data collection. Data analysis using the grounded theory approach showed the following: (1) the students acquired the ability to conduct research collaboratively with other organizations and (2) they participated enthusiastically in the research, because their intrinsic motivation increased. The three factors that contributed to this increased motivation and participation are as follows: (a) their learning with peer interactions and interactions with others involved in research, (b) their commitment toward research activities, and (c) the learning culture of the collaborative groups. In other words, the students learned the technical and practical knowledge and skills of working collaboratively with other organizations in authentic situations. Moreover, the learning satisfaction and sense of achievement that accompanied participation increased their motivation and the value that they attached to participating enthusiastically in such research projects. Thus, the actions of individual students strengthen and re-construct the learning culture of the collaborative groups, and this culture serves as a stable learning environment for graduate students.

Key words: higher education, community of practice, qualitative research, learning environment, case study

1. BACKGROUND OF RESEARCH

The Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, promotes the reform of graduate schools. Various programs have been conducted to improve the quality of education offered at these schools, for example, the “Educational Reform Program for Professional Graduate Schools” and “Program for Enhancing Systematic Education in Graduate Schools” (MEXT 2008).

Traditionally, the teaching and learning style practiced at graduate schools in Japan was apprenticeship with a close relationship between teacher and student (Oosaki 2000). However, owing to the following two reasons, graduate schools have had to change their teaching and learning styles in recent years. First, the graduate schools decided to accept non-traditional students as well, such as office workers and international students, in an attempt to increase student enrollment. Therefore, students with different needs and backgrounds began enrolling in graduate schools (Ebara 2007). Second, in a survey conducted by the Committee of Public Relations in Tokyo University (2007), it was found that students enroll in graduate schools to “acquire professional knowledge and skills” (75.2%), “conduct research and become researchers in universities” (41.7%), “learn the skills necessary to contribute to society” (29.5%), and “get a diploma” (25.8%). Therefore, not all students enroll in graduate schools just to conduct research and become researchers.

Considering the various aims and backgrounds of students nowadays, it is difficult to follow the traditional style of teaching (Soyoda 2001). To satisfy student needs, graduate schools are forced to adopt new teaching styles.

New approaches in education are now being explored at graduate schools. Instructors have recently started employing authentic activities like problem-solving and project-based learning. However, it is reported that students do not learn

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as the instructors have expected although the instructors intentionally embedded learning contents into the problems (Schon 1987, Ueno 2006, Winn 1989). This is because the authentic problems to be solved are complex and rather ill structured. When facilitating student learning in an authentic situation, it is important to allow the students to practice working in an actual workplace so that they learn the ability to cope with complex and ill-structured problems through effective collaboration with workmates. It is for these reasons that learning through practice in an actual workplace and collaborative learning are gaining popularity in graduate schools.

1.1. Collaborative learning through practice in higher education

It is reported that learning in an actual workplace allows students to acquire professional skills through the support of specialists in the field (Schon 1987, Harris 1993, Winn 1989). In on-the-job training (OJT), one of the learning styles, learners gain experience and acquire the competencies needed in their field by means of an apprenticeship in the workplace (Nakahara and Araki 2006). This learning has been studied in the fields of “community learning,” “workplace learning,” and “professional education.” Researchers point out that experience at actual workplaces enables students to acquire professional skills in authentic situations (WEBSTER-WRIGHT 2009). This practice is mainly adopted in the medical (Dowie and Elistein 1988), social work (Siegel 1984), and engineering (Koen 1984) fields in the form of case studies.

Graduate schools, however, need to implement a system that allows students to work in an actual workplace, like OJT, as part of their educational program. Companies consider OJT an investment, as employees develop the skills that the company requires them to have (Nakahara and Araki 2006). However, conducting OJT for graduate students is not very beneficial for companies; it involves much time and money, and most often, the students discontinue working for the company post-training. Graduate schools need to think of a strategy how to allow students to involve in practice at actual working place.

Although it is difficult to include OJT in graduate school programs, it is possible to design learning activities on the lines of OJT. OJT enables learners to interact with different kinds of people. The advantage of graduate school is to have different kinds of people including member of society. Learning through interactions with different kinds of people also forms an important part of education (WEBSTER-WRIGHT 2009, Johnson et al. 1998, Kishi et al. 2008). Learning collaboratively allows students to gain knowledge as well as construct meaning (Sato 2007). Moreover, learning collaboratively is reported to have both cognitive and emotional outcomes. Learners accumulate knowledge and experience as a group and share accountability to reduce the workload (Hatano and Inagaki 1991). Their intrinsic motivation increases and they also develop a strong sense of identity (Ueda and Okada 2006). In higher education, however, it is difficult to construct a community for learning collaboratively and therefore, students find it difficult to develop a sense of identity as community members. This is because there are no group classes like in primary and secondary school. Therefore, the challenge lies in clarifying how higher education students construct relationships for collaborative learning (Sugihara 2006).

1.2. Community of practice in graduate school

This research focuses on the community of Practice (CoP) theory. J. Lave and E. Wenger (1991) developed this theory on the basis of case studies of traditional forms of apprenticeship at workplaces (Wenger 1999). A CoP is defined as a group of people who share an interest, a craft, and/or a profession. The group can evolve naturally because of members’ common interest in a particular domain or area or common goal to gain knowledge related to their field. It is through the process of sharing information and experiences with the group that members learn from one another and have the opportunity to develop both personally and professionally (Lave and Wenger 1991). Wenger et al. (2002) emphasize the importance of cultivating a CoP as a learning organization within companies and suggest how it can be cultivated as part of knowledge management (Nakahara and Araki 2006). It has been pointed out that a CoP is important in higher education as well (Sawyer 2006, Yanagimachi 2006, Shigeta 2008).

This research uses CoP as a theoretical framework on the basis of which to analyze the learning process of graduate school students practicing in authentic situations. Lave and Wenger (1991) consider learning as embedded in situations and describe it as the process of becoming full participants in the CoP. Their idea stems from dissent against the traditional concept.
of learning, which involves knowledge being transmitted by teachers and assimilated by learners. Lave and Wenger (1991) suggest that learning takes place through increased participation.

The findings of this research will help improve education at graduate schools (Ito et al. 2006). By using CoP as a theoretical framework, it is possible to describe the process in which graduate students develop the necessary professional skills from the socio-historical perspective.

Here, three case studies are reviewed in order to explain the importance of analyzing the learning process of students from the socio-historical perspective. The case studied by Sawyer (2006) clarifies how overseas students’ gain access to the equipment needed for experiments in departments of science and engineering. It is reported that overseas students need to be part of an informal network of Japanese students, who play a gatekeeping role in the community. Overseas students rely on the Japanese students and therefore, lack easy access to equipment. The study by Yanagimachi (2006) reports that overseas students learn the code of conduct for laboratories in departments of science and engineering through collaborative work with other students; verbal and nonverbal communication; and other resources, equipment for experiments, etc. These two case studies describe how overseas students come to participate in the community. Another case study reported by Shigeta (2008) emphasizes the importance of developing a sense of identity in the community. The student identified as a full participant in the department behaves and learns as a PhD student would. Her study indicates that learning should be studied concerning one’s identity.

Thus, studying student learning from the socio-historical perspective enables us to understand how students interact with people and objects and how their identity evolves in the process. These case studies, however, only focus on learning within a department. Therefore, it is essential to study learning through practical work in authentic situations, which few studies have reported on.

1.3. Learning based on practical work in authentic situations

Graduate schools have recently started employing learning activities based on practical work in authentic situations. Firstly, as mentioned above, not all students join graduate schools in order to become researchers. Some students aim to acquire the professional skills needed for the development of society and their careers. It is therefore necessary to provide all students with the opportunity to practice in an actual workplace, in keeping with their aims. Secondly, learning based on practical work helps students understand the relationship between theory and practice. It has been reported that theory cannot be applied in the real field of education (Yoshizaki 1997, Ootani 2007 and Kubota et al. 2008). Therefore, research methodologies such as action research (Akita et al. 2005) and the design experiment approach (Ooshima 2004 and Brown 1992) are now gaining popularity. These methodologies help students develop the skills required to study and work in authentic situations.

One case study reports on an education program’s students majoring in instructional design and working for a company to gain practical experience (Quinn 1994). These graduate students had the opportunity to work as instructional developers on design teams in a corporate environment. Quinn points out the importance of the role played by the course instructor. The students would discuss their progress on projects with the instructor at a weekly class meeting, and all project material was subject to a final review by the instructor. The instructor was also available to the students outside of class, to answer questions, address problems, etc. The client-centric company allowed the students to design their training course material because the instructor would check and approve all material. Although conducting such programs from the perspective of sustainability is a great expense, the practical experience that these graduate students gain helps them acquire the skills needed for the development of society, and, as WEBSTER-WRIGHT (2009) points out, it is essential for their professional development. The challenge is to develop and sustain these programs in graduate schools.

2. RESEARCH OBJECTIVE

The objective of this study was to investigate how graduate students participate in research projects that involve collaboration with other universities and organizations such as elementary schools and private companies. Quinn (1994) reported on graduate students working in collaboration with a company. He discussed the importance of students maintaining long-term relationships with companies, because his research
focused on a program in which students worked as instructional designers for one semester. Therefore, in our study, we focused on the long-term commitments of students participating in collaborative research projects. We chose to study the Y department of X graduate school, because X graduate school has been conducting long-term collaborative research projects for years. We liken these research projects to a CoP.

A graduate school itself is, of course, not a CoP, as Sawyer (2008) mentioned. A CoP should be organized by accessing resources in a social structure through the practice of sharing and reconstructing them contextually. The CoP in the Y department is a research project with a research objective; the students participating in the project share common goals and interests and work in collaboration with other organizations. By participating in the project, the students acquire the knowledge and skills necessary to conduct research as well as to manage research projects with other organizations. In other words, they learn the expected code of conduct. For instance, they learn to take care of newcomers and junior students, share information with project members, adjust the different objectives among organizations, plan and practice activities, and evaluate and improve their own activities in order to ensure the success of the research project. Therefore, the full participants learn and practice all that they should in a graduate school. In this study, to understand the process of becoming a full participant, we attempted to determine how students acquire the knowledge and skills needed in the Y department of X graduate school. We clarify the factors that promote full participation in order to suggest how to design a CoP for professional development in graduate schools.

3. OUTLINE OF THE RESEARCH PROJECT

3.1. The Y department at X graduate school

X graduate school offers post-graduate courses for masters and PhD students. The students study the application of Information and Communication Technologies (ICT) to the field of education. Table 1 presents the number of students enrolled in the Y department. Every year, five to eight students join research projects. Students who have graduated from the same university as well as other students enroll in the department. Elementary and secondary school teachers also enroll as part-time students because they are interested in learning the application of technology

to new education, for example, integrated study and "information" subject.

Three instructors work on these collaborative projects.

The instruction style in the Y department is unique as compared to that in the departments at national universities. Students can choose their instructors according to their research themes.

The learning style in the Y department is also unique. The students acquire the knowledge and skills necessary for conducting research not only as per the curriculum of X graduate school but also by participating in a research project (details in 3.2.). The research project serves to provide a field of research for the students to practice what they learn as part of the curriculum. The curriculum covers a wide range of subjects such as education, sociology, and economics. The students select their subjects according to the theme of their research. They learn the basic knowledge and skills for research, for example, educational theory and research methodologies (qualitative research and statistical science). In short, the curriculum and research project are interrelated.

A seminar is held every Tuesday, and students take it in turn to report the findings from their field research. The students discuss whether their research objective, research methodology, and data collection are appropriate for the success of the research project.

3.2. Research project

Students in the Y department learn how to conduct research and write theses by participating in a research project. The students participating in a research project have a common objective and interest. Projects are established according to the students' interests and the problems that they wish to solve. Although these projects are not part of the official curriculum of X graduate
school, over 90% of the students participated in them to explore different research themes and research fields. After participating in the project, each student writes a thesis on the basis of the fieldwork conducted.

Each research project has members from various institutions such as schools, private companies, international organizations, and other universities. They get together to achieve their respective objectives. For instance, students participate in projects to conduct action research that involves working with schoolteacher participants to help them improve their lessons. Through such activities, the students also make a social contribution. Every project has its own objective of activity. For instance, the “international collaborative learning project” involves research on collaborative learning using ICT, which includes problem based learning projects in Japanese and Korean primary schools, email exchange programs with overseas volunteers, and collaborative art production with Palestinian refugees. Thus, in addition to research, projects involve social contribution activities such as conducting workshops and publishing newsletters for local communities.

4. RESEARCH METHODOLOGY

The semi-structured interview was conducted with six students from September 2007 to March 2008. Each interview took 90 to 120 minutes. The interview outline was prepared to some extent in order to obtain general information on the students’ learning when participating in the project. The interviewer then developed interview questions on the basis of the dialogues with the interviewees.

It is said that a good relationship between interviewer and interviewee is necessary to elicit honest opinions. The author already had a good enough relationship with the interviewees because the author was also a student at the Y department. However, when interviewees are working on the same project as their interviewer, a power relationship could emerge (Wertsch 1993). Therefore, in such cases, the author requested other researchers to conduct the interview. The interview data was recorded using an IC recorder and transcribed.

The data was analyzed using the grounded theory approach (GTA) (Strauss and Corbin 2007 and Saiki 2006). The GTA is one of the appropriate qualitative research methodologies for analyzing the interaction and the process in which happening in a social phenomenon (Kinoshita 2003a and Kinoshita 2003b). There is no single method of analysis when using the GTA, because the analysis steps change according to the research field and case study. However, three basic steps are common to all analyses using the GTA: open coding, axial coding, and selective coding. This research employed the analysis steps suggested by Strauss and Corbin (2007), as shown below.

**Step 1:** Open coding: The open coding process involves identifying and naming the phenomena found in the text. We used a software called “MAXqda” (Sato 2008a) because it is useful when referring to original data. We added property and dimension in each code at the same time.

**Step 2:** Categorizing: The codes generated by open coding are categorized according to their similarities.

**Step 3:** Axial coding: Axial coding is the process of relating codes (categories and properties) to one another. To simplify this process, causal relationships are determined and the basic framework of generic relationships described.

**Step 4:** Selective coding: Selective coding is the process of choosing one category as the core category and relating all other categories in order to generate theory.

**Step 5:** Interpretation: The generated generic relationship is described.

First, the data of four students was analyzed and simplified on the basis of the causal relationships among the codes. Next, the other two cases were analyzed and continuously compared with the previous four (Sato 2008b). If new causal relationships were generated, the categories were modified and reproduced. This process was repeated until no more new codes were generated. Before confirming the basic framework of generic relationships, the original low data was repeatedly referred to in order to ensure no gaps between the causal relationships and original data.

The basic framework of generic relationships was explained from three perspectives: personal, interpersonal, and community, as suggested by Rogoff (1995). Rogoff emphasized the need to consider all three perspectives when analyzing the process of development.
4.1. **Target groups**

The target groups of this research are students who joined X graduate school from another seminar or university, as shown in Table 2. They have been selected because it is possible to trace their process of going from peripheral to full participants in the project. Analyzing this process helps us determine the factors that played a role in their becoming full participants. The students who were members of the seminar for instructors of the Y department had participated in the project since they were in the 3rd or 4th year of university, and some of them were already full participants. These would not be able to reflect on their experience 3–4 years ago. Therefore, only those who joined the graduate school from another seminar or university were selected, because they could reflect more clearly on their experience than those who became full participants 3–4 years ago.

In this research, the terms "full participant" and "peripheral participant" are often used. They are defined below.

A **peripheral participant** is a student who is a legitimate member of the project and has access to all resources and networks available to the project. He/she learns the expected code of conduct through observation and collaborative work.

A **full participant** is a student who takes initiative in the project. He/she actively contributes to the improvement of the project, not only by conducting research, but also by helping newcomers or junior students find their way. They generally take the lead and manage the project. Not all full participants take on leadership roles, but the project members and instructors consider them as leaders. Therefore, most importantly, they start to behave as project leaders would.

<table>
<thead>
<tr>
<th>Name</th>
<th>Student background</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taguchi</td>
<td>Joined the graduate school from another seminar or university</td>
<td>1st year of Masters</td>
</tr>
<tr>
<td>Kondo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hashimoto</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suzuki</td>
<td></td>
<td>Graduated (2008)</td>
</tr>
<tr>
<td>Sugawara</td>
<td></td>
<td>Graduated (2007)</td>
</tr>
<tr>
<td>Fuji</td>
<td>university</td>
<td>PhD course</td>
</tr>
</tbody>
</table>

5. **FINDINGS**

In our analysis, 54 categories were generated from 1039 codes. These 54 were grouped into 10 core categories and the causal relationships among them examined. Finally, the basic framework of generic relationships was generated, and the findings are explained below.

5.1. **The process of becoming a full participant in the project**

In the Y department, most under graduate and graduate students (MA and PhD) get together in a camp at the beginning of every academic year.

Usually, people from other universities and organizations participate in the camp to find students who would like to work with them.

Students who are new to the Y department may not know what they want to learn, how to learn, and what is considered appropriate behavior in the department. They need to learn the unique culture of the Y department; in other words, students conduct research by participating in a project, their research themes are based on the activity of the project, and projects are run and collaboratively managed by under graduate and graduate students. Therefore, students immediately begin looking for a project that is in line with their interests. Although they can obtain information on the projects through the camp, as mentioned earlier, the new students may not already know what they would like to research. In addition, even with this information, they are not able to describe how exactly the project functions. Therefore, the motivation to access projects differs among new students and those already studying at X graduate school.

Sugawara and Fuji, who came to X graduate school from other universities, were passive participants in the project. In their interviews, they made statements like “I participated in the project because it is a tradition in the Y department,” “My instructor advised me to join any project,” and “My seniors recommended that I join the project.”

Thus, most new students in the Y department participate in projects because their instructors or seniors advise them to. Even though they have information on their projects, they lack a clear understanding of the actual work done.

First, new students usually participate in an “open project,” one that is open to any student (Table 3). Most open projects have graduate and undergraduate students. Open projects are
Table 3. Types of the projects

<table>
<thead>
<tr>
<th>Project details</th>
<th>Open projects</th>
<th>Closed projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples</td>
<td>Multi resource projects and email exchange programs with overseas volunteers</td>
<td>The international educational project with UNRWA in Syria and the collaborative learning project using ICT</td>
</tr>
<tr>
<td>Characteristics</td>
<td>Both graduate and undergraduate students participate in open projects. They are continuously run, so their rules and ways of management are established and stable.</td>
<td>Students cannot freely join closed projects. Project members usually invite students who already possess the knowledge and skills necessary for the project.</td>
</tr>
</tbody>
</table>

continuously run and so their rules and ways of management are established and stable. For instance, the tasks performed by the 4th year students are always handed over to the 3rd year students once they graduate. Further, annual activities are always planned and repeatedly held so that the necessary information is accumulated in the project. Information from the previous years is stored in the form of reports and portfolios, and students are able to refer to it whenever necessary. Moreover, since they collaborate with the same organizations, they know one another well and communication and negotiations take place smoothly. In other words, all the necessary resources are readily available and are shared among project members.

The students learn the manner of conducting research and the rules that are unique to the Y department. They access the project resources and begin thinking of what they would like to research by making use of the resources. Some students may look for another project, one that better fits their interests and research themes. Most students withdraw from open projects and participate in other projects in order to engage in activities that interest them and are in keeping with their research theme.

Thus, new students in the Y department start out as passive participants but gradually find their own interest and research theme and select a project accordingly.

Taguchi, Kondo, Hashimoto, and Suzuki, who were already studying in X graduate school but in another seminar, were not passive like Sugawara and Fuji. When they selected their project, they already had enough information to judge whether it was of interest to them and in keeping with their research theme. They selected the project from the perspective of the project image and project members.

Although each student had different motivating factors, the process to become a project member was the same for them all.

Once the students join a project, they are included in the mailing list so that all information regarding the project is shared with them. They also begin attending regular project meetings. The project members together decide the date, place, and frequency of these meetings. Thus, all new students become legitimate project members. Since they are accepted as a member of project, they are able to get any resources regarding the project mailing list through regular meeting.

Although the students have access to the project resources, they may not feel comfortable at first, because they would not be very familiar with the objective, activities, and members of the project. They gradually start feeling one with the project members and identifying with the project owing to the following reasons. Firstly, they begin to share accountability with the other project members. Secondly, they begin to share repertoires as they understand the objective, rules, and activities of the project. By observing senior students and working with them on project activities, they learn how to behave and start doing what they are required to.

Most students conduct research for the project. They are also required to manage the project. For instance, included in the project are social contribution activities such as publishing newsletters and conducting workshops for teachers and students. These tasks require collaboration among all members. Thus, the students acquire knowledge and various skills through activities such as desktop publishing, editing, designing workshops, and networking. As soon as they acquire all the necessary knowledge and skills, they are able to participate in the project more actively and more fully. They also start identifying more clearly with the project objective, activities, rules, and members. Identifying with the characteristics of project
members is related to identifying with the project. The students start to collaborate with other project members to gain from their prior knowledge, experience, skills, characters, and interests.

Basically, the full participants assign work to the other students. For each activity, the full participants assign roles to each project member, taking into consideration their prior knowledge, experience, skills, characters, and interests. The following are the full participant’s reflections: (1) “When I organize an activity, I assign each project member with an appropriate role, taking ability into consideration” (Kondo). (2) “When I decide on roles for an activity, I do not force them upon members. If I do, they will assume their roles passively, not actively. Therefore, if I want them to learn something from the project, it is necessary to see that they do what they are interested in and want to. This is important for designing learning in the project, I think” (Hashimoto).

The attitudes of the full participants indicate that accountability and repertoires are intentionally shared by them by taking into account one another’s prior knowledge, experience, skills, characters, and interests. The full participants try to promote active and full participation among project members.

The roles of students participating in the project change as they get accustomed to the project. Responsible students are in charge of assigning tasks to project members according to the degree of importance of the tasks. The more important tasks necessarily involve working with people from other organizations. Project tasks are usually planned in advance and usually go as planned. However, when working with other organizations, students have to be prepared for the unexpected and have to deal with it on their own. Tasks are assigned to responsible students with creative skills such as problem-solving and analytical skills. Since the tasks usually involve complicated problems, they are not easy for students to perform on their own. They are required to collaborate with one another to solve such complex problems and thus, learn the importance of collaboration. Students are also required to negotiate with various kinds of people from other organizations. Sometimes, these organizations expect too much of them. However, even if the students lack the knowledge and skills required to complete a task, they do their best to not refuse a request. This could involve them engaging in further study or specialization. The students therefore gain experience in a wide range of research fields such as intercultural understanding, psychology, sociology, history, and politics. They also develop networking, analytical thinking, and collaborative problem-solving skills. Thus, students are able to collaborate with other organizations and develop metacognition.

Another factor that encourages students to work collaboratively with others is if the project continues to be run even after the students graduate from university. The full participants then consider assigning all the tasks to the project members. They try to identify the skills and knowledge needed for the project and ensure that they acquire them through the project. For a clearer understanding, we now introduce the case of Sugawara.

Sugawara

As soon as Sugawara entered graduate school, he joined the “collaborative learning project using ICT among Japanese and Korean primary schools.” The project members were supposed to support teachers and pupils in communicating with Korean students. One primary school teacher in charge of the project lacked experience in collaborative learning with other countries. The students therefore needed to support her with respect to technical matters as well as educational matters such as designing lessons for international understanding. Sugawara’s main role was to provide support in technical matters, because he had rich knowledge and skills in networking and in the use of ICT equipment. He was asked to develop a multi-language Broad Bulletin Board (BBS) and set up video conferences using the school’s system. The project included three graduate school students. The second student, who had lived abroad, provided support in designing activities to promote international understanding, and the third student, who had experience as a schoolteacher, prepared worksheets and lesson plans. “At that time, it was necessary to collaborate with other students to achieve the project objective. We often chatted about how each one of us played an important role in the project. We complemented one another and successfully completed the project” (Sugawara’s reflections). Sugawara identified his role in the project and considered that the project would not have been a success if the three students, with their different knowledge and skills, had not complemented one another. Sugawara put a lot of
effort into his role. When he faced challenges or difficulties, he would contact the educational board and IT Company to discuss how to innovate multi-language BBS in primary schools. When necessary, he depended on the students and instructors from other university departments who could have solutions to his problems. Thus, he learnt how to develop multi-language BBS.

By the completion of the project, Sugawara had identified the skills necessary to develop a multi-language BBS for international collaborative learning. He decided to pass on this knowledge to other students and conducted a workshop on developing multi-language BBS. By instructing other students, they came to rely on him, and he was assigned to more important tasks in the project that he participated in. He was finally asked to manage the project as project leader. He did as his seniors had instructed him to do when he was new. For instance, he guided newcomers and junior students and negotiated with other organizations that the project was affiliated with.

The five other students also became full participants in a similar manner. As their knowledge and skills increased, they were assigned more important tasks.

Once they identified themselves as project leaders, they started to behave as project leaders did. They began looking to other project leaders for resources. They also began looking for role models in other project leaders and would observe them and discuss with them in informal settings. They learnt how to behave as a project leader, manage a project, negotiate and communicate with other organizations, share information among project members, encourage members to engage in activities, and so on.

In addition to their project management skills, their research skills improved. They started discussing more with their instructors, who usually give students advice and make suggestions through the project leader. The project leaders therefore have more opportunities to discuss research as well as project management with the instructors. They usually instruct project members on research and attempt to answer any questions concerning research from the project members. If they face difficulties, they report them to the instructors and are guided by them. They gain a sense of learning satisfaction and achievement from the value that they attach to participation in such research projects.

5.2. The learning culture that promotes students’ full participation in the project

It is found that the learning culture in the Y department is related with students’ motivation to actively and fully participate in the project. Without being told, the students know that they have to take the initiative in conducting research and managing the project. This has been a tradition in the Y department. Therefore, students often participate in multiple projects and make it a point to take care of newcomers and junior students. In this manner, the learning culture of the Y department draws on students’ full participation in projects.

Suzuki

The objective of the project to which Suzuki belonged was to research on design using ICT with the cooperation of incumbent schoolteachers and a private company. The project members were therefore required to know networking and systems development.

When Suzuki joined the project, Sugawara was project leader. Sugawara passed on all the necessary knowledge and skills to Suzuki because he found that he was both interested and talented in networking and systems development. He gradually started assigning more important tasks to Suzuki. “I did not know anything about the project when I first joined the group. (Before working on the project,) I thought I had good networking and computer skills. But I soon realized that I needed to study a lot more because my knowledge was not enough to work on the project. Mr. Sugawara helped me realize that” (Suzuki’s reflections).

Sugawara encouraged Suzuki to take on responsibility for the project. He identified Suzuki’s position in the project and made it clear that he expected Suzuki to take over his role after he graduated. “I think I will need to take over Mr. Sugawara’s role soon,” Suzuki mentioned. This means that he too has identified his position as the next leader once Sugawara graduates.

In Suzuki’s case, the process of becoming a full participant seems horizontal, because Sugawara handed over his role to Suzuki. However, when analyzed from the interpersonal and community perspective, the process is rather complicated. In fact, the process followed by Suzuki was deeply related with participation in multiple projects.

At the beginning of the first academic year, Suzuki was too shy to assert his opinion in public.
The Y department organizes many academic events such as conferences, research societies, and discussions with people in various positions. Suzuki participated in all these academic events in addition to participating in the project. As all these activities required him to be assertive and to participate actively, Suzuki gradually started asserting his opinion. He mentioned that he started being more assertive when he had to work with other people. He learnt how to collaborate with others and realized his ability to do so through the various kinds of activities that he participated in.

"I gained the confidence to assert my opinion in public when I participated in the preparation for a conference on intercultural education. I was also able to prove myself (and my capabilities) to others in the situation. (By participating in various kinds of activities,) I learnt how to manage and improve different activities. This was all thanks to my experience with working on the preparation for that conference" (Suzuki’s reflections). Therefore, Suzuki was able to identify all that he could do for the project and learn all that was necessary to be a full participant in the project by participating in several other activities.

Students get the opportunity to participate in multiple projects when senior students or instructors assign them to the projects. The seniors and instructors observe their performance in projects, academic events, and informal settings and are able to identify characteristics such as prior knowledge, experience, skill, character, and interest. When they have the opportunity to start a new enterprise, they assign responsibilities to the students who are the most appropriate for the enterprise. Suzuki, for example, was assigned the management of a conference held in X graduate school and the “school based networking project,” because the attitude that he displayed in informal settings and other activities proved that he was fit for the role. This is also how he had the opportunity to participate in various kinds of activities. On the other hand, some students like Taguchi take up and lead new projects voluntarily.

The projects in the Y department fall into two categories. The first, as mentioned earlier, is the open project, in which students’ roles change as their knowledge and skills increase. In the second category of projects, students’ tasks cannot be handed over because their knowledge and skills are specialized. For instance, Taguchi is a member of the international education cooperation project. The project supports Palestinian teachers in refugee camps in Syria with the cooperation of the United Nation Relief and Work Agency (UNRWA). The project leader needs to speak Arabic as well as English to negotiate with UNRWA administrators. The project members learnt English, Arabic, and the Islamic culture to some extent. It was, however, extremely difficult to manage the project because it is practically impossible to master the languages enough to negotiate with UNRWA. Taguchi was therefore uncertain about being able to lead the project. He decided to set up a new project that he would lead.

"I was able to contribute to the project and support its members. But I strongly felt the need to take initiative. I wanted to be a leader. I wanted to start something new” (Taguchi’s reflections) Taguchi started a new project together with a high school in Kanagawa and a university in Kyoto. He gathered members and managed the project. His role included negotiating with other organizations to set up and reach the project’s objective.

The need to take initiative was also seen in the cases of Kondo, Suzuki, Sugawara, and Hashimoto.

In the Y department, the ideas that “senior students have to take care of newcomers and junior students” and “students have to take the initiative and manage projects as project leaders” are shared among all the students. Because of the interplay with the culture of the Y department, students can take the initiative and set up new projects, as seen in Taguchi’s case, or they can become project leaders by changing their positions in the project.

6. CONCLUSIONS

Our conclusions are as follows: (1) the students acquired the ability to conduct collaborative research studies with other organizations and (2) they became full participants in the project. The three main factors that contributed to their full participation are as follows: (a) their learning through peer interactions and interactions with others, (b) their commitment toward the research
project activities with other organizations, and (c) the learning culture of the laboratory.

6.1. Their learning through peer interactions and interactions with others

Focusing on the personal perspective of each student, the process of becoming full participants seems straightforward. They systematically acquire the knowledge and skills necessary for conducting research and managing projects. However, from the interpersonal perspective, we find that interaction among students plays an important role in full participation.

When the students first started working on their projects, they identified the knowledge and skills needed for the project by observing their senior students and working together with project members. They then acquired the necessary knowledge and skills by working collaboratively with others. Soon, they were handling important tasks and learned how to manage projects as project leaders.

They either took the initiative to lead by themselves or were given the opportunity, to change their roles to that of a leader. The latter is possible by carefully observing and visualizing the characteristics of project members in the Y department.

Once they became project leaders, they paid special attention to other project leaders in order to learn how to behave appropriately. “I have learnt how to manage the project. I applied what I learnt in my project after discussions with other project leaders on how to facilitate discussions and assign roles to project members” (Hashimoto’s reflections). The students acquired the necessary knowledge and skills for conducting research and managing projects by participating in multiple projects and interacting with others, in other words, by following instructions and working collaboratively with others.

6.2. Their commitment toward the research project activities with other organizations

The students have to be prepared for the unexpected when working on a social project. All such projects involve solving real-life problems. As these social problems are usually rather complicated, the students need to collaborate with people who have different knowledge and skills. In addition, short-term solutions for these problems are not feasible. In other words, the project activities are ongoing. Therefore, the students’ project responsibilities do not end at graduation.

This is one of the reasons for which full participants take care of newcomers or junior students. Such interactions among students of different positions and years help establish healthy, reliable relationships.

6.3. The learning culture of the laboratory

The students who become full participants in a project learn various kinds of knowledge and skills in the process. In addition to developing the skills needed in the Y department, they learn how to conduct research and manage projects. Moreover, once they become project leaders, they communicate more with their instructors. The learning satisfaction and sense of achievement that students gain from participation serves to increase their motivation and the value that they attach to participating enthusiastically in such research projects. Although the students work harder after becoming full participants, their confidence and sense of satisfaction increases as they are both appreciated by their juniors and relied on by their instructors.

Focusing on the community perspective, the learning culture of the Y department is found to be related with the process in which students become full participants. For instance, the students made statements like “I wanted to take initiative in the project because it is our tradition,” “We have to assume leadership and manage the project,” and “It is natural to take care of newcomers and junior students.”

Therefore, we see that the learning culture of the Y department motivated them to become project leaders. Although they started out as passive participants in the project at the beginning of the first academic year, once they became full participants, they felt like encouraging the junior students to actively and fully participate in projects, owing to the sense of learning satisfaction and achievement that they had gained.

The actions of individual students strengthen and re-construct the learning culture of the Y department. Thus, the culture of this department serves as a stable learning environment for graduate students.

6.4. Summary

This research reports on six students who learnt how to conduct research and manage projects in the process of becoming full participants. The three main factors that contributed to their full participation are as follows: (a) their learning through peer interactions
and interactions with others involved in the collaboration, (b) their commitment toward the research project activities, and (c) the learning culture of the laboratory. In other words, the students learned the technical and practical knowledge and skills of working collaboratively with other organizations in authentic situations. Moreover, the learning satisfaction and achievement that they gained from participation served to increase their motivation and the value that they attached to participating enthusiastically in such research projects. By using the GTA, we were able to clarify the process of becoming full participants as well as the interplay with the learning environment in the Y department.

7. FUTURE DIRECTION

This research only focuses on the students who joined the Y department from other universities. However, it is necessary to also take into account the students who were already studying in X graduate school, because the culture of the Y department is created collaboratively among the students who come from other universities and those who belong to the same university. Therefore, a more detailed discussion is needed on the interplay between them.

Further, it is found that participating in multiple projects affects a student’s behavior and identity. Participation in plural projects should also be analyzed from the perspective of “boundary,” a core concept suggested by Wenger (1999). By describing how students decide their participation style in multiple projects, student identity and behavior in learning will be more clearly understood.

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