교육학석사 학위논문

Understanding Student and Teacher Interactions in Korean High School Science Classrooms from a Structure and Agency Dialectic Perspective: Implications for Pedagogy and Research

구조와행위주체의변증법적관계의관점에서이해한 한국고등학교과학교실에서의학생과교사의상호작용: 교육과연구에대한제언

2015년 2 월

서울대학교 대학원

과학교육과 물리전공

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구조와 행위주체의 변증법적 관계의 관점에서 이해한 한국 고등학교 과학교실에서의 학생과 교사의 상호작용: 교육과 연구에 대한 제언

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이 논문을 교육학석사 학위논문으로 제출함
2014 년 10 월

서울대학교 대학원
과학교육과 물리전공
김 의 주

김의주의 교육학석사 학위논문을 인준함
2014 년 12 월

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ABSTRACT

This study examines students' classroom interaction patterns while engaging in science learning to better understand the phenomena of student silence in Korean classrooms. Conducted as a video-based ethnographic study, data collection took place over a 12-week period and included observations and video recordings of ten lessons in two 10th grade science classes taught by an experienced teacher. The video and audio recordings from lessons were edited and analyzed at the meso- and micro-levels to determine recurrent patterns in student and teacher practices. Short video clips were used during teacher and student interviews to stimulate participant recall about classroom interactions. Through survey responses from 60 students and interviews with 21 students, researchers identified various preferences for learning environment and patterns of verbal and non-verbal engagement with the teacher and among peers. Our analysis of observed and self-reported practices revealed coherences and contradictions in student and teacher beliefs regarding what it means to "participate" or to "actively" engage in class. Building from these findings, researchers applied sociocultural theory as a framework to identify structures at macro, meso, and micro levels, which serve to limit and/or afford students' verbal and non-verbal participation in science. Intense emphasis on examination preparation, societal expectations regarding what it means to enact "good" teaching and learning practices, and the need to adhere to strict curriculum timelines are examples of factors that exist outside of the classroom, but which structure teacher and student practices at the micro (classroom) level. Such findings reinforce the need for researchers, educators, and policy makers to attend to overarching macro and meso level structures if engaging teachers and students in

active, verbal and non-verbal participation patterns is a goal for Korean science classrooms. Finally, this research raises questions about role and impact of student silence on science teaching and learning in Korean contexts.

*Keywords:*classroom interaction, participation and engagement, structure and agency, Korean cultural context

Student Number: 2013-21415

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER1

THE PROBLEM

High school classrooms in Korea are often described as places in which students are hardworking without active participation or talk between peers and limited talk to the teacher. The science classroom is no exception even though much of the research in science education (Lemke, 1990; Kuhn, 1993; Gee, 2005; Yerrick& Gilbert, 2011)emphasizes the need to engage students in activities in which students "talk" science in small group and in whole class interactions. When researchers compare what occurs in classrooms that utilize "globally recognized best science teaching and learning practices" with the passive learning contexts commonly observed in Korean science classrooms, they may expect to find low achievement among Korean science learners. However, the opposite is true as Korean students routinely perform well above the mean on international math and science assessments(Kang and Hong, 2008; OECD, 2011). Thus, there appears to be a contradiction between what is universally promoted as being important for students to achieve in science and what is happening in Korean science classrooms.

This contradiction serves as the starting point for my exploration of the role of student participation in Korean science classrooms and the impact of Korean culture on teacher and student expectations for actively engaging in discourse in small or whole group interactions. Specifically, I examine how structures, such as the national Korean science curriculum or historically constituted cultural expectations about how students and teachers should appropriately interact in classroom settings, each affect teacher and student practices in two high school

physics classrooms.

In the section that follows, I offer an overview about literature related to trends in science education that promote active student engagement as beneficial to student learning. Following this introduction, I provide an overview about research examining the issue of student engagement and participation in classrooms with a specific focus on research exploring the value of non-verbal interaction practices.

1.1 INTRODUCTION

Today, it is prevalent to reform science content in learning and teaching to emphasize collaborative interactions that promote engagement and dialogue as a means of preparing students to be competitive in a global economy (Stromquist, 2002). These changes are visible in the global push towards employing specific science teaching methodologies, such as *inquiry*, *constructing models, collaborative laboratory work, and argumentation activities* (Chiu &Duit, 2011; 2012; Guo, 2007). Most of these strategies were developed in Western educational contexts and they have not been evaluated in other contexts than the ones in which they were developed (Tao, et al, 2013). In this thesis, I argue that these strategies may not be compatible with the educational contexts in some Eastern countries. In Korea, researchers have become increasingly interested inutilizing these strategies. Much of this research has focused on understanding the challenges Korean teachers face when trying to effectively engage students in participatory science learning. In the section that follows, I describe some of the research advocating for increased participatory interactions to improve student learning in science.

1.1.1Reasons for participatory science learning strategies

Instructional strategies that emphasize student participation in science classes are

based on constructivist teaching methods. In the constructivist learning theory, learning occurs when students are actively involved in a process of meaning and knowledge construction as opposed to passively receiving information (Gray, 1997). In theclassroom, the teacher's role is to prompt and facilitate discussion. Thus, the teacher's main focus should be on guiding students by asking questions that will lead them to develop their own conclusions on the subject through active involvement in discussion and argumentation.Some examples of learning strategies that are founded on constructivist learning theories include problem-based learning, inquiry-based learning, and a variety of cooperative learning strategies,such as reciprocal peer teaching and jigsaw activities.In the sections that follow, I describe three commonly of these strategies and discuss how they are designed to promote student discourse with peers and their teachers. Each of these learning methods emphasizes students' active involvement in science class through diverse types of activities that include discussion, self-reflection, and collaboration. These activities necessitate students' verbal participation in science class through discussion with peers and teachers in order to deepen their comprehension of the concepts they are learning.

1.1.1.1 Problem-based learning

Problem-based learning is designed to elicit the students' prior knowledge about a topic and to have students ask questions related to the specific problem or issue to be studied. Following awhole class or small group discussion about the topic, teachers typically provide time for students to individually research or reflect ontheir newly acquired information. Afterwards, students may meet in small groups for further discussion about the new information they have collected through individual research efforts. After repeating this process, students critically analyze individual and group thoughts and try to synthesize the information in an attempt to

draw a conclusion about the given problem or issue. The goal is for students to come to a shared consensus about their findings based on the collective effort of the class. In this way, problem-based learning enables students to actively construct individual understandings of a topic using both prior and newly acquired knowledge (Schmidt &Loyens, 2007).

1.1.1.2 Inquiry-based learning

Inquiry-based learning is an educational approach associated with problem-based learning in which the student learns through investigating issues (Hakverdi-Can &Sonmez, 2012). In this approach, students pose and answer questions individually and collaboratively in order to draw conclusions regarding the specific issues. Inquiry-based learning has been shown to be beneficial in developing a student's ability to design and conduct investigations, to engage in collaborative activities, and toexpand student conceptual understanding of phenomena in science. Inquiry-based learning emphasizes communication skills, not just as talk, but also with regards to writing and representing findings using a variety of graphical means.

1.1.1.3 Cooperative learning

Cooperative learning strategies focus on supporting individual students to work together to achieve a specific learning outcome (Hsuing, 2012).An example of a cooperative learning approach includes Reciprocal Peer Teaching (RPT), which places students in alternating roles of both teacher and learner. The utilization of cooperative learning strategies, such as RPT has shown to be effective in the development of teamwork, leadership, and communication skills, as well improving students' understanding of content (Krych et al., 2005).

Another example of a cooperative learning strategy is a jigsawactivity, which is typically implemented in four stages: introduction, focused exploration,

reporting and re-shaping, and integration and evaluation. The jigsaw is a method of organizing classroom activity that makes students dependent upon one another to learn about a topic. The teacher assigns students into small groups and then breaks assignments into smaller pieces that the students in each group work to re-assemble in order to complete the (jigsaw) puzzle.It is in the 'jigsaw' group that students explore the material about the subtopic and prepare for teaching it to their 'home' group, where the reportwhat they learned and re-shaping their knowledge. The approach concludes in the fourth stage, during which students integrate and evaluate what they have learned (Karacop&Doymus, 2013). In the sections that follow, I discuss some of the research that promotes these strategies as a means for promoting talk and I discuss some of the research that describes the benefits of student "talk" for improving student science learning and comprehension.

1.1.2Why is "talk" important in science classrooms?

Manyresearchers suggest that students learn more deeply and perform better on complex tasks if they have the opportunity to engage in meaningful activities with these instructional strategies that require sustained engagement, collaboration, research, management of resources, and the development of an ambitious performance or product. In addition, researchers believe that learners make meaning and define, explain, and contextualize concepts through speech and interactions with others. Studies have shown a positive impact on learning when students participate in lessons that require them to construct and organize knowledge, consider alternatives, engage in detailed research, inquiry, writing, and analysis, and to communicate effectively to audiences (Newmann, 1996). For example, a study of more than 2,100 students in 23 schools found significantly higher achievement on intellectually challenging performance tasks for students

who experienced this kind of “authentic pedagogy” (Newmann, Marks, &Gamoran, 1995).

As a result, strategies such as inquiry-based learning, problem-based learning, or cooperative learninghave been encouraged in science classes as a means to promote students’ active and verbal participation. The belief that student “talk” will improve a students’ learning is a strongly held belief (schema) among many science education researcher and educators that serve to structure teacher and student practice in science classes all around the globe, even in countries with cultures that do not traditionally encourage students or young people to verbally Much of the research focusing on the need for “student talk” in classrooms (especially in science), justifies promoting “talk” by citing social theories of learning.

Particularly influential is Lev Vygotsky’s work on thought and language, which emphasized the importance of social interaction in the development of cognition (Ollin, 2008). Recently, a small group of researchers (Hao, 2011; Jaworski&Sachdev, 1998; Ollin, 2008; Ha & Li, 2012) have begun to question this dichotomization of speech and silence and instead, are asking that researchers challenge the norm that privileges speech over silence. This is because, in general, silence, as an absence of speech tends to be problematized in schools because student engagement and participation is equated with “talking” and “remaining silent, even if actively listening, is equated with non-participation” (Ollin, 2008).

In this thesis, I raise questions about how commonly held schema in Western educational contexts in which “talk” isvalued and expected may not be well aligned to classroom cultures in Korean contexts. I argue that the structures necessary to support students to effectively enact the verbal practices that are appropriate and expected may not be in place because the Korean education system

has developed in a different cultural and historical context. Thus, what is appropriate and normal in the Korean classroom may be very different than in the Western classrooms where strategies that promote active participation and dialogue have been developed.In the sections that follow, I provide some historical context for the introduction of these strategies to the Korean science curriculum and I discuss the impact of these changes on science teaching and learning.

1.1.3Trends in Korea

In this section I describe some of trends emphasizing students' active and discursive involvement in science as evidenced by historical changes in publication trends in the top science education research journal in Korea and in the national science curriculum. I offer this information to contextualize the problem that is central to this research, which is that global trends towards verbal participation and overt engagement in science class is influencing research and curriculum in Korea, but not necessarily shaping teacher and student practice in science.

1.1.3.1Trends from published research in Korean Science journals

A brief analysis of publishing trends in *the Journal of Korea Association for Science Education* (JKASE) reveals that Korean science educators have regarded some instructional strategies that promote classroom interaction to be increasingly important. This graph shows publication trends from the late 1996 until 2013.

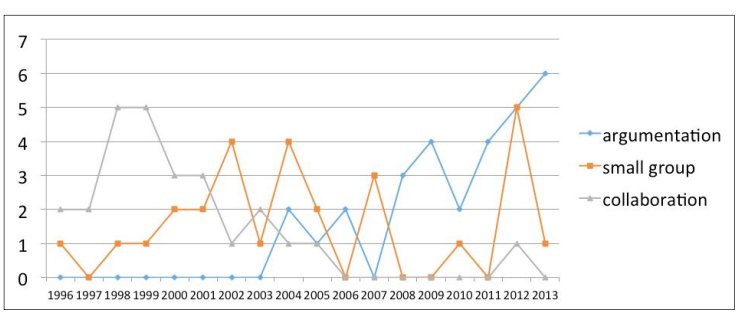

Figure 1. Frequency of papers with the terms argumentation, small groups, or

collaboration in title.

Figure 1shows that the number of papers dealing with instructional strategies such as argumentation, small group activities, and collaboration in science education first appeared in the 1990s when the same topics were gaining popularity in Western science education research journals. These strategies each emphasize students' active participation and talk in science class. An analysis of these papers revealed that the majority of papers served to introduce the research to the science teacher educators in Korea or they shared findings from limited implementation in a few classrooms.

While some of these studies found that the strategies could be useful in promoting active student participation and improved conceptual learning, most of these students noted that these strategies would be incompatible in "real" classroom situations because the structures of the school and classroom did not support teachers and students to enact these practices on a long-term basis due to pressures for examination preparation. This finding is salient to the arguments in this thesis because it provides evidence that strategies promoting students' active verbal engagement may not be well aligned to Korean educational contexts. In this thesis, I seek to examine the ways in which culture may serve as a structural barrier for effectively implementing such strategies in Korea. Before considering this point further, I present trends from the national curriculum that highlight the ways in which educational strategies developed in Western countries have been integrated into the Korean national science curriculum.

1.1.3.2 Analysis of Korean Science Curriculum from 1945-2009.

In this section, I highlight the Korean science curriculum has undergone extensive changes over the last 64 years. Some examples of the ways in which the science curriculum has been influenced by global education trends include the introduction

of “Life-centered” education, followed by “Discipline-centered” education, andfinally by the introduction of STS (science, technology, and science) education (see Figure 2 for a more detailed description).

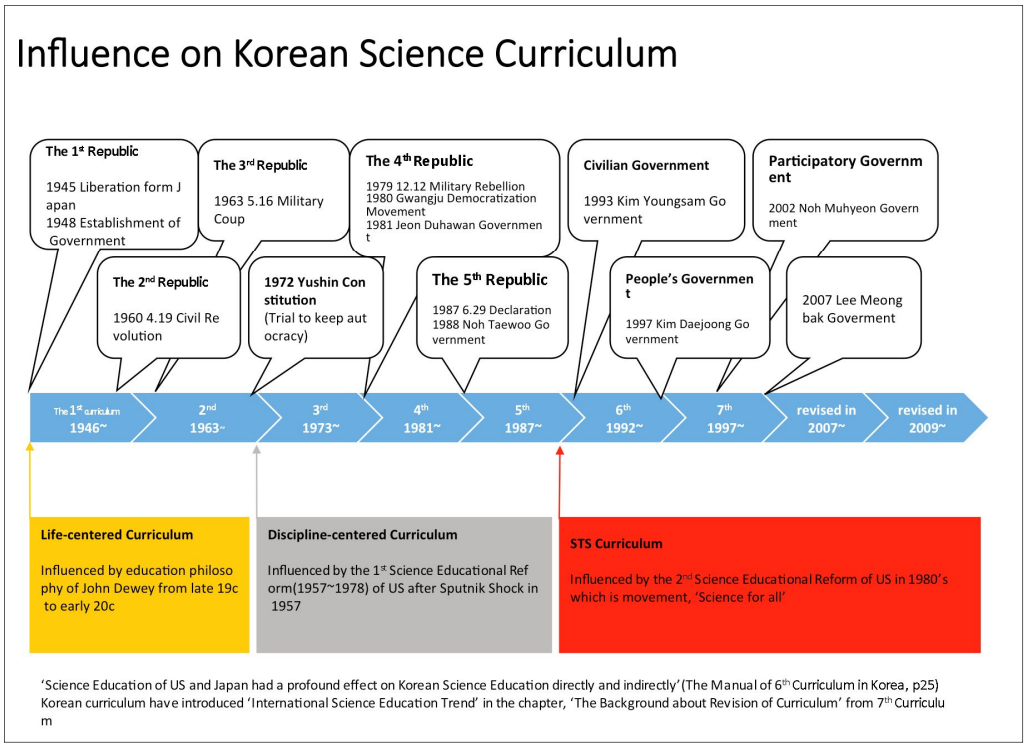

Figure 2. Influence on the national curriculum from global education trend.

Interestingly, each of the major changes in the curriculum also coincides with a governmental regime change.This finding is important because it underscores the ways in which political issues in society can influence education. Unlike countries without a national curriculum, small changes in the Korean curriculum will inevitably affect all science classrooms in the country because the national science curriculum dictates what is taught.Thus, the introduction of new topics or strategies in the national curriculum can have a big impact on how students experience the classroom and how teachers are expected to teach.

Figure 3 highlights some specific trends in the curriculum that correspond to global trends in specific terminology or "buzzwords" in science education. This figure shows a change in the frequency of appearance of specific terms in the curriculum over time. In the early 1990s, research advocating for inquiry and collaborative learning appeared in the international science education literature. The same terms began to appear with greater frequency in the curriculum after this time, which is indicative of the influence of these trends on the curriculum.

Curriculum	Inquiry (탐구)	Collaboration, Group work (협동, 협력)	Argumentation, Discussion (토론, 토의)	Modeling (모형)
2nd	0	0	0	0
3rd	2	0	0	0
4th	1	0	0	1
5th	0	0	0	2
6th	6	2	3	3
7th	8	2	2	3
In 2007	12	1	4	3
In 2009	4	1	4	1
total	33	6	13	13

The frequency of using these words has been increasing from the 6th science curriculum

Figure 3. Change in frequency of different terms in the science curriculum over time.

Terminology such as inquiry, collaboration, argumentation, and modeling has appeared as important key words in the science curriculum over time. There has been a noticeable increase in the frequency of these terms from the time of the 6th science curriculum (1992), which suggests these strategies are being emphasized at the policy level as being appropriate for teachers to use in science classes. However, despitethese trends, researchers in Korea have noted that

teachersand students face a variety of challenges to successfully implement these strategies.

For example, in the case of small group discussion, one study (Kang, et al, 2001) found that when implemented in the classroom, Korean studentsdid not have enough skill to engage in productive discoursebecause there is an absence of "discussion culture" in Korean society. The same study also found that discussion time was limited due to pressures for the teacher to cover all the topics in science curriculum (Kang, et al., 2001). Other studies (Oh, et al, 2007) have found that when using collaborative learning strategies, sometimes students made non-productive responses or asked non-productive questions which served to disrupt the natural progression of the class (Oh, et al., 2007). In addition, research has also found that teachers found when using these strategies, the absence of an effective evaluation process that would impact student gradesprevents teachers from being able to engage students in these activities in an authentic and meaningful way (Kwak& Choi, 2005).

These findings are relevant to my discussion of the problem of student participation in the Korean science classroom because they show that even though policy at the macro level (government) supports the use of these strategies and researchers value these strategies as potentially beneficial tools for supporting science learning, there are still limited examples of these strategies being used at the secondary level in Korea. These issues frame my interest in this topic as both a former science student and a current science teacher in Korea. In the following section, I draw from my personal experiences to provide more contexts for this topic.

1.1.4Reflecting on my personal experiences as a teacher and student.

As an experienced high school science teacher over 10 years, I have felt many limitations to implementing diverse activities such as group work, inquiry, free discussion, and hands-on activitieswith the students in my classroom. When I first beganteaching, I tried to introduce diverse method into my science classes including demonstration experiments, showing interesting video clips, engaging students in role play and small group work, butI soon found myself abandoning these strategies and using lecture like the other science teachers in my school. Instead of using the new strategies I had learned about in my teacher education programs, I found myself teaching science just like I learned it as a student – through lecture with the teacher speaking and students listening. None of the teachers I worked with blamed me for failing to successfully implement these innovative practices in my science classes because they had all been in my place before. One of the main reasons I needed to follow the common way of teaching that focused on simply transferring science knowledge through lecturewas the pressure I felt to prepare my students to do well on the college entrance exam so they could go a good university.Doing well on the college entrance exam isseen asa vital way tostudents a chance to improve their opportunity to be successful in Korean society – so it was of critical importance for me to do my best to help them pass the exam. Somehow I could not imagine meeting this goal while using the interactive strategies promoted by the government.

As a researcher, when I reflect on my situation, I recall how urgently the Education Board tried to push me and other science teachers to implement the diverse instructional strategies I discussed above with the goal of improving our students' science learning. This tension between what educational policy, teacher education programs, and individual teachers want to do and the reality of what

happens presents astressful situation for science teachers which has not effectively changed since the early 1990s curriculum reforms and research trends discussed above.

Some researchers have sought the reason of this disparity between the ideal and actual condition of science classes in Korea, with some blaming students for their lack of motivation to be actively engaged or they blame teachers for their lack of hard work or will power to continually struggle to implement these new methods. However, in this thesis, I argue that this is a more complex problem than to ascribe blame to any individual student or teacher. Instead, I argue that teachers and students agency to affect change in the classroom has been limited by structuresthat are shaped by social, cultural, political, and historical factors that must be considered. To provide greater context for these issues, in the sections that follow, I introduce researchthat examinesfactors that may shape ahigh school student'sinteraction patterns in a science classroom in Korea.Specifically, I introduce research about student engagement and participation and I introduce the theoretical lenses I will use to describe how factors, such as Korean culture, can influence student participation in science. Finally, I introduce the purpose of the overall study and I provide an overview of the dissertation.

1.2CLASSROOM INTERACTION RESEARCH

Interaction is more than action followed by reaction. It includes acting reciprocally, acting upon each other. Rivers (1987) described interaction through its Latin roots, noting that 'action' means 'to do' and inter means 'among'. Interaction has a similar meaning in the classroom. Interaction can proceed harmoniously or it can be fraught with tension. Malamah-Thomas (1987) stated that each interactive situation has the potential for co-operation or conflict. How the situation actually

develops depends on the attitudes and intentions of the people involved, and on their interpretations of each other's attitudes and intentions. Interaction means participation of teacher and students in the process of teaching. In this process, teachers influence students and students also interact with and influence the teacher. Interactions also take place among the students. Thus, in the process of teaching, everybody interacts with every other person involved in the learning environment. In order to better understand interactions in classrooms, researchers have developed a variety of methods for collecting and analyzing data. In the sections that follow, I highlight some common methods.

1.2.1 Methods for conducting classroom interaction research

Ned Flanders (1970)is an influential researcher in interaction studies whodeveloped a system of interaction analysis known as the Flanders Interaction Analysis Categories System. The FIACS was designed toclassify 10 different categories of verbal behaviors comprising of teacher talk, student talk, and silence or confusion. Flandersasserts that by analyzing classroom verbal interactions using video recordings, teachers could improve their teaching practices to help students more effectively and actively participate in classroom interactions.In later sections, I discuss the FIACS and observational tools similar to this one that have been widely used by researchers to categorize interaction patterns.

The important role of verbal discourse in the classroom has been an interesting subject for several researchers (e.g., Cazden, 2001; Edwards & Mercer, 1987; Edwards & Westgate, 1994).In particular, the three-part exchange structure known as 'triadic dialogue'(Lemke, 1990) has been found to be pervasive in classrooms, including science classrooms. Mehan (1979) was one of the early researchers to observe and categorize common interaction patterns as an IRE

pattern. An IRE patterntypically consists of three moves, including Initiate (often via a teacher question), (student) Response, and (teacher) Evaluation. In the typical IRE pattern, the teacher normally asks a closed question that is basically an information-seeking question that requires only a short answer. After the students' response, the teacherevaluates the students' answer with either praise or a modification of the wrong answer.This method of categorization has been very widely used to make sense of student and teacher turns at talk in whole class and small group interactions in science. In the section that follows, I describe more carefully what I mean by interaction, participation and engagement.

1.2.2 Participation and engagement in classrooms

Interactions occur between two or more people and are mainly achieved by two methods, verbal and non-verbal means of expression. Non-verbal methods play as an important role as a verbal interaction. This holds true for a classroom as well as for other social situations. The one thing that makes the classroom different from any other social situation is that it has a primary pedagogic purpose. Teachers spend a lot of time talking, lecturing, asking questions, and giving instructions. Teachers and students in the classroom not only use verbal interactions for these functions, but they can also choose toexpress and exchange their opinions using non-verbal methods, such as facial expressions and hand or bodily gestures.

When students participate in interactions in science class, they can be said to engage in the teaching and learning of science.Many academics consider class participation as evidence of active learning that benefits learning, critical thinking, writing, appreciation of cultural differences, time management and interpersonal, listening and speaking skills (Howard &Henney 1998; Peterson 2001; Petress 2006). Thus the definition of interaction, participation and engagement can be very

broad, which can be confusing for researchers.

According to Petress (2006), class participation includes three evaluative dimensions: quantity, dependability and quality. He pointed out common distracting classroom behaviors and alternatives: long-winded contributions (answers, questions and expressions of support for classmates need to be concise, specific and as relevant as possible), repetitive responses (students should be attentive and not go over old ground), participation mobilisers (students encourage lowfrequency contributors) and responses that discourage others from contributing (signs of impatience, boredom or superiority expressed verbally or nonverbally). Students characterized as participation-dependable attended class regularly and did not chat privately, were respectful, came to class on time and prepared, and they did not fail to pull their weight with classmates.

Other researchers, such as Dallimore, Hertenstein and Platt (2006) evaluated a classroom strategy that included cold calling and marked participation to stimulate more graduate students to engage in class discussions. Results indicated that cold calling and marked participation were associated with preparation for class, frequency of participation and comfort with class participation.However, faculty and student definitions of, and preferences for, participation in classroom discussions are not always harmoniously aligned (Dallimore, Hertenstein, & Platt, 2004), which has the potential to complicate classroom communication. The tendency is for faculty to define participation as oral, whereas student definitions are more diverse in their defining what it means to participate (Dallimore, Hertenstein, & Platt, 2004).Thus, what instructors consider as participation is often a source of confusion for students.

If participation is only defined as oral, then when one student is talking (i.e., participating), by definition, everyone else in the classroom is not participating.

The present study takes a more dialectical position by considering both oral participation and silence under the broader notion of engagement. By reframing student engagement as a more complex and dynamic concept, both oral participation and silence can be seen as possible components. Therefore, engagement avoids the binary logic that silence and orality are opposites and recognizes that active participation with course content can occur in silence instead (Meyer, 2009). This perspective on classroom engagement directly challenges previous assumptions, practices, and studies that conceive of oral participation as a necessary prerequisite for student learning. Instead of approaching classroom communication from this type of a linear standpoint, studies and measures are needed that examine student participation and silence as interactional.

Yu, et al.(2008) stated there have beenfew studies in Koreathat have explored participation structures in the science class. However, in Yu's research,they focused on how examining how often space was made in the discourse for the speaker and listener. They used a distribution method of turn taking to analyze participation.However, just like all of the research studies discussed so far, Korean researchers examining participation and interaction in classrooms still focus on verbal interactions and students' attitudes and they emphasize the teachers' role in facilitating student talk and in making the learning environment appropriate for students to engage.

1.2.3 Participation in science teaching and learning

To a large extent, learning opportunities are influenced by the quality of verbal interactions in classroom talk between teachers and students (Seidel &Prenzel, 2006). Learning has been shown to be particularly effective if students contribute to classroom talk(Webb, 2009; Wells &Arauz, 2006). Given that classroom talk is

the most prevalent component of science instruction, it provides a relevant setting in which to study opportunities for boys and girls to engage meaningfully in science learning.According to the cognitive elaboration perspective (O'Donnell, 2006), students elaborate their thinking through conversations with others. These interactions lead to cognitive restructuring, resulting in elaborated knowledge and deepened understanding (Webb, 2009). Thus, learning is particularly effective for students who are verbally engaged in classroom talk (Wells &Arauz, 2006).

Engaging students in classroom discourse where students are perceived as equal conversational partners by their teacher, has shown to enhance students' knowledge development (Seidel et al., 2007). Students who experience support of autonomy and intrinsic motivation show less negative affect and self-handicapping (Turner et al., 2003). In contrast, classroom talk in which teachers ask closed and reproductive questions and where students were givenfewer opportunities to express their own ideas was shown to diminish students'intrinsic motivation and interest in learning physics (Seidel, Rimmele, &Prenzel, 2003).

Viewing learning as a social rather than as an individual pursuit has implications for approaches to classroom change in science (Olitsky, 2007). Rather than focusing efforts on raising students' test scores through methods such as standardizing the curriculum to correspondwith test content, more attention could be given to altering the environment of classrooms in ways that increase students' opportunities for meaningful participation and interaction surrounding science learning.

1.2.4Asian Culture and Classroom Interaction Research

In most studies, Asian students are characterized as being "deficient" with regards to creativity, ability to articulate ideas, and ability to engage in critical thinking

(Chan & Watkins, 1994; Biggs, 1998; Hofstede & Hofstede, 2005). Particular reference is made to terms, such asConfucian Heritage Cultures (CHC), Confucian Heritage Learners (CHL), and Chinese Learner (CL). Research using this terminology includes students from Korea, Japan, Viet Nam, Taiwan, Hong Kong, Singapore, and China. These studies tend to refer to a stereotypical student who is passive, dependent, a rote learner, prone to plagiarism, and lacking in critical thinking ability (Ryan & Louie, 2007).

More recently, researchers have begun to criticize studies promote ahistorical and acultural interpretations of the influence of Confucian's teachings different cultural contexts (Kennedy, 2002; Ngyuen, et al, 2005; Wang, 2013). Few researchers positioned themselves in the context of the classroom or culture and none have raised questions about the role cultural bias may play in their interpretation of Asian students' silences (Katyal& King, 2011; Ryan & Louie, 2007; Ryan, 2010). None of these papers use methodologies that engage the participants in directing the course of the study, the analysis and interpretation of the data, or the representation of the data (Eaves, 2011; Park, 2011)

Until the 1990s, the majority of research on classroom interactions in diverse educational settings has taken place in thecountries like the United States, Australia, and the United Kingdom and the research has often been conducted by members of the mainstream (ie., mainly white, male, middle class, science backgrounds). This is particularly problematic for classroom studies as researchers who lack an emic perspective may negatively construct students' interactions (passive, unmotivated) because the students' practices may fail to conform to the researchers' underlying preconceptions about the nature of participation and interaction (Ollin, 2008). In classroom research, speech has primarily been characterized as "participation" and silence as "non-participation" (Ollin, 2008).

These studies present an over-generalization of Asian students (both in Western countries and in Asian countries) as being homogenous and unchanging and that ignores the dynamic and changing nature of cultures (Ryan, 2010). The findings from such studies that have traditionally positioned students who are silent as being passive and deficiently engaged as learners should be reexamined in the cultural aspect. I raise questions about the need for innovative research methodologies that are designed to examine alternative forms of participation, including silence, and that seek to examine the role of these forms of participation in supporting students to learn science.

1.2.5Asian student participation in science

Asian American students have been described as a "model minority" for their academic achievements in general, and mathematics and science performance in particular. The model minority label, however, has serious flaws. This stereotype neglects the diversity among Asian students (Lee, 1997). The emphasis on doing science poses a challenge to Asian students. Related to the distinction between reproductive and transformative understanding, Asian students tend to be receptive learners, rather than exploratory learners. Students from Confucian cultures are ingrained with respect for knowledge transmitted by authority figures, including teachers and textbooks, rather than the desire to seek and initiate inquiry and investigation (Trueba, Cheng, &Ima, 1993). The emphasis on doing science may also pose a challenge to students who have not been exposed to science activities that involve abstract, decontextualized thinking. These students may have difficulty differentiating explanations from observations and descriptions (Lee, Fradd, &Sutman, 1995).

The recent reform in science education emphasizes 'talking' science

(Lemke, 1990; Palincsar, Anderson, & David, 1993). Through communication, students clarify thoughts, organize ideas, share views, and inform one another.Language and communication are interwoven with cultural contexts, and communication patterns vary across languages and cultures (Cazden, 1988). Asian students who appear reserved and quiet may be perceived as lacking interest or motivation in science when, in fact, they intend to communicate their deference to the authority of teachers.

Developing scientific values and attitudes, while respecting their own cultural norms, will pose a great challenge to Asian students. For instance, according to Confucian and Buddhism traditions, these students are enculturated to be in harmony with others, reach consensus in a group, and sustain mutual loyalty (Levine, 1993; Smart, 1991; Spence, 1993), rather than engage in criticism, critical and independent thinking, and tolerance of ambiguity. Their cultural norm of respecting the authority of textbooks and teachers is in conflict with scientific values and attitudes, involving rules of evidence and empirical criteria rather than authority, questioning the established practices, and legitimate skepticism. Thus, Asian American students experience difficulties in reconciling their cultural practices with the scientific values and attitudes expected in science classrooms.

1.2.6Korean Culture and Student Participation

Discussion culture in Korean society is not well developed – the small group discussion is conducted actively but, these results are because of that they do not have enough skill to discuss affected by the absence of discussion culture in Korean society and also enough discussion time due to the limitation in science curriculum either (Kang, et al., 2001).

This research shows active discursive engagement in sharing knowledge

process between teachers and students give a chance to create the space for active sharing knowledge. But this could result in the problem in which students made non-productive responses or questions out of teachers' intention and disrupt the natural progress of the class when this function is overemphasized (Oh, et al., 2007).Most teachers pointed out that the biggest problem is perfunctory evaluation habitus or system as well as the absence of valid evaluation (Kwak& Choi, 2005).But – there is a concern about Korean students and their lack of engagement because engagement has been linked to interest, enjoyment, and career aspiration.

Some researches which deal with students' participation in science classes pointed out students' problems related to the lack of discussion culture and non-matured attitude during science activities. Also, they indicated the lack of supports from education system such as science curriculum to build up more actively participatory science classes. However, these limitations to set up better circumstance for active students' engagement in science classes not only come from respective factors such as students, teachers, and curriculum but also from cultural, historical problems which are prevalent in school site. In this study, I will explore how these cultural factors are related to students' participation and engagement through a socio-cultural theory as a lens.

1.3 THEORETICAL BACKGROUND

My conceptual and methodological framework is grounded on theoretical underpinnings in cultural sociology. Specifically, I draw from William Sewell's (1992; 1999) work to make sense of the ways in which structures encourage or constrain teachers and administrator to meet their goals. I draw on this theory to better understand the role structures in supporting teachers and students to implement different patterns of engagement and participation in Korean science

classrooms. Specifically, this research explores the impact structure and student and teacher agency in relation to science teaching and learning. I discussthe theoretical framework and methodological consideration for this research in detail in Chapter 2.

1.4PURPOSE AND FOCUS OF THE RESEARCH

Currently, there is limited research examining the impact of culture on student engagement and participation in science classrooms in Korea. Conducted asa ethnography, the purpose of this research is to better understand how teachers and students in typical Korean high school science classrooms interact with one another during normal science lessons. By examining these interactions, I seek to identify interaction patterns that occur in natural science education settings and find out what kind of factors influence on theses interaction patterns in Korea.

Building from these findings, I use sociocultural theory to explain how certain factors may support or limit students' engagement in science classes of Korean high schools. My goal for conducting this research is to offer an alternative perspective for thinking about how classroom practices enacted by Asian students in general, and Korean student in particular, may be shaped by structures in the life of a student at multiple levels. Some of these structures may be related to historical and social factors in Korean society and in the Korean education system, which may limit teacher and students from effectively enacting certain types of practices in the science classrooms. The findings from this research offer implications for how researchers, science teacher educators, and classroom teachers regarding the need to reframe how we think about student participation in Korean science classrooms which could help to improve the overall learning environment.

1.5 DATACOLLECTION AND ANALYSIS

In this study, I employ the theories introduced above as a means to focus my data collection, analysis and interpretation in that I will focus my attention on identifying schema and resources available in classrooms. Of particular relevance to this study are activities in the science classroom where teachers engage students in teacher student and peer-peer discourse, as well as activities requiring student participation in whole class and small group reading, writing, drawing or talking. Using sociocultural theory, I can investigate how science teachers support students to access and make use of resources, such as the laboratory materials or texts, through their discourse. By analyzing students' actions and interactions, I will learn how students appropriate resources to support their learning in science. Such knowledge will allow me to consider how student and teacher participation is structured by rules and expectations for social interactions in science classrooms. By observing and analyzing typical interactions in two high school science classrooms, I will focus my data collection and analysis on understanding how observed rules and beliefs about participation are connected to culture in Korean classrooms.

1.6RESEARCH QUESTIONS

Using sociocultural theory as a lens for thinking about how teacher and student agency in science classrooms are limited or supported by structures at different levels in society, I used the following questions to guide my research:

1. What are typical patterns of interactions between teachers and students and students and their peers in science classrooms in Korea?
    a. How often do participants engage with one another in small and whole class discussions?

b. How do characteristics of interactions change dependent upon the participants (ie., gender differences, achievement levels of students, interest in the subject, etc.)?

c. How do characteristics of interactions change dependent upon the context (ie., seating position, activity, content being explored, time, etc.)?

2. What beliefs do teachers have about their role in structuring social interactions during science class?
3. What beliefs do students have about their engagement in social interactions during science class?
4. What rules (schema) regarding appropriateness or expectations for interactions can be identified based on observable actions of teacher and students?
5. What are student preferences regarding interactions in science classrooms and how do their understanding of the rules and expectations for engaging limit or afford their participation in small group and whole class interactions?

1.7CONTEXT OF THE STUDY

In this section, I describe the context in which the data was collected. The school was founded asa public high school in 1976 and located inthe suburbs of Seoul. It was originally started as a boy high school and changed into a mixed school in 2003.Data for this study was collected from two science classrooms in a public high school which could be regarded as a typical high school in Korea. From now on, I will call this highs school as 'M high school'.Mhigh school is located in a socioeconomically depressed neighborhood in the suburbs of Seoul, which is a megacity with more than 11 million inhabitants. M high school serves approximately 1500students in grades 1-3. The student population is fairly

homogenous with regards to race and ethnicity. In addition, about 20% of the student population is eligible to receive government assistance in the form of basic living subsidies, meaning those students are living at the poverty level.

As this study involved direct contact with minors, the Institutional Review Board (IRB) of Seoul National University monitored all procedures, including teacher and parental consent and student assent processes and data collection. I provided all required documentation to parents, students, and the teacher prior to start of the study and the researchers orally explained all ethical issues to the teacher and to student participants before commencing the study. In accordance with guidelines for conducting ethical research, I use pseudonyms for the name of the school and for all participants in the study.

1.7.1 Participants

This research took place over a 12-weekperiod. I collected data fromfive lessons observed and recorded in 2 classroom (n=10 lessons). Additional data included survey responses from 60 students regarding learning preferences and interviews with selected participants using short video clips edited from recorded lessons to stimulate participant recall while discussing various student engagement patterns identified by researchers.I introduce all of the research participants in this section.

1.7.1.1 Teacher

This study took place in two sections of 10th grade physics class taught by a science teacher T, a veteran teacher with 8 years of physics teaching experience at the high school level. T holds abachelor and master degree in Physics Education. He is also taking a doctoral course with interests in Korean science curriculum and shows a cooperative attitude to help my research. At the time of the study, T had been working at M high school for 1 year. Hiring and placement policy in Korean public

school requires that teachers move to a new school site once every four or five years. As a result, M high school is T's third public school assignment.

1.7.1.2 Students

Two science classes of 10th grade had 31 and 29 students at each section and a total of 60 students gave consent to participate in the video recording of the science classes and take the survey (See Table 1). Of the 60 students who consented, 31 were boys and 29 were girls. All students ranged in age from 15 to 16 years.

Table 1 Student participants for each source of data collected.

Data Collected	Boys	Girls	Total Number
Survey Responses	31	29	60
Recorded Observations	31	29	60
Video Recall Interviews	10	11	21

In this thesis, I focus my attention to describing the conditions and experiences impacting science learning for all students who participated in both the video recordings and surveys, but I focus special attention on 20 students who also participated in interviews (including 10 students (5 boys and 5 girls) from one class and 11 (5 boys and 6girls) from the other class).

1.7.1.3 Researcher

In this study, I participated as a classroom observer and I collected all of the data and conducted all of the data analysis and interpretation. As such, I bring an emic or insider perspective to this study. Drawing from my experiences and understandings about science teaching and learning and culture, I engaged in on-going interpretation and analysis of the data.

1.8 OVERVIEW OF THE THESIS

1.8.1Chapter One

In the first chapter, I begin with a description of problem. Next, I briefly introduce the context of the study and I delineate the purpose and the questions of the study.

1.8.2 Chapter Two

The second chapter describes the methodological and theoretical framework for the study. This study was conducted as interpretive video ethnography. In this chapter, I describe the research methods and I introduce and describe what data was collected and how it was analyzed using a sociocultural lens.

1.8.3Chapter Three (Short chapter 1)

In this chapter, I describe typical patterns of interaction and 4 categories of students, participatory and discursive,participatory and non-discursive,non-participatory and discursive, andnon-participatory and non-discursivepatterns. I describe some patterns from data and some contractions. And raise questions about these students.

1.8.4Chapter Four (short chapter 2)

In this chapter I describe in greater detail how I used the structure/agency theory and I introduce levels of analysis (using macro, meso, micro) to show how this theory can be useful for thinking about how teachers can change structures to expand possibilities for participation. I talk about this this can help important for improving school engagement, participation, which may be translated into interest and enjoyment. I do this by sharing a story of a single student.

1.8.5 Chapter Five

In the concluding chapter, I re-examine the findings of this study and I offer implications for policy, teacher education, and researchers about how to improve student participation. Finally, I suggest the ways in which more researchers can examine education issues about classroom interactions in science classes in the Korean cultural context, and education stakeholders at each level can organize education strategies in a more culturally adaptive way.

1.9 CONCLUSION

In this chapter, I have described problems associated with participation and engagement in science classrooms in Korea and general issues related to research around this topic in science education. I also introduced the concept of structure agency dialectic, which will be used as a theoretical framework for conducting analysis of data in this study. I have tried to highlighttypical patterns of classroom interactions existed in the science classes of Korea and how these classroom interactions examined with the socio-cultural theory as a lens.

In the following chapter, I will describe the methodology and theoretical framework to introduce how these are applied in the school site to investigate students' interactions. I will also describe the process of this study and how this process is carried out while collecting proper data from diverse source.

CHAPTER 2

METHODOLOGICAL AND THEORETICAL CONSIDERATIONS

This study employed a multiphase mixed-methods design in order to explore factors that affect student participation in Korean science classrooms. The study included both quantitative and qualitative data gathered concurrently and sequentially. The quantitative survey data was collected and analyzed to support and expand what I learned from my qualitative analysis of classroom observations and participant interviews. My analysis relied on an interpretive research paradigm to help me explore and document student participation practices in the classroom.

2.1 METHODOLOGICAL FRAMEWORK

2.1.1 Qualitative research

In this study, I used qualitative method to analyze collected data from observation of students' interactions in the science classes and interview with some interesting students.Qualitative research is a situated activity that locates the observer in the world.It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series ofrepresentations, including fieldnotes, interviews, conversations, photographs,recordings, and memos to the self(Denzin& Lincoln, 2005). Qualitative method is more useful to inquiry problems related to human and social issue because qualitative research begins with assumptions, a worldview, the possibleuse of a theoretical lens, and the study of research problems inquiring

intothe meaning individuals or groups ascribe to a social or human problem(Creswell, 2007).Qualitative research today involves closer attentionto the interpretive nature of inquiry and situating the study within thepolitical, social, and cultural context of the researchers, the participants, andthe readers of a study(Creswell, 2007).

2.1.2 Mixed method approach

The concept of mixed method probably originatedin 1959, when Campbell and Fiskeused multiple methods tostudy validity of psychological traits. They encouraged others to employtheir 'multimethod matrix'(Campbell& Fiske, 1959) to examine multiple approaches to datacollection in a study. This prompted others to mix methods, and soonapproaches associated with field methods such as observations andinterviews (qualitative data) were combined with traditional surveys(quantitative data) (S. D. Sieber, 1973). Recognizing that all methodshave limitations, researchers felt that biases inherent in any singlemethod could neutralize or cancel the biases of other methods. Triangulatingdata sources-a means for seeking convergence across qualitativeand quantitative methods-were born (Jick, 1979). These reasons for mixing methods have led writers from around theworld to develop procedures for mixed methods strategies of inquiry andto take the numerous terms found in the literature, such as multimethod,convergence, integrated, and combined andshape procedures for research (Tashakkori&Teddlie, 2003).

2.1.3 Ethnography approach

An ethnographer is interested in examining shared patternsof behavior,beliefs, and language, and the unit of analysis is larger than the 20 or so individualsinvolved in

a grounded theory study(Creswell, 2007).Ethnography focuses on anentire cultural group. Granted, sometimes this cultural group may be small(a few teachers, a few social workers), but typically it is large, involvingmany people who interact over time (teachers in an entire school, a communitysocial work group)(Creswell, 2007). Ethnography is a qualitative design in which theresearcher describes and interprets the shared and learned patterns of values,behaviors, beliefs, and language of a culture-sharing group (Harris, 1968).

Ethnography approach is often accompanied with video recording to observe participants to examine their behavior such as students'interactions in the classroom. As a process, ethnography involves extended observationsof the group, most often through participant observation, in whichthe researcher is immersed in the day-to-day lives of the people and observesand interviews the group participants. Ethnographers study the meaning ofthe behavior, the language, and the interaction among members of theculture-sharing group(Creswell, 2007).

2.2THEORETICAL FRAMEWORK

Much of the research in science education that explores the impact of culture on learning has been conducted in diverse learning environments where under-achievement and lack of participation by minority students was the focus. In these studies, researchers have identified differences in culture, language, ethnicity, socioeconomic class or gender to explain why different patterns of achievement and participation occur between various student groups in science. Often, when researchers used "culture" as a lens for explaining difference, they failed to articulate how they defined the concept. In this section, I define culture as I use it in this study and I describe how I use this definition to support analysis of structures that shape teacher and student agency in Korean science classrooms.

2.2.1 Defining Culture through a sociocultural lens

Using the word of culture in life is familiar with people in a certain society but the conception of culture has not been considered much among people who use that term in their daily routine. Sometimes, such a familiarity keeps people from understanding social phenomena exactly.Awell-known sociologist, Simmel (1971)referred to culture as 'the cultivation of individuals through the agency of external forms which have been objectified in the course of history'. Culture in the sociological field can be defined as the ways of thinking, the ways of acting, and the material objects that together shape a people's way of life. Culture can be any of two types, non-material culture or material culture.

In the same context, a classroom culture could be understood as collective and aconsistent way of behaviors and thoughts of students and also its products such as symbols and materials in a social field, i.e. the classroom.In the science classroom of M high school, students have shown a certain typical patterns of interactions according to environment of science classes, which could be viewed as a specific way of their behaviors. For instance, most students in science classes are devoting themselves to pay attention to the teacher's talk with their best energy and massive silence in the classroom. In contrast, they looked outgoing and sociable at the rest time before and after class, which are different from general recognition of western culture.

In the following section, I describe sociocultural theory as a theoretical framework in greater detail and how this method could be a useful tool to investigate such students' specific interactions in the science classroom

2.2.2 Structure agency theory

Using a sociocultural framework for examining science classes (Sewell, 1992;

1999; Bourdieu, 1986) science classrooms can be viewed as distinct social fields. These social fields are structured by *schema (rules, attitudes, and beliefs) and resources (material, human, and symbolic)*. Structures (schema and resources) within social fields afford or limit student and teacher agency (see Figure 4).

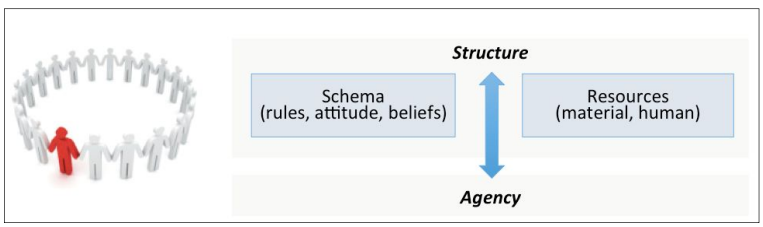

Figure 4. Schematic to describe how a field is structured by schema and resources, which in turn, shape the agency of individuals within the field.

Agency is defined as the ability to access and appropriate these resources to meet one's goals (such as teaching and learning science).A student's agency in a science class could be expained as a his/her ability to utilize proper metiral and human resources such as text book, experiment equinpments, teaching aid, laptop, teacher, and peer.

In the last decade, science educators have paid increased attention to sociocultural theory (Bourdieu, 1986; Sewell, 1992; 1999) as a useful framework for understanding culture as enacted practices. In this study, I employ the structure | agency dialectic to identify structures that afford or limit Korean students practices while teaching and learning science. Using this theory, I raise questions about the compatibility of science teaching strategies developed in one cultural context being effectively implemented in different contexts.

2.2.3 Using Structure and Agency for multi-level analysis of social life

A student's agency and related interaction pattern in the classroom is influenced and shaped by his/her multi-layered structures. Considering structures as layers of students' circumstance could be useful to analyze their classroom interactions in science classes as thinking the impact of each level of structure and relation between them.

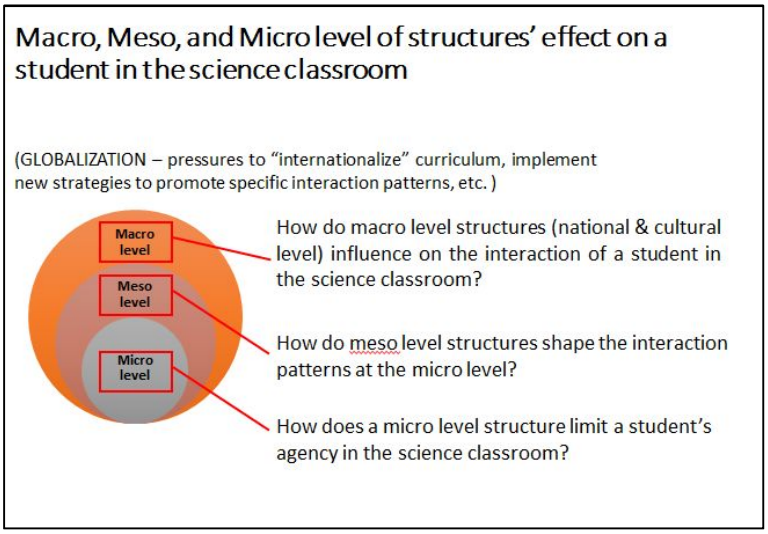

Figure 5. Multi-layered structures which impact on studentsin the classroom.

In this case, macro level of structures students have could be regarded as national and cultural level of environment which shape and impact their interactions in science classes. In the same way, meso and micro level of structures could be regarded as learning environment in a school and the classroom site respectively. Each structure is commonly and complexly influential on students' interaction patterns in a certain classroom situation and has relation between each other as affording and limiting together.

2.3DATA COLLECTION

This project is designed to take place in four distinct phases (See Figure 6), data collection, analysis, follow-up interview, and interpretation.

Phase 1 Observations and Classroom Data Collection	Phase 2 Analysis of Observational Data	Phase 3 Follow-up Interview with Classroom Participants	Phase 4 Student Questionnaire

Select Participants
▪ Select 2 high school science classrooms
▪ Consent teachers and parents
▪ Assent student participants
 	
Collecting video/audio data
• Use three stationary cameras and one hand-held camera to video record science lessons
• Capture 10 lessons during 2 week period
 	
Collecting ethnographic observational data
• Researchers took hand-written field notes while recording lessons
• Develop descriptions of classroom structure
• Describe science lesson content and activities
• Select descriptive vignettes of general practices of science teachers and students, focused on interactions
	Prepare Analytic memos from videos
	▪ Written in Korean
	▪ Description of the content, teaching strategies, and commonly enacted practices
	
	Micro level analysis of the video
	• Increase and slow the speed of the video to capture interaction patterns and individual and collective practices
	
	Collaborative analysis
	• Discuss analytic memos
	• Transcribe salient dialogue from vignettes and transcribe into English as needed
	• Identify structures and describe impact on student agency
	
	Editing clips for interview
	▪ Select vignettes representative of typically observed interaction patterns.
	▪ Prepare vignettes to present during interviews
		Select interviewees
		• 21 students (10 boys and 11 girls)
		• Consent students to engage in interview
		• Conduct interviews during break time and before after the school
		
		Stimulated Recall Interview
		▪ Audio or video record interview
		▪ Conduct interviews in Korean
		▪ Share short segments of the video with the participants
		▪ Ask participants to describe their practices and reasons for enacting the observed practices
		▪ Share the analytic memos from the recorded lessons and member check with participant regarding our interpretations
			Design and implement questionnaire
			• Prepare 42 general questions
			• Questions target student perceptions regarding
			  • the openness of the learning environment
			  • purpose of science learning participation practices,
			  • perceptions about teacher's expectations for participation
			  • preferences related to science teaching and learning strategies, and
			  • Seating preferences
			• Conduct survey with 60 students (31 boys and 29 girls)
			• Analyze results and consider findings

Figure 6. Overview of methods for data collection and analysis.

During *Phase 1* of the project, I observed and video/audio captured typical science lessons in two high school science classrooms. In *Phase 2*, I analyzed the videos using video analysis tools and traditional ethnographic observational tools to describe and identify structures that informed different patterns of classroom interactions. In *Phase 3*, I interviewed teachers and students to discuss the findings from our analysis and to expand our understanding by asking the teachers and students to a) discuss their perceptions of our analysis (member checking), b) to verbalize their reasoning for their individual actions captured in the video observations, c) to provide feedback regarding their individual preferences for choosing to engage or not engage in different types of activities, and d) to provide insight regarding their beliefs about the role of teachers and students in promoting positive and production classroom interactions during science lessons. Finally, in

Phase 4, I prepared a student questionnaire designed to access student perceptions regarding the openness of the learning environment, the purpose of science class, what it means to "participate" in school science, and their general preferences for engaging in different types of activities.

All data was collected over a 12-week period, and included field notes and classroom observations, video recording of 10 science lessons (5 per section), and analytical memos generated from analysis of video recordings of each science lesson. Additional data included survey responses exploring student participation preferences and interviews with 21 students using short video clips edited from previously recorded science lessons to help stimulate participant recall while discussing various patterns of student engagement identified by the researchers. In this section, I describe each data source and the methods used to collaboratively analyze the data.

2.3.1.Field Notes

As an observer, I did not have time to take detailed notes during the science class because I was recording interactions, but I did keep field notes, writing about the lessons before each class and reflections of the lessons after every science class and also after interviews. Figure 7 shows the field notes that I have used during the research. They were written in Korean or English. The reflections were written in Korean mostly to describe my observations in more in detail.

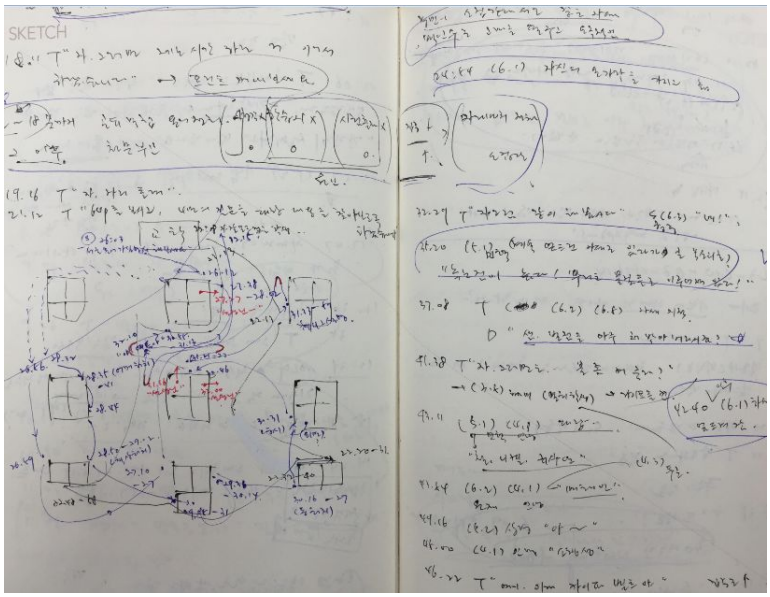

Figure 7.Method used to develop field notes for observations and to generate questions.

My field notes were created using traditional ethnographic methods. The notes contain sketches of the classroom structure, student seat arrangements, notes about the content of the lesson and a general description of the unfolding lesson plan. Field notes also described general participation patterns (i.e., how often individual students raised their hands, spoke in class, were called upon by the teacher, failed to engage, etc.) and reminders to examine the video at certain time periods for more detailed examination during video analysis phase. These notes often served as placeholders for video resources indicating the dates on which I should go back to review specific classes and interactions of interest. My recorded observations, reactions, and questions all served as a data resource.

2.3.2Video Data.

I captured the video data over a 2-week period, during which time I observed and

recorded 10 science lessons from each class for a total of 10 lessons. The video was captured using four camcorders, two of which were set to record from the front and left side and two were set to record from the back and right side. In addition, I used a hand-held camera to capture small group interactions. I used multiple camera positions in an attempt to capture as much detail about teacher and students' interactions practices as possible. The video data (about 35 hours of classroom recordings) was saved on a password protected hard drive that was stored in a locked closet when researchers were not accessing the data.

2.3.3 Analytical Memos.

After each class was recorded, I watched each set of videos (from all 4 camera angles per lesson) in real time (the meso level) to prepare an analytical memo. All memos were initially written in Korean. I watched each video, stopping to record time stamps and to write descriptions of individual and collective practices and salient discourse (participant utterances). Each memo included a general description of the content for each lesson (i.e., the solar system), a description about the teaching strategies that were implemented (i.e., small group activities, demonstration activities, whole class discussion), and specific notes to describe common practices students enacted (i.e., hand-raising, coming to the board to write, or putting head down on desk). Thus, memos focused my attention on describing actions and utterances.

The memos also prompted me to consider questions 1-3, which focused my attention on identifying schema and resources that could serve structures that either afforded or limited student agency. The memos also included space for providing evidence from the video data to answer the main questions. This required me to conduct a micro-level analysis of the video by isolating short segments of video

(30-180 seconds in length) and re-viewing these segments multiple times in both slow motion (viewing the video frame by frame at 1/30th of a second) and by increasing the speed of the video (2x, 4x, 8x).

Slowing the video reveals practices that occur too quickly to detect in real time (i.e., subtle gestures, such as students who lower or raise hands or turn their heads away from or towards a speaker, and facial expressions, such as, smiles, frowns, or arched eyebrows). In addition, when video is sped up, patterns can be revealed that are not easily seen in real time, including repetitive motions like pointing or patterns regarding how teachers or students walk around the room).

Time		Observations	Observer Comments and Questions
Start	*Finish*		
8:40		(Student (A) was **standing next to teacher's desk**)	What are the rules regarding student movement around the room (standing by desk, getting textbook from cubby or going to the restroom)? Are the rules explicit? Do the rules apply to all students?
	8:41	T: Text page 46. (One student (Y) is going back to get textbook) T: Student B, 44 쪽이야. 진성이도	
		(Students read and discuss passages individually and in small group)	What is the rule in the classroom and school regarding students putting down their heads during class? When teacher called his name, what was her expectation for his response? (Ask teacher in interview – show clip).
	9:04	**Teacher called (name of Student C)** who had his head on the desk and who has been looking off into space. He did not look up. (*See offprint from video showing Student C with head on desk in back row*).	**Structure and Agency**
		How long was his head down? Is this typical practice for him in science? In all classes? (Ask student in interview – show clip).	What schema do these practices reveal about the expectations for student participation? Can we identify contradictions to these practices? (For example, are there students who are not allowed to walk freely around the room or who the teacher does not acknowledge when their head is down?)
9:05			

Figure8. Offprint of analytical memo demonstrating time stamp, observations, and connections to research questions and analytical categories.

Initially the memos were all written in Korean, but when I identified important episodes from the videos, I transcribed dialogue from short segments into Koreanthen translated it into English. I used the memos to add off-prints from the video connected to the dialogue which I arranged in a data chart to support my

analysis (see Fig. 8 above for an example). During collaborative research meetings with my thesis advisor, Dr. Sonya Martin, the Korean transcript was orally translated into English and transcribed as notes in the memo. Comments and questions were also added to the memos at this time.

2.3.4 Stimulated Recall Interview.

Using the analytical memos and discussions from our research meetings, we selected short segments of the video (30-120 sec long) for simplified simulated recall interviews (Gass and Mackey 2000) which were conducted with 21 students and the teacher. In addition to being videotaped, many of the interviews were audiotaped by placing a recorder with a flat microphone on the desk in the center of the participants. During interviews, Ishared videos as prompts to help the participants recall the moment when the episode took place. Participants were then asked view the video and describe the practices they were enacting and reflect on why they were enacting those practices in that moment. Each interview lasted between 10-40 minutes, depending upon the content of the video to be discussed. In addition to the videos, transcripts and personal analytical memos from the science lessons were also shared with participants for member checking. All interviews were conducted in Korean and the interviews were also audio or video recorded to provide additional data.

2.3.5 Student Questionnaire.

In addition to observations and interviews, I designed a questionnaire that included 42 questions and that was administered to all of the students in the two sections. The survey asked general questions about students' perceptions about the openness of the learning environment, their relative preference for the use of different

science teaching strategies, their preference and perceptions about student seating, student participation, the purpose of science learning, and their perceptions about what their teacher values in a science learner. Thequestionnaire was developed to help me probe more deeply about some issues that emerged from the observations and interviews.

2.3.6 Research Meetings

My thesis adviser, Dr. Martin, and I had a regular meeting once or twice a week. We discussed the research that was done that week and exchanged ideas as I tried to make progress with the research. Some of the research meetings were also audiotaped and I took notes from the research.

2.4 METHOD OF DATA ANALYSIS

In this section, I will briefly describe how the data was analyzed for each data source. My analysis focused on describing typical examples of practices enacted by students in these two Korean high school physics classrooms. I focused my attention onidentifying structures that supported or limited possibilities for students to engage in certain types of participation during science class. In an effort to describe and explain patterns of participation, Ipurposefully selected data representative of patterns I identified across all of the data. To help organize my analysis of observed practices, I found that it was useful to consider the structural factors that supported students to enact these practices. See Table 2 below for a chart that clearly demonstrates my approach for analyzing the data for the different questions.

Table 2.Data sources for the study.

Focus Question	Video & audio data	Ethnographic observational data	Teacher interview	Stimulated Recall Interview	Survey questionnaire
What are typical patterns of interactions between teachers and students and students and their peers in science classrooms in Korea?	X	X	X	X	X
What beliefs do students have about their engagement in social interactions during science class?			X	X	X
What rules (schema) regarding appropriateness or expectations for interactions can be identified based on observable actions of teacher and students?	X	X	X	X	X
What are student preferences regarding interactions in science classrooms and how do their understanding of the rules and expectations for engaging limit or afford their participation in small group and whole class interactions?	X	X	X	X	X

Specifically, I considered how macro, meso, and micro level structures (consisting of schema and resources) either afforded student's to enact certain practices or how these structures might constrain or limit students from engaging certain practices. I also sought to uncover contradictions to these patterns by highlighting moments from the data that demonstrate how structures that expanded opportunities for active engagement for some students, failed to support other students to engage. In the following chapters, I share findings from my qualitative observational data and I incorporate excerpts from interviews with descriptive

statistical analysis of survey data to help me answer the questions that frame my study.

2.5LIMITATION OF THIS RESEARCH

As mentioned in this study previously, defining a culture as the way of thinking and acting and its productsthat shape students' interactions in the classroom, it could be much harder for me, as an insider ,to examine cultural phenomena in that site. At the first observation of science classes in M high school, I was bored with that nothing special happened to in the science class because everything occurred in that classroom is perfectly familiar with my prior experience as a science teacher in a Korean high school. However, for my professor who joined with my observation then, everything was full of interesting situations which come from cultural difference. Through continuous discussion with research members with collected data and analytic memo, I could have several meaningful findings from observations recorded. I could address issues of validity and reliability in my study through the following survey results and the interviews.

2.6 CONCLUSION

In this chapter, I tried to describe the methodological and theoretical frameworks that underpins my research and introduced the data of my research, context, resources, and analysis. Specifically I introduced the concept of qualitative method, mixed method, and ethnography as useful tools to conduct my research. I introduced a socio-cultural theory which explains the dialectic relationship agency and structure as a theoretical lens. I described how I applied it to answer my questions. In following chapters, I will show the results of my research by referring to my research questions.

CHAPTER 3

PATTERNSOF INTERACTION

3.1 INTRODUCTION

In this chapter, I share findings from observational analysis, survey results, and interviews with students to demonstrate that there are multiple forms of participation in Korean science classrooms. Specifically, I will describe four forms of participation that are readily observable through traditional ethnographic research means and I will also highlight the limits of observational tools by discussing a form of participation that was revealed through student surveys and interviews – and is also identifiable through microanalysis of video captured classroom interactions. In this chapter, I examine what it means to be a non-discursive student who is also participatory.I conclude this chapter by raising questions about the limits of current classroom interaction research that prioritize "talk" as a form of participation. I offer implications for science education research and teacher practice in Korean classrooms.

3.2 ANALYSIS OF CLASSROOM INTERACTIONS

When a teacher is instructing his science class, diverse interactions between teacher-students and between a student and their peers occur in the classroom. Diverse interactions in the classroom could appear as verbal or nonverbal exchanges among classroom members. Many researchers have been interested in the classroom interaction and some of them tried to analyze classroom interactions

in the way in which they tried to quantify teachers and students' interactions during classes. One of the most famous researchers, Ned Flanders (1961), examined classroom interactions and was concerned with how to organize information about the teacher's spontaneous verbal behavior and how to incorporate this information in a program of in-service training. He classified interactions into 10 categories, which roughly consisted of two parts, teacher talk and studenttalk. His work has been referred by other researchers, including Korean education researchers, and has been applied in similar ways to analyze classroom interactions all around the world. Most studies of classroom interactions share three commonalities: 1) the researchers always regard talk as the most important action because talk generally activates classroom interactions between teachers and students; 2) the data they collected for analyzing classroom interactions was all 'observable' data, meaning it focused ontalk; and 3) the research has mainly focused on quantifying classroom interactions.

Each of these commonalties speaks to a limitation of this kind of research. For example, as classroom interaction research has been particularly influenced by Lev Vygotsky's work (1962) on thought and language, researchers tend to emphasize the importance of social interaction as evidence oflearning in these studies. As a result, talk is highly valued. Second, as only visible data can be collected andby the researcher in the classroom - other forms of data that the researcher might miss during classes cannot be used. So if the research prioritizes talk over gestures, the researcher may ignore body language, facial expressions, etc. Finally, researchers tend to focus on identifying the kinds of pattern that exist, how often they occur, and what kind of implications result from these interactions. Some of the research has been limited in interpretive value and has failed to engage participants in providing their own interpretation of their actions.

Likewise with classroom interactions, much research related to class participation serves to distinguish actions and talk, such as classroom discussion (Burchfield, & Sappington, 1999), talk, verbal load (Karp &Yoels, 1976), comments, responses to oral questions (Cross, Frary& Weber, 1993) and loquacity. Much research that has referred to classroom interactions and classroom participation or engagement did not put much stock in distinguishing between those conceptions when handling with those issues in the classroom. However, because more of the classroom research focuses on describing cases where students actively engaged in the classroom, we have limited knowledge about students who do not participate in class.

3.2.1 Assessment of classroom participation

There have been lots of efforts in which researchers try to evaluate students' participation in the classroom in diverse ways. In this process, rubrics and other guidelines have been suggested to provide details of performance expectations, and include a range of marks for levels of class participation. Rubrics are explicit, structured criteria used for assessing and scoring a particular type of performance. Teachers specify assignment expectations by identifying parts and detailed descriptions of those parts (Stevens & Levi 2005). Decreasing student anxiety and adjusting study habits accordingly when their class participation is marked regularly and consistently, establishing explicit performance criteria to evaluate class participation was recommended (Lyons, 1989; Bean and Peterson, 1998).

Craven and Hogan (2001) suggested factors which consist of communication, sharing sources and resources, openness to learn, respect, acceptance and provision of constructive criticism, material preparedness, academic preparedness and class presence. They assessed classroom participation

in accordance with that factors. However, using rubrics and guidelines to evaluate students' participation in the classroom has not been accustomed to the classroom situation in Korea so far. Many teachers in Korea have difficulties to evaluate classroom participation in the science classroom and they pointed out that the biggest problem is perfunctory evaluation habitus or system as well as the absence of valid evaluation (Kwak& Choi, 2005).

3.2.2 Analyzing interaction patterns during science class in typical Korean high school

In this situation, I tried to find out what typical patterns of interactions exist between teachers and students and students and their peers in science classrooms in Korea. In that effort to get an overview about how typical Korean high school students participate in science classes, I analyzed a science lesson recorded according to the amount of talks and actions they made as other researchers mentioned previously. There could be diverse interactions between teachers and students and peers to peers in the science classes.

To make it simple, I organized these interactions during observation as observable and non-observable. In this analysis, I focused on the observable data I could catch during observation to quantify their interactions. Theses observable data mainly consist of two parts, students' action and talks which I could identify during observation even though some of them I could not distinguish what the students intend with them.

In the case of participation, the purpose of their actions and talks was the standard to determine whether they are regarded as participation or not. To determine the intention of the students' actions and talks in the science class as their participation, what the students mean by their actions and talks should be

verified and the intention should be pedagogic at the same time.

Table 3. Categories for analyzing student participation

Category	Form of Participation
Student talk or utterances	utterances during presentations, while asking questions, offering comment, responding to teacher questions, responding to peer's comment or questions related to science class.
Student Gestures	raising hand, any action taken to support the teacher's instructional activities in class (ex., turning page in book, passing papers)

Some verbal data and actions students made in the class are observable but hard to recognize their actual meaning and I excluded those data from students' participationin that case.

As mentioned previously, many researchers asserted the importance of talks in science classes and they believed discourse, which they made during classes to communicate with teachers, and students make them participate in classes more actively. Therefore, I checked students' talks, which is observable during the class without regard to whether they include to participation or not.

3.2.3 Four types of students

I observed that the number of turns at talk all students made during the class was 238 times. The average number (8.2) of students' talks was gained by dividing with

the number of students (29). If a student made more talks in that class than the average, I treated him/her as 'discursive' in the science class. In the same way, I identified some students as 'participatory' students who show their participation with their talks and actions related the science class as the standard established. The results are shown in Table 4.

Table 4. Four types of students.

Non-participatory and discursive = 20.1%(6)	**Participatory and discursive = 13.8%(4)**
Non-participatory and non-discursive = 48.3%(14)	**Participatory and non-discursive = 17.2%(5)**

At a glance, we could find out that there are not much participants during science class in typical Korean high school. Most students (48.3% of students) in that class positioned at 'non-participatory and non-discursive' section as most western researchers think about stereotype of Asian students. However, my analysis has lots to reconsider of weak points to interpret actual participation of typical Korean high school students.

First, all data was analyzed with observable data, which means non-observable data was exclusive to analyze their classroom interactions. Second, this analysis was conducted with distinguished data among observable data, which means some observable data could be ignored when they could not be verified. Third, even some distinguished data could be missed if they are not clear with the standard established.

These problems in this analysis related to several limitations in the process to conduct this analysis in the way of quantifying students' interactions in the

classroom. For example, camera could not catch all the discourse and actions of students in the classroom clearly though there is a possibility that some of them could be significant data to understand their interactions. The physical limitation of the researcher's ability to analyze is also another problem in the process of this analysis. The guarantee about the perfect objectivity as a human to analyze a social phenomenon is always impossible. The condition of the observer could be influential to determine what kind of data is selected. We could say the researcher as observer also interact with the object he/she has to examine.

Most important issue in this study is the consideration in the socio-cultural perspective to analyze classroom interactions. There must be a distinct limitation to look through the inside their classroom interactions between teachers and students in a specific cite, a typical Korean high school with this method. Interactions and their participation patterns with their discourse could be appeared as the different forms in each social level – individual (micro), peer or family (meso), and cultural or national (macro) level. For, example, a common response '네 (yes)' could imply diverse meaning depending on such as who says, what kind of relationship is established, and what cultural and historical background they have. In that aspect, it is impossible for the researcher to get exact understanding about classroom interactions of students who are placed in a specific social field during observation.

3.2.4 Investigating classroom interactions with surveys and interviews

To get a better understand Korean high school students interactions in a specific situation, in this research, I conducted surveys and interviews twice for 60 students who participate in the research. At first survey, I asked them 39 questionnaires to look through their general conception about learning environment they have such as the atmosphere of science classes, teaching-learning methods, participation

patterns, and the purpose to take science classes, preferences for science, and the belief for science classes.

In questionnaires at the first survey which ask their conception about participation and the amount of talks according to the type of class, I found out several interesting points to consider the hidden meanings from their responses and the relationship between them. First, they answered at the medium of most questionnaires in the survey, which means they have a kind of tendency to avoid extreme responses such as 'never and strongly agree' to a certain opinion and also it is related to social norm about that 'the best way as a man of virtue is to keep moderation'. Second, the tendency of responses between participation and discourse during science classes are different from each other according to the type of classes. This result is different form the common expectation in which westerners believe that the more talk, the more participation in science classes. Third, more students answered they are participating harder than students who answered they talk actively during science classes. It means they believe they are participating in science classes in the different way in which they make discourses such as giving their opinions, presentation, and answering to teacher's questions.

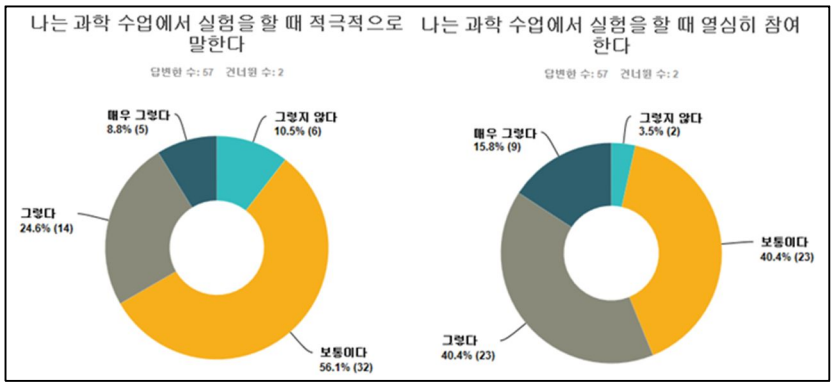

Figure 9. Results of questionnaires which ask the amount of discourse (on the left diagram) and participation (on the right diagram) in the laboratory type of science

class.

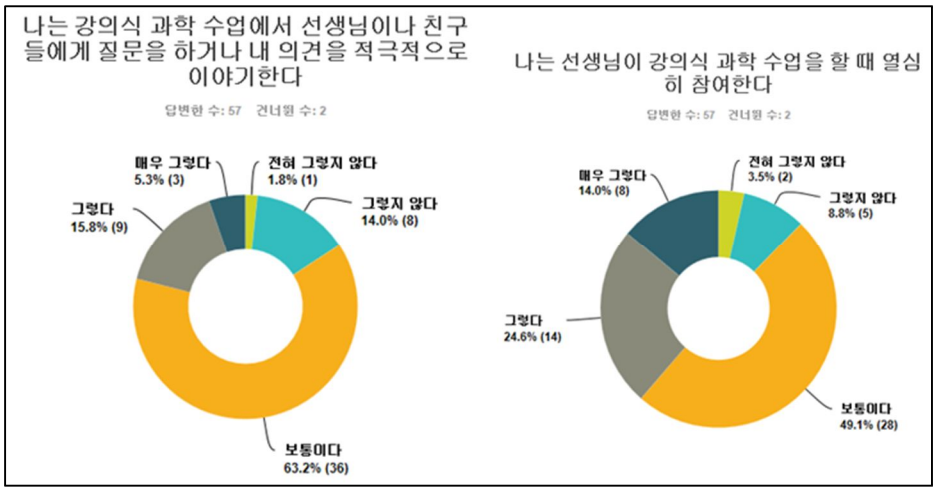

Figure 10. Results of questionnaires which ask the amount of discourse (on the left diagram) and participation (on the right diagram) in the lecture type of science class.

3.2.5 Modifying survey to examine student perceptions of participation

By analyzing the student responses, several curious points were revealed could not be detected from classroom observations because it is possible that students' internal thoughts and their externally observable actions are not always matching.

Subsequently, I became more curious about students' conception of participation in science classes and the relationship between the amount of discourse a student participated in and the degree to which they were participating. Therefore, I modified the survey to ask a few more key questions. I made the second survey without a 'medium' scale so it only had a 1- 4 Likert scale (strongly agree, agree, disagree and never) because student responses on the first survey revealed a tendency to choose medium at most questionnaires.

Table 5. Excerpt from in the second survey items

These statements ask you to reflect on how you think and feel about your participation in class.		Never	Disagree	Agree	Strongly Agree
11	I speak often during science class.	①	②	③	④
12	When I speak in class, it is related to the science content about which we are discussing.	①	②	③	④
13	I like science.	①	②	③	④
14	I like science class.	①	②	③	④
15	I participate hard in science class.	①	②	③	④
16	How much a student says in class could be different depending on where they sit in the classroom.	①	②	③	④
17	I am more likely to speak in class if I am sitting near my friends.	①	②	③	④
18	I am more likely to speak in class if I have a strong relationship with my teacher.	①	②	③	④
19	I tend to speak less in class if I feel tired or sleepy.	①	②	③	④
20	How much I speak in class differs depending on the class I am taking.	①	②	③	④
21	Male students tend to speak more than female students in science class.	①	②	③	④

These survey questionnaires might seem to be general to ask the students' conceptions about talks and participation in science classes.

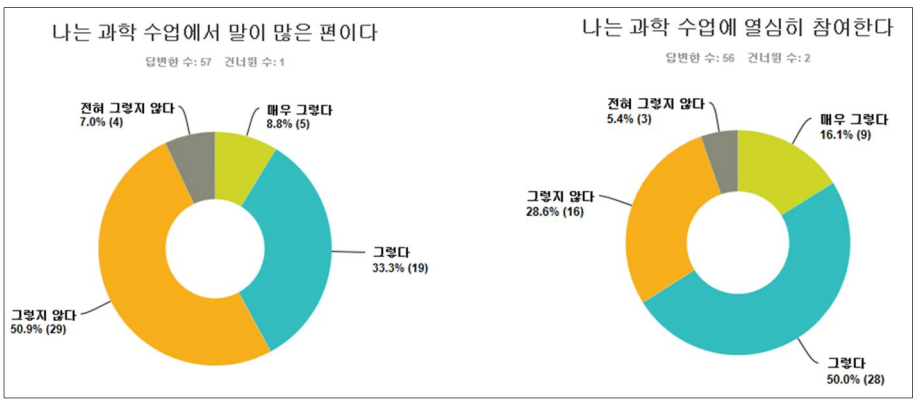

Figure 11. Results of questionnaires which ask the amount of discourse (on the left diagram) and participation (on the right diagram) in the science class.

However, as seen in Figure 11, if we concentrate on two questionnaires Q11 and Q15, we could investigate their conceptions about talks and participation and compare with the typical conceptions in western cultures. The responses of these two questionnaires from 58 students who participate in this survey are as follows:

In the left questionnaire to ask the amount of discourse students make, more students (57.9%) answered that they do not have much discourse during the science class, but in the questionnaire to ask students' participation in the science class, much more students (66.1%) answered that they are participatory in the science class. This result suggests a possibility of a non-discursive and participatory interaction in the science class, which is not corresponded with general concept that participation is related to active talk and action.

Following Table 6 provides student self-reported data which asked students to describe their participation practices in science class.

Table 6. Four types of students according to response in the second survey.

Non-participatory and discursive = 3.6%(2)	**Participatory and discursive = 38.2%(21)**
Non-participatory and non-discursive = 30.9%(17)	**Participatory and non-discursive = 27.3%(15)**

While the results of Table 6 may seem similar to Table 4, the data actually reveals the opposite results. Table 6 shows 65.5% of the students regarded themselves as participating in science classes hard. This result is contradictory to what I expected based on my observation of student practices in the science class. In addition to a higher percentage of students rating themselves as being both participatory and discursive (compare the two percentages), about 1/3 of all respondents (27.3%) also considered themselves to be 'non-discursive but participatory students' in science classes. Meaning students identified as being 'quiet, but participating'. These results imply the possibility of another form to see participation pattern in Korean high school.

If the researcher who assert talks play important role for students to participate in science classes saw these results, they would feel strange with theses answers. Less students (42.1%) answer that they are discursive in science classes, but more students (66.1%) answer they are participate in science class hard. In the aspect of western researcher's opinion about discourse and participation, each response has to show proportional result to another. In other words, less talk mean less participation in science classes in Korean high school science classrooms. These results also mean that there are some students who regard themselves as quiet students but participate in science classes hard. I traced each participant's answer in this survey and how they answer these two questionnaires together.

Recently, some researchers challenged the traditional conception of

students' participation and suggested different types of participation. For instance, faculty and student definitions of, and preferences for, participation in classroom discussions are not always harmoniously aligned (Dallimore, Hertenstein, & Platt, 2004; Fritschner, 2000). By reframing student engagement as a more complex and dynamic concept, both oral participation and silence can be seen as possible components. Engagement, therefore, avoids the binary logic that silence and orality are opposites and, instead, recognizes that active participation with course content can occur in silence (Meyer, 2009)

3.3INTERVIEWS

I developed interview questions to help reveal students' conceptions of participation and discourse in science classes. I conducted interviews with some interesting students during observation to find out how they define and think of the conception of participation in science classes. At these interviews, I asked those students the same question, 'How do you think about participating hard in the science class?' Interestingly, all the students in interview have the common conception, participation is listening, rather than answering that participating is talking and acting instead.

Interview with JW

Researcher:	Do you think you are participating in the science class?
JW:	I think I just **listen well**
Researcher:	Do you think listening hard means participating hard?
JW:	I don't know well.
Researcher:	I am wondering why you think like that.
JW:	I think **listening hard means participating**.

Interview with JY

Researcher: What does it mean by not participating well?
JY: It means not **listening**

Interview with HH

Researcher: How do you think about the attitude to participate in the science class hard?
HH: I think that is **listening** to contents in the science class hard.

In the interview with JW, JY, and HH, they have a common conception of participation that the participation in the science class means listening to the teacher's talk. It suggests that the action of listening is normally regarded as a typical type of participation during science classes in a typical high school in Korea.

Interview with HJ

Researcher: What kind of student do you think is participating in the science class hard?
HJ: A guy who is participating hard.
Researcher: So what?
HJ: **Make some question to ask, participate, and listen first**.

In the interview with HJ, she shows a little different opinion in which she considered more complex type of interactions, questioning, participating, and listening, as the participation in the science class. Interestingly, she is well known as a student who makes lots of questions in the science class among students in the classroom. However, she also emphasized on that the listening is the most important interaction in the science class.

This result suggests that student thinking about forms of student

participation in science classroom in Korean typical high school differ from the way student participation is generally discussed in the literature. In addition, it is noticeable that this type of participation, listening, among Korean students is not only one of diverse patterns of classroom interactions but also the most important participatory pattern they have regarded. It shows the possibility that 'listening' as an interaction pattern has played important role for students to participate in science classes in typical Korean high schools and has been hard to be identified as an interaction pattern simultaneously because it does not make sound and action. Listening during classes should be distinguished from being silent and doing nothing even though students who listening during classes are shown as not doing anything.

3.4 VIDEO MICROANALYSIS OF INTERACTIONS

Besides looking through students inside with surveys and interviews, we can get a hint of an evidence to see students participate in science classes without much talks and actions in careful observation. Apart from the aspect to see participation as talks and actions, we could see other things of students interactions such as eye gaze, head nodding, appropriate response to directions (e.g. turn to page 42) and taking notes during class. These gesture and small actions are accompanied with students' careful listening during classes. If I counted these all interaction at the former observation to examine students' participation, the result about students participation pattern with their discourse would be changed and be close to the students' answers about their conception about participation. In different way, we could recognize their non-discursive participation during science classes at a specific moment.

Figure 12. Heading up of many students in the science class after listening to the teacher's unexpected talk.

These two vignettes are taken at the almost same time but show some different points that students' heading up after the teacher's unexpected talk. In the second picture, at least more than 15 students who are looking up are checked when the teacher said something unexpected. This moment shows an evidence that these students are 'paying attention' to the teacher's talks and participate in that science class with listening. If only the first picture was shown to people, students in a science class in a typical Korean high school could be judged as in negative ways such as passive, static, quiet, non-energetic, and even appeared as lethargic. As taking an important clue with such a micro video analysis, we could reconsider the meaning of their static and non-discursive behaviors, which seemed non-participatory as another pattern of participation in science classes in Korean high school.

3.5CONCLUSIONS AND IMPLICATIONS

From these observation, observable interactions mainly mean the actions and discourses the class members made and some of them are what we could hear even though we could not recognize what they are. Thus, I tried to investigate and

identify students' classroom interactions in the science class of M high school according to existing standard. However, in the following surveys, interviews, and careful observation with video micro analysis, I verified the possibility of another type of participation, non-discursive and participatory interaction. Students believed that they are participation hard in the science class without active action and talk, which is different from general conceptions about participation. This classroom interaction could be identified with some evidences in video microanalysis as they showed that they were focusing on the science class while listening to teacher's talk.However, there is more to carefullyconsiderclassroom interaction patterns of the science class in typical high schools in Korea beside my findings. For, instance,head-nodding, writing notes, and simple utterance (네, 응) needs to be dealt with in the thesis – all are good examples of Korean student participation that are not typically valued as "good participation" in Western cultures. There are several forms of participation in typical Korean classroom – including one that does not involve discourse.

This finding suggests the need for researchers to re-consider how participation is defined (data on cognitive engagement or cognitive participation practices – cite this research). Maybe in Korea – need to consider this form of participation as more legitimate form of classroom participation. In the western educational context, which greatly influences science education pedagogies, participation is usually framed as "talking". Talking is privileged as the best way to engage with concepts, etc.

My research suggests that science pedagogies that do not recognized non-verbal forms of participation as relevant to learning or as legitimate ways to participate may not be well aligned to practices of Korean students. This situation should be rethink in the cultural context. In the following chapter, I will suggest

how this issuesshould be viewed properly in the socio-cultural perspective based on structure and agency dialectic perspective.

CHAPTR 4

APPLYING THEORYTO SOCIAL INTERACTIONS

4.1 INTRODUCTION

A specific interaction pattern which is non-discursive and participatory as listening and focusing on teachers' talk is identified in science classes in the M high school. These different patterns of interactions of students in science classes in this school are not regarded as strange or interesting, but as a common phenomenon. If it is true, what makes these differences in the patterns of classroom interaction including participation at a specific site?

4.2STRUCTURE AND AGENCY

The socio-cultural perspective (Bourdieu, 1986; Sewell, 1992; 1999) to review interactions between teachers-students and peer to peer could be appropriate way to see this situation in the local context that respect cultural norms and expectations for teaching and learning, and that are flexible enough to be responsive to the ways in which culture changes over time. In this chapter, using socio-cultural theory as a lens, I try to interpret their different interactions from common conception of participation, which are affected by the structures in their culturally different social field. In the sections that follow, I will try to find out what kind of factors in structures could affect a student in M high school and make him/her get a specific type of classroom interaction in a certain situation in the socio-cultural perspective.

4.3 SOCIOCULTURAL THEORY AS A LENS

An interaction pattern of an individual's agency could be affected by the structure, schema (rules, attitudes, and beliefs) and resources (material, human, and symbolic). The structure shapes a student's agency, which is the ability to access and appropriate these resources to meet one's goals such as teaching and learning science. Likewise, a specific interaction pattern a student has, non-discursive but participatory attitude at science classes in M high school could be understood from a structure and agency dialectic perspective. When a student is placed in a certain social field such as at a science class, in a general high school, and in Korea, his/her participation, which is related to his/her agency could be limited or afforded by structures he/she has. Building from this socio-cultural perspective, in, I attempt to subdivide structures the students have into three levels and find out how structures impact on their interactions in science classes and how each level of structure related to another. Figure 13 (below) represents the levels of questions that could be used to examine a students' classroom interactions related to each level of structures.

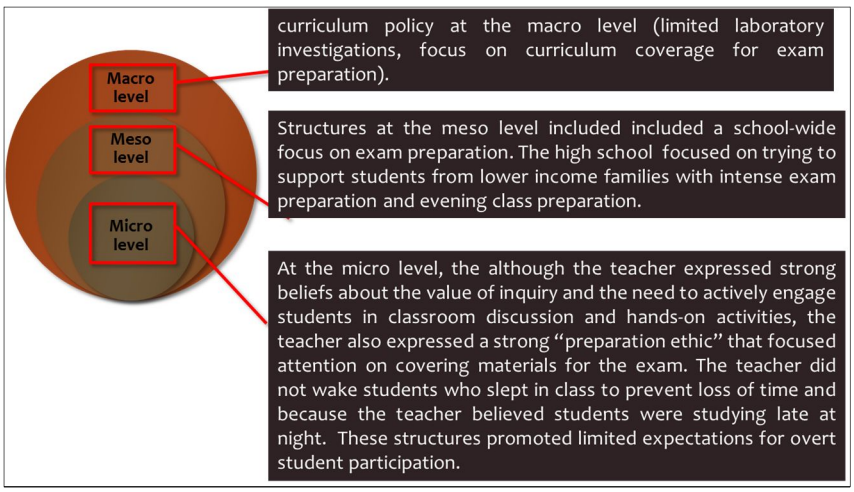

Figure 13. Structures at each macro, meso, and micro level in science classes.

For instance, assuming a student is observed as a silent student during that lesson, the researcher as observer could determine him/her as a student who has non-discursive attitude and could categorize him as a certain code. Subsequently, if a student who was quiet in the science lesson tried to make an eye contact with the science teacher, the researcher could code him/her as non-discursive but participatory. Sometimes, this work can help the researcher in that site to understand their interaction pattern and devise a better method to promote science education in a pedagogic purpose. However, is it enough to get understanding of a student in that situation? There might be more students who are silent but trying to participate in the class, but it is hard to say they are exactly all same cases because of their different background.

The patterns of classroom interactions are different from symptoms of diseases so cannot be dealt with giving those students the same prescriptions even though they appeared similar behaviors in science classes. These issues should be handled in more complex approach because that each student's history has formed in diverse pathways from multiple layer of circumstance chronologically. For instance, if there is a student who is showing lethargic appearance while cupping his/her chin with his/her hand and looking down at the floor during science classes, is it appropriate to judge him/her as a passive student who does not have any interest in science? It would be a jumping to conclusion if the reason why the student shows that appearance in that science class is investigated without his cultural and historical background – structures the student's has.

Figure 14. Student who shows different attitude according to different situation.

In this research, I considered their specific interaction patterns, especially non-discursive and participatory, in science classes at each level of structures-micro, meso, and macro which are classroom level, school level, and national or cultural level respectively.In particular, I will focus on a student, MS who has shown consistent silence during observation and interviewed as he was participating hard in the science class to examine what kind of factors he has in his structures impact on his a specific type of participation, non-discursive but participatory attitude, which is regarded as one of common classroom interactions in a typical high school in Korea. In this process, I will draw some data such as video, interview, and survey data to support interpretation with his story.

4.3.1 Why is he looking out of the window for long time?

MS is one of students in science classes I observed to investigate typical patterns of interactions between students and teachers. I did not consider him as a special case because he is one of typical students who do not have lots of talk and responses to teachers and peers and seem to be static as well as other high school students in Korea. Beside him, I could easily find other students who show similar attitude to

him and rather felt hard to distinguish individual differences among these students as a Korean researcher.

Figure 15. MS wearing gym clothes during the science class.

Many students were sitting down in their seats and trying to be awake and listen to the teacher's talk not to miss important information. The reason why I became more interested in him among these students was because that I frequently observed him wearing gym clothes during science lessons unlike the other students in the science class.

He hardly talks and instead he looks at the front without actual gestures and without moving while being silent. With this behavior in science classes, he was one of the interesting students who shows a typical classroom interaction in the M high school. During more careful observation for analytic memos, I found him looking out of the window for some considerable seconds from time to time.

43.04		MS looking out of the window (43.04-44.08, 44.58-46.35) ES looking into the mirror and combing

Figure 16.Analytic memo of MS and ES at a certain time.

In this analytic memo, he looked out of the window two times which are 64 seconds and 67 seconds each, and it is hard to see coincidences without any intention because he showed a different way in which he normally sit down his seat, look at the front without talk and action. After finding his unusual attitude in the science lesson, I paid more attention to him and looked through other science lessons more carefully focusing on him.

4.3.2 MS one day, every 5 minute

At the last science lessons I observed, I found out that he was appeared in a more different way in which he showed his displeasure while making a face, folding his arms, and looking down all the time at the science class. He continued this attitude and it seemed strange for him to maintain his posture in one way all the time during that science class.

Figure 17.MS's lethargic appearance one day, every 5 minute.

In the Figure 17, he had just two changes, which were putting his textbook on the desk after beginning bell and crossing his legs during the science class. This science class was organized as small group activities in which each group made a presentation with a theme, 'a planet in the solar system' that the science teacher asked them to choose by themselves in discussion with peers before that class. Being more careful to watch his behavior in that class, I made an analytic memo to check his behaviors in detail.

MS opening his shirt and putting his arms under the desk

04.47 pulling out his textbook

08.08 staring at the camera – 09.40 (1'32")

09.56 folding his arms

10.54 S: touching MS's shoulder and trying to transfer something

11.05 MS: pulling something from his pencil case and throwing it expressing annoyed with something

It drops in front of JW

Students: "Wow"

IS: "Hey, what are you doing?" to JW

T: "It is not his fault"

MS: No reaction

36.10 MS: folding his legs

37.08 T: approaching to MS and looking at him carefully "Are you ok?"MS: shaking his head

38.26 MS: looking down

4.3.3 The evidence of MS's not participating

As mentioned in chapter 3, I could find two moments which shows he was not participating in the science class with microanalysis of video as evidence.

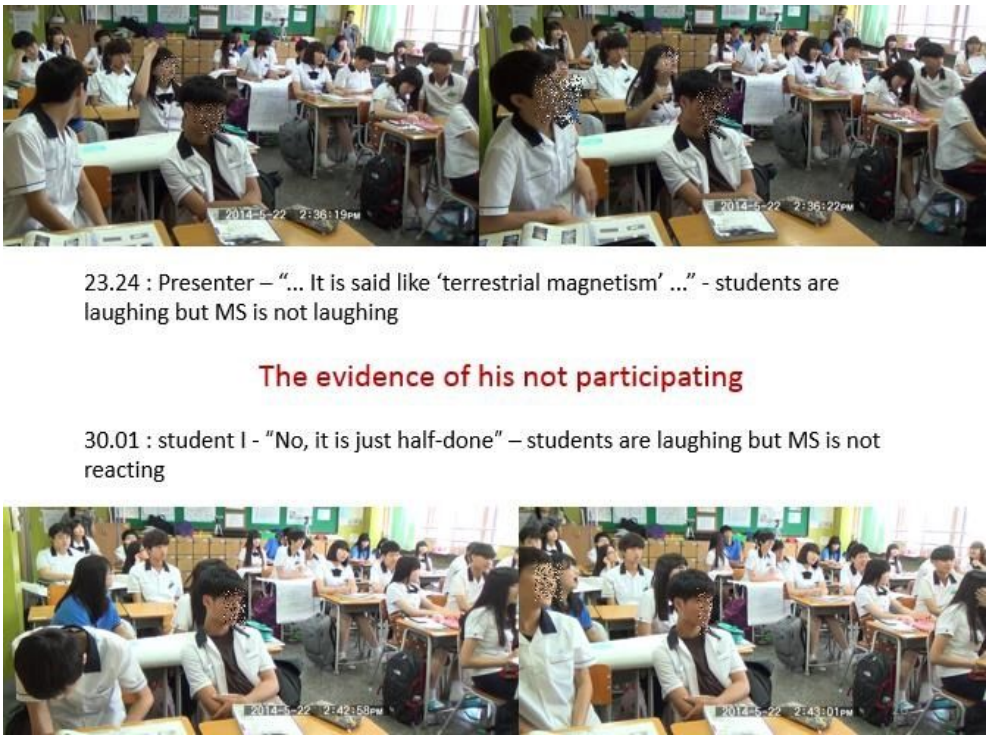

Figure 18. Evidence of MS's not participating

In addition to this micro analysis of video, I could find other evidence which showed he was not participating in the science class at that time.

23.24 SH(presenter): "It is referred as terrestrial magnetism..." Students laughing, MS no reaction

30.01 IS: "No, it is unfinished work". Student laughing, MS no reaction

32.43 MS: Not looking at the textbook when others looking at it

36.36 MS: Being expressionless when others laughing

After observing his these specific interactions, I was determined to retrace his video records in a more careful way and conduct additional interview with him. In that process, I investigated what kind of factors impact on forming his usual interaction pattern, being silent, looking at the front, listening and focusing on the science teacher, and being without talk and action, and also, what kind of factors influence on his unusual interaction pattern on that day when his making a face, folding his arms, and looking down all the time at the science class. In the following sections, I tried to analyze his behaviors and interpret his classroom interactions during science lessons from the data I collected such as video recorded, interview, and survey. In particular, I will try to explain his classroom interactions in the socio-cultural dialectic perspective in accordance with each level (micro, meso, and macro) of structure he has, which impact on his classroom interactions including the type of participation at each situation.

4.4 MICRO LEVEL OF STRUCTURES

In the classroom, many factors could impact students' interaction patterns while affording or limiting their agency which can make them utilize human and material resources they have such as their peers, teachers, the classroom, laboratory room, experiment equipment, text book, and teaching aid. In this context, as an example, I will handle MS's story that how his interactions have been shaped at each situation by his structure which consist of schema and resources. In this section, I examine his classroom interactions at the micro level of structure, which means in the classroom.

4.4.1 Seat position

MS's seat position in the classroom could be influential on how he participated in

the science class. I found him looking out of the window when he was sitting near the window. From this, I could interpret the seat position as a factor that could influence him not to participate in the science class.

Figure 19.MS looking out of the window

In the interview with him, he mentioned about his preference for seat position. He said he could participate in the science class better when he sit at the first row in the classroom because he could get a better situation with a good sight for lesson to listen to the teacher carefully.

R: Do you have any preference for seat positions?

MS: The first row

R: Why do you like sit there?

MS: Good sight for lesson

R: Okay, do you participate in science classes harder according to the seat position?

MS: When I sit at the first row.

In the survey with students, the seat position in the classroom turned out one of factors, which are related to the type of interaction in science classes.

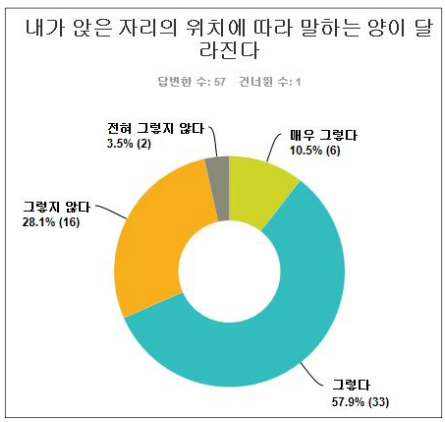

Figure 20. Result of questionnaire which ask the amount of discourse according to seat positions

In this survey to ask the relation the amount of discourse during science classes and seat position. Most students answered that the seat position could affect their talk in science classes and it also means their physical position in the classroom is influential in their classroom interactions during science classes. In the interview with some other students, there are no determined locations such as front, back, window side, and aisle side, which are directly proportional to the amount of their discourse. However, they have their own preferences about seat positions to feel comfortable, and these preferences related to other factors such as peers who sit around them, whether it is easy to avoid the teacher's watching, and whether it is good for concentrating on lessons.

Interview with ES

R: Do you think seat positions affect your participation?

ES: Not really, just I have some friends around me.

R: You think it is important who sit around you.

ES: However, not much

Interview with JY

R: What is your preference in seat positions?

JY: Window side.

R: Front or back side?

JY: No matters

R: Do you have any reason to choose that side?

JY: It's comfortable

Interview with SY

R: Do you think where you sit affect your participation in science classes?

SY: Not exactly, some students sleep at the first row but it is easy to be found by teachers

R: Do you think where you sit affect the amount of your talks in science classes?

SY: Not really, I don't make more discourse when I sit at the front seats.

Not all students in the science class prefer the front seats in the classroom like MS, but it is true they have their own seat preference related to diverse reasons such as the relationship with peers and teachers, that brings diverse type of classroom interactions during the science class.

4.4.2 The relationship with peers and teachers

As mentioned in the interview about the seat position, MS also said the relationship

with peers and teachers could impact on his participation in the science class as well as the seat position.

R: Do you have more discourse in the science class when you have close friends around you?

MS: If I have curious things to ask.

R: Do you like you have close friends around you during a science class? And, do you think it affects your participation or the amount of discourse?

MS: (No answer)

R: Ok, how do you think about the relationship with the science teacher? Do you participate in a science class harder when you feel more comfortable with him?

MS: Yes.

In the interview with MS, the better relationship with peers and teachers make him feel more comfortable and lead him to be more participatory in the science class. During observation of science lessons, I could not find his active motion and talk in science lessons but he recognized as he has a better situation to participation in the science class with the better relationship with peers and teachers in the classroom.

It is interesting that many students who interviewed about the effect about seat position on their participation and discourse said the relationship with peers around him/her during science classes is more influential in their classroom interactions. Also, the relationship with the science teacher is important to determine how they participate in the science class.

Interview with JY

R: Do you think it is affect you that close friends sit around you?

JY: It affects me much.

R: What kind of effect on you?

JY: If close friends sit around me, I have lots of talks with them, but if not, I only concentrate on the teacher's talk.

R: Do you think that adversely affect the participation in science classes?

JY: Yes.

R: Is there any good effect with close friends who sit around you?

JY: When I forgot to bring my pen.

R: For example, when you have a question to ask.

JY: It depends on whether they are hard-working students or not.

Interview with JO

R: How are you when you have close friend around you during science classes?

JO: I have chit-chat

R: Don't you talk about science classes?

JO: Sometimes

R: In that case, it is not about chit-chat but useful talk for classes?

JO: Yes.

R: Do you participate in science classes harder when you feel closer to the teacher?

JO: I don't participate more when I feel comfortable.

R: Why?

JO: When I feel free, I am not aware of the teacher's supervising.

Interview with SY

R: Is it important whether closer friends sit around me?

SY: I have no idea of closer friends. Maybe, I have more chit-chat with them. Now, talkative students sit at first and second row and hard-working students sit third and fourth row. I am sitting with hard-working students so feel tension during science classes

R: Do you think it is helpful to participate in science classes harder when you sit with hard-working students?

SY: It make me get tension during science classes.

R: How about the relationship with science teacher?

SY: It makes me more careful not to be pointed out by the teacher.

Even some students said that the closer with students and teachers, the worse effect on their participation in science classes, which is different from MS's interview. They believed that the more talks with peers and teachers during the science class because of the closer relationship with them interfere in concentrating on taking classes.

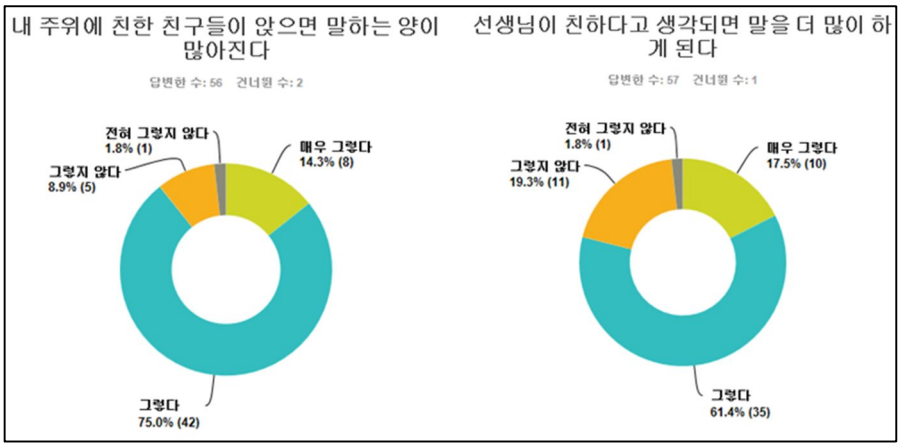

Figure 21. Results of questionnaires which ask the amount of discourse according to the relationship with peers around responder (on the left diagram) and the relationship with the science teacher (on the right diagram).

Such a tendency is continuously shown in the survey as they have more talks when closer friends sit around them and they feel comfortable with teachers. In the result, most students agreed with that the closer relationship with peers and teachers make them have more discourse in the science class but did not agree with that the closer relationship with peers and teachers make them to participate in the science class harder.

4.4.3 Type of class and classroom layout

MS's attitude according to the type of science class is more dramatic from his point of view. Retracing his interactions while observing video recorded, I could find out that he showed different appearance in accordance with the type of class and classroom layout.

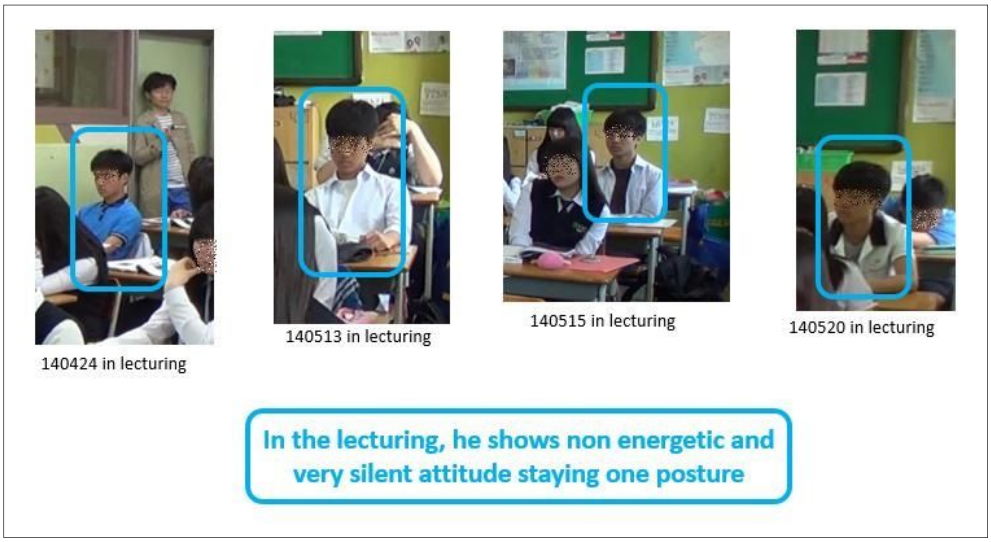

Figure 22.MS's attitude at the lecturing type of science class.

At a lecturing type of science class, his attitude has been alike in the same way in which he has shown silent and non-energetic attitude while looking at the front or down and staying one posture during the science class.

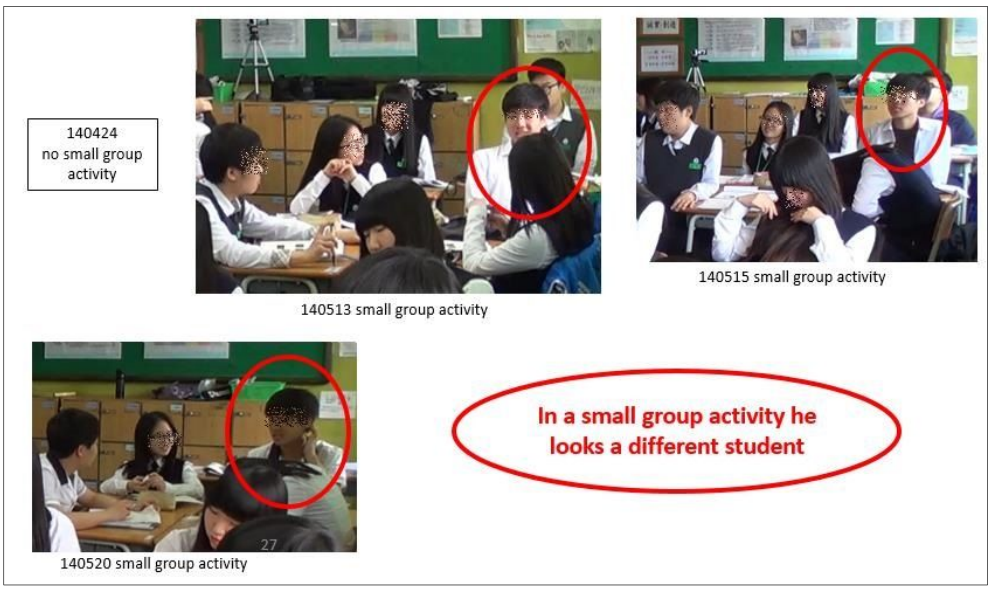

Figure 23.MS's different attitude at the small group activity.

However, in a different type of class such as a small group discussion, he had shown different attitudes in which he looked brighter and had more talk than in the instructor-led science class. I could not find out easily his another face which looks more active and outgoing because the time for small group activity had not been allowed much for them during the science class, that means most science lessons usually enacted as a lecturing type. The other students who could be found in Fig 19 also show similar attitudes to MS in accordance with the type of class, which means the type of class could be influential on students' classroom interactions affording or limiting their actions and discourse during the science class.

As the questionnaire which asks the amount of talks in science classes according to the type of class, the most students (56.1%) answered they make more talks in the laboratory type of science class, 21.1% of students chose the discussion type, 14.0% of students chose the lecture class, and only 8.8% of students chose the presentation class.

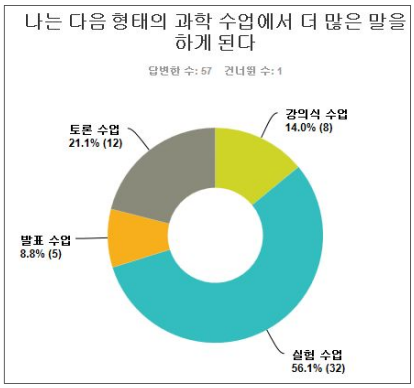

Figure 24.Result of questionnaire which ask the amount of discourse according to the type of class

This survey result in Figure 24 also reconfirmed this tendency that the type class could impact a students' classroom interaction patterns during the science class. The change in the type of science class normally accompanies with the change of classroom layout. Most science lessons I observed were enacted as a type of lecturing class, so their classroom interactions are limited at one position in the classroom to focus on and listen to the teacher's talk more carefully. The arrangement of students' seats in the straight line and forward the blackboard is optimized formation for a lecturing type of class. Therefore, students' seats are arranged in this way and they are sitting at one position and looking at the front side for most of their time during the science class.

Figure 25.Classroom scene at the instructor-led science class.

This layout is appropriate for instructor-led classes and the science teacher normally teach science in this arrangement of seat positions which are in the straight and paired with each two seats.

In particular, at the first lesson among science lessons I observed, students' seats were set up in the position all separated and in the straight, which was on the purpose of maximizing students' concentration on the teacher's lecture to prepare mid-term exam.

Figure 26.Classroom scene at the science class for preparing exam.

In the small group activity of science classes, the teacher rearranges students' seats in small groups in which they could discuss each other more actively.

Figure 27.Classroom scene at the small group activity.

4.5MESO LEVEL OF STRUCTURES

In Korea, many things about a school policy are strongly limited by policies of upper level of institutes such as education board and ministry of education. The authority as a principal of a high school in Korea is limited mainly to running curriculum and administrative affairs which are already figured out by the umbrella organization (Kim et al., 2011).Nevertheless, it is still true that lots of things which happen in the school impact on a student's life in the classroom. What kind of

school a student attend, what kind of region the school is located, and how the policy of the school is running could afford or limited a student's behavior in the school life and it is regarded as the impact as a meso level of structure.

4.5.1A School event

In this section, I will try to continue MS's story about his strange attitude at the last science lesson I observed. That science lesson was enacted as a small group activity in which each small group had a presentation about a planet in the solar system. As mentioned previously, MS normally shows a quiet but participatory interaction at the lecturing type of science class, which covers most time of the science class but more active to speak and act at the small group activity. In this circumstance of science class, MS's behavior at the last science lesson could be expected as a more energetic and active interaction with peers and the teacher. However, he showed a different attitude from anticipation while making his face, looking down, and folding his arms all the time during the science class. Consequently, I planned to interview with him to examine what made him behave in that way. In the interview with him while showing some significant vignettes, I could find out.

> R: Actually, I have a curious thing in this video. You looked more lethargic and stay in on posture all time during this science class. When I checked you every 30 second, there is no distinguished change of you. I remember this science class is enacted as a presentation of each small group. What did you think at that time?
>
> MS: Something bad happened to me at that time.
>
> R: Do you remember what happened?

MS: Our team lost in the final basketball game at the school sports day.

R: You really like to play basketball.

MS: Yes.

R: Do you play well? Are you the best player among all classmates?

MS: Yes.

R: So?

MS: I was depressed due to the defeat.

R: So, you couldn't participate in the science class well. But, not like this as usual?

MS: No.

R: Does it take up much room in your school life to play basketball with your friend at school?

MS: I play basketball with friends each lunchtime.

If without this interview, MS could be judged as a passive and problematic student who is not interested in the science class or dissatisfied with certain factor in the classroom such as the relationship with peer and the teacher, science subject, and the type of class. His strange interaction at that time, however, could be understood in the situation which happen out of the classroom. A conception of homeroom at a school in Korea is normally much stronger than in western countries as well as a conception of community. Except in special cases, most schools in Korea from elementary to high school is running their curriculum and administrative affairs as unit of homeroom. In other words, every students in the same homeroom normally stay at the same classroom all day long and have almost the same schedule for a year. In this circumstance, a school event is also enacted as a unit of homeroom and it is normally appeared as a competition between

homerooms. This is affected by how the school organize and manage programs. In the case of MS, the impact of school event played an important role for how MS takes his science class at that time.

4.5.2Economic situation

Poverty or low-income level could cause a crisis in the mental health of parents or a family member and could impact on the academic achievement of children with changing the way of nurturing. Financial difficulty could make parents choose an inappropriate way of nurturing with increasing their stress. Accordingly, that could hinder their children's academic development and achievement (McLoyd, 1998). The economic situation of students is related to the socioeconomic status of their parents and a community and affects their agency, which can make them access proper resources easily. MS referred to his family's economic situation as an average comparing with others in the interview.

R: How do you feel about your family's economic situation?

MS: Alright.

R: Does it mean being higher or average?

MS: Average.

It is interesting that most students as well as MS believe that they are located at medium level in the economic situation in the survey. Only two of them answered they have bad economic situation.

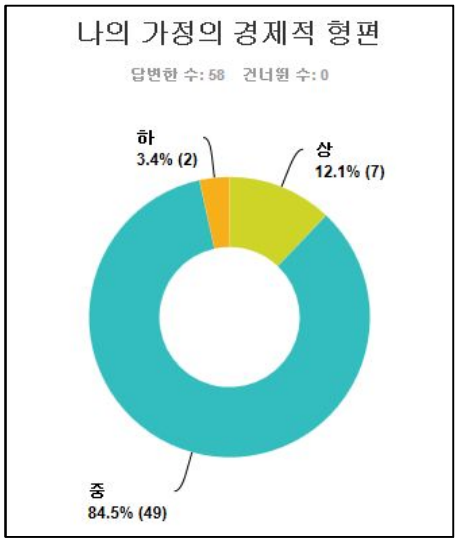

Figure 28. Result of questionnaire which ask the economic situation of students.

In contrast, this result in the survey is mismatched with the science teacher's comment in the interview.

T: The students in this school come from an economically depressed area.

T: One fifth of students in a class get a tuition support from the government, which is more than average.

R: Do you feel difficulties in giving students science classes because there are many students who are in bad economic situation and low academic achievement?

T: First, I feel they fail to meet the basic standards. In particular, they are poor in difficult science vocabulary during science classes.

The different view about the level of economic situation could shape different interactions between the teacher and students and be appeared the difference in expectation for their active participation in the science class.

4.5.3Family structure

Family structure could have a negative effect on a student's academic achievement as changing a nurturing environment of the student. A single parent could suffer from a high level of stress without sharing burden of raising children and his/her nurturing could have a negative change. Supervision, monitoring, and involvement in schoolwork for children could be weakened and nurturing lose consistency (McLanahan&Sandefur, 1994). Family structure of students, which is normally related to their economic situation, could also be a factor which impacts on their character formation and the pattern of behavior in the science class. When I interviewed with some interesting students who show consistent quiet attitude during science classes, some of them have a single-parent family due to divorce. Such a family structure could influence on a child's classroom interaction with a bad experience from home. MS is one of these students whose parents were divorced in his childhood.

R: How is your family structure?

MS: My grandfather, my mother, and me.

R: Don't you have a father?

MS: They are divorced.

R: When?

MS: When I was 13 years old.

It is hard to say that a bad experience such as broken family have a decisive effect on a student's negative interaction at the science class. Nevertheless, it could be possible that a negative experience from home increase the risk to bring negative classroom interaction of the student.

4.6MACRO LEVEL OF STRUCTURE

All the society members act as a social player in the social field where they play a role to form the whole society such as nation, an ethnic group, and cultural area, and they are affected by the higher level of structure such as national policy, law, culture, language. These macro level of structure identify ethnic, cultural, and characteristics of a whole group. Sometime these traits of groups make people have a bias to view an individual as a typical stereotype without diversity and generalize them in a certain way. To better and correctly understanding an individual as one of members of a certain society, of course, it is salient to examine how cultural and national factors of the whole society impact on an individual's life without a prejudice. MS's a specific classroom interaction according to situation could be affected by the whole society in which MS plays his social role as one of member of a superstructure such as a nation, an ethnic group, and a cultural group.

4.6.1Conception of participation

As mentioned several times earlier, MS is a quiet student in the science class and I recognized him as a non-participatory student at the first observation of him because he did not show any conspicuous action or gesture during the science class. At the following interview with him, I found out that he recognized himself as a participatory student in the science class.

R: You are quiet in the science class.

MS: Yes

R: Do you think you are participating in the science class?

MS: I am listening to the class well.

R: Are you? I didn't think you are participating in that science class.

MS: Yes, I am.

R: Do you think you are participating in the science class because of listening to the lesson well?

MS: Yes

MS thought of participation as 'an action of listening', which is not visible and hard to regard as an actual noticeable action for researchers to observe. Not only MS but also many other students show the same conception of participation in the science class as verified in chapter 3.

The conception of 'participation' in Korea is way different from in western countries. The meaning of participation normally includes action and talking of students while their taking classes in western culture. Instead, the conception of 'engaging' which is not familiar with students in Korean classroom culture could mean by students' involving in science classes irrespective of a certain action and discourse. Unlike the usage of the conception of participation in western culture, '참여' which is the general dictionary definition of participation in Korea is normally considered as a meaning regardless of action and talk.Comparing the definition of participation between English and Korean is worth consideration. It shows the different aspect to view the conception of participation related to action and talks in that term. The following terms are defined using the the*Oxford English Dictionary*

- Participation -The action or fact of having or forming part of something; the sharing of something. In early use: the fact of sharing or possessing the nature, quality, or substance of a person or thing.
- Engagement - The action of engaging; the state, condition, or fact of being

engaged

- Engage - If you engage in an activity, you do it or are actively involved with it.

If we compare these terms to definitions for the Korean words that are similar it is very interesting. The following terms were defined using the *National Institute of the Korean Language*

- 참여(participation) - 어떤일에끼어들어관계함 (to make relation while involving in a certain thing)

In the translation of 'participation' and 'engagement' from English to Korean in an English-Korean dictionary, the conceptions of those words in Korea are not much different each other. Those terms are translated into Korean as the same word '참여' and sometimes, only engagement is translated into another meaning '관계함' which means 'involvement'. In both ways, when translating participation or engagement from Korean into English and vice versa, there is no exact meaning about a certain action and talk. When examining these words in the *Oxford Advanced Learner's English-Korean Dictionary*, I found the following definitions.

- Participation참가, 참여
- Engagement관계함, 참여
- Engage - 관계를맺다

As mentioned previously, most students in Korea have regarded participation during the science class as listening to and concentrate on teachers' talks and contents of the class because Korean people have not been asked to act and talk actively but asked more to stay still to concentrate on teachers' lecture in the classroom for long time.

4.6.2Confucianism

In most interviews with students, including MS, the students had a tendency to answer short in a few words such as yes or no for the researcher' relatively long question. This trait cannot be said a coincidence among students I interviewed but could be regarded as a sociocultural effect embedded in those students' subconscious in the classroom. Confucianism in Korean culture could be one of strong reason, which shape students' interactions in the classroom in that way. For instance, SamgangOryun, which means the three bonds and five relationships is a representative virtue and an ethics which is rooted in Korean daily life and inviolate for long time from Confucianism. Especially, 'Jang Yu YuSeo,장유유서(長幼有序)' is regarded as a common virtue about proper respect for the elders in the community and most widely recognized among people in Korea (Son, 1976). Confucianism, as an ideological system continues to shape Korean society by structuring social interactions between members of society, dictating morality through the legal system, and sharing curriculums traditions and classroom practices (Lee, 2006).The influence of Confucian philosophy espouses reverence for teachers as leaders of the people. These factors contribute to the relatively high sociocultural status teaching continues to hold in Korea relative to many other countries. In the classroom, this trait can control the learning atmosphere. For Korean students, they are reluctant to discuss with teacher about teaching topic and

often keep silent because students are uncomfortable when they feel they are offending the teacher to interfere in the teacher's talk in the social norm, which emphasize on respect for the elder.

The impact from these characteristics of Confucianism could be found in the interaction patters during the science class comparing the amount of talk between the teacher and students. The following record of the science class to check how much the teacher and students on one day shows this aspect of classroom interactions which affected by Confucianism.

The time of the talk the teacher and students made in the other class on May 20 in 2014

Especially, the class has three activities which are 'an individual presentation', 'a self-study', and 'a small group activity'.

Individual presentation (2min 57sec, total 177sec): A student has her presentation at the first of the class

Self-study (7min 10sec, total 430sec): The teacher give a time for students to solve problems on the worksheet individually by themselves.

Small group activity (6min 4sec, total 364sec): They move to small group (3 or 4 students) and discuss to solve problems.

I figured out the time beside these three times above. (So, 50min - 16min 11sec = 35min 49sec, so total 2029sec)

1) How much time the teacher talks

- He made talks in the class for 1844sec totally which is 30min 44sec

So, his talks in the class is 90.8% among 35min 49sec except the activities which is similar to the former class.

- Also, 6.2% (115sec) of his talk is not related to lecturing such as chit-chat with students, discipline, and etc.

2) How much time is available for a student to talk

- Students made talks in the class for 269sec, 4min 29sec, which is 13.3% among 35min 49sec

- If we regard a student's individual presentation as students' talk as well, 269sec + 177sec = 446sec is total students' talk.

3) How long does the teacher normally wait for students to respond or his feedback.

- He asked students questions 120 times in the class

And, the total waiting time is 110sec

So, the average of a waiting time is 0.92sec which is bigger than before but still small.

* Others

- his talk overlapped with students' answers 28 times among 120times.

- He made feedbacks 44times without waiting for students' answers

In this record, students could not have many chances (13.3%) to talk during the science class, but the science teacher's talk takes most time (90.8%) of the science class. The amount of talk between the teacher and students is stark contrast and this shows students play a role as a listener to respect the science teacher in the classroom. The average of waiting time by the teacher is more dramatic because it is less than 1 second and even he did not wait students' answer nor made feedbacks 44 times. It implies two possible situations that the teacher had been pressed for time to complete the science class or the teacher had not cared enough for listening to students' talk.

4.6.3Test dependency

Returning to the story about MS, I could find an interesting point in the interview with him because he is not interested in science but he is in favor for the science class. The reason why he is not reluctant to take the science class without interest in science was that he regarded science as a subject in which he easily get a good grade at exams.

R: Do you like science?

MS: No.

R: Why?

MS: I don't like science because I have felt difficult since childhood.

R: How about the science class?

MS: Not bad

R: You consider science as a difficult thing but are in favor of the science

class. Other many students answered in opposite because they like science but they feel difficulties in contents of the science class.

MS: Science itself is difficult to me, but I could get a good grade at the science test.

In this interview with him, he showed a positive attitude for the science class and regarded the science class as a subject which he could get a good grade at the exams. It shows that getting a good grade at the test plays an important role to how a student takes the science class. Not only for the case of MS but also other many students referred to the significance of the result of test and exam which impact on how much they are participating harder in the science class.

Interview with HH

R: Are you participating in the science class?

HH: Not much

R: Is it because you don't have a good grade in the exam?

HH: I think so

Interview with HJ

R: Are you participating in the science class positively?

HJ: I try to participate in that science class as much as I can becauseI think I am weak at the science subject.

R: Do you think getting a good grade at the test is the most important reason to participate in the science class?

HJ: Yes

R: Do you any other reason?

HJ: Nothing special

Interview with HE

R: What kind of factor do you think affects you to participate in the science class?

HE: the seat position or the result of the exam.

In addition,in the interview with the science teacher, he pointed out the lethargic attitude of students as a significant problem during the science class and found the reason from their low grade not enough to enter a good university.

T: The problem for my students is lethargy in the science class

R: What do you think is the reason?

T: I think the paradigm of the education in Korea is the entrance exam. But, the entrance exam is no longer the purpose for many students because of their low grade in the science class. They lost the motivation to participate in the science class to get a good score at the entrance exam. In this situation, many students show lethargic attitude during the science class.

R: With that being said, I am curious about that you mentioned extra points to add to grade several times during the science class. Do you think it is effective to attract their participation?

T: It is effective temporarily but would not last long.

Even the science teacher accepted that the most urgent and crucial issue is to make them get a better score at the entrance exam through the science class. Entrance exam has been a strong motivation for students to study harder in Koreafor long time since Joseon Dynasty. Confucianism placed a great virtue on social hierarchies and promoted the ideal of meritocracy through the belief that public office officials should be selected based on their performance on competitive examinations. As a result, a Civil Service Examination system was instituted as a rigorous, competitive process for selecting officials based on academic excellence in Korea (Conner, 2009). Until now, this Confucian influence has been handed down as a universal college entrance exam, the College Scholastic Ability Test (CSAT), with the belief to be able to gain success and upward mobility through studying hard. In questionnaires to ask students' career which they and their parent want after graduation of high school, absolute majority of them (over 90%) aimed to go to a 4-year-course college, which shows their strong belief which could be dominant over their attitude and behavior in the classroom.

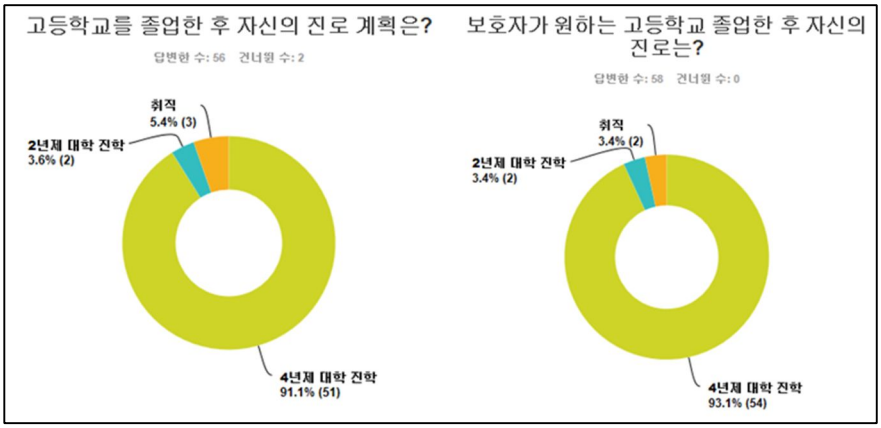

Figure 29. Results of questionnaires which ask career plans after graduation to students (on the left diagram) and their parents (on the right diagram).

This belief have influenced on the purpose of participating in the science class, 78.8% of students answered that the reason why they participate in the science class is to get a good score at the exam instead of the general purpose, improving the ability to think and solve problems in a scientific way.

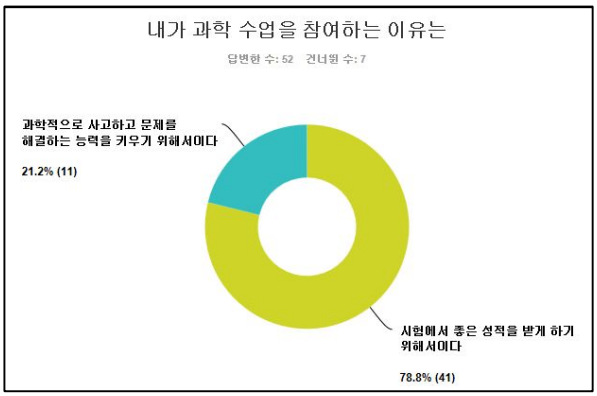

Figure 30. Result of questionnaire which asks the purpose of students' participation.

4.7 CONCLUSIONS

In this chapter, I tried to examine a typical classroom interaction, non-discursive and participatory interaction, in the science class of M high school based on the structure and agency dialectic perspective asa theoretical lens. In this process, I followed MS's story as a representative example to find out how the structure at each level limit or afford students' classroom interactions in the science class. I subdivided the impact of structures into three levels, i.e. micro level, meso level, and macro level and tried to examine the impact on students' interactions during the science class from the classroom (micro), the school area (meso), and national and cultural level of site (macro) in the socio-cultural perspective. In particular, I was interested more in the relation between the amount of discourse and diverse social and cultural factors at each level. I investigated about their specific participation and engagement attitude represented by a 'non-discursive but

participatory' interaction in the science class and tried to figure out what this specific interactions meansand how the structures students have impact on this interaction in the socio-cultural perspective.

This specific interaction type, which is shown as typical interaction among Korean high school students as well, is has been shaped by diverse social factor from each level of structure and is shown as a result of complex relation between impacts of each level. Upper level of structure could afford or limit lower level of structure and impact on students' behaviors in the science class. For instance, 'test dependency in Korea' is a significant social issue in the aspect of macro level of structure. This factor is also related to another big impact, Confucianism in Korean society, at the same level, and these factor shape students agencies together and reinforced the impact on their attitude in the classroom. In addition, these macro level of structures could influence on school policies as typical high schools run their curriculum under the influence of national curriculum which is appropriated to public issue, CSAT. Subsequently, this impact is naturally continued in the science classroom as the science teacher plans his science class as an instructor-led type of class which is most suitable to preparing exam.

To make this long story to simple is 'culture'. I could identify that cultural factors from each level of structure impact on students' classroom interactions during the science class in M high school through diverse data source, video observation, surveys, and interview in the socio-cultural perspective. Furthermore, the task that how education stakeholder apply this understanding of actual situation to make the learning environment of the science classroom be suitable for cultural contextwill be left behind.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

"Quiet but participatory students". This phrase could be shown strange to understand in the aspect of some people who have background based on western culture. In the other hand, people including me who are in Asian cultural background recognized this situation as natural practice because they are accustomed to this learning environment in which they should focus on and listen to teachers' talk to meet their purpose, for instance, entering better colleges to gratify their and their parents' expectation. This issue leads to consequence in which Asian students including Korean students have overall high achievement in science assessments compared to other western countries but they are reported to have limited interest in science and lack of enjoyment in learning science. In addition, science teaching and learning in Korean classrooms reveals that teachers and students and students and their peers tend to have limited interactions during class, and Korean students are not typically active participants in small group or whole class activities. The problem in this study began with recognizing this issue and initiated to investigate what kind of factors affect such a classroom interactions in Korea

In this concluding chapter, I re-examine the findings from this study in conjunction with the questions posed at the beginning of this thesis. In doing so, I revisit some of the challenges associated with identifying typical patterns of interactions between teachers and students and their belief about engagement in science classes in Korea as introduced in the first chapter. I discuss limitations of

this study before presenting an interpretation their classroom interactions in Korean high school. At last, I offer implications that these findings raise for education reforms at each level of structure to suggest appropriate methods in accordance with their social and cultural situation.

5.1 SUMMARY

In the science classroom in Korea, students have been regarded as that they are not positive to participate in the class and they do not have enough discourse to discuss with teachers and peer while staying static during science classes. In particular, this passive attitude is more distinguished in the site of a typical high school in Korea. This perspective to consider highs school students' behavior in Korea as problematic situation raises a question of whether this issue should be dealt in the place of their negative characteristics which are related to cultural bias. Recently, there is a growing voice to rethink specific interaction patterns of students in Asia in the socio-cultural perspective and, also, the need to reconsider Korean high school students' classroom interaction during science classes is required in the same context.

For this reason, I visited a typical high school, M high school in Korea and investigated students there to understand their actual condition in which how they interact with their peers and teachers during science classes and what schema they have affect these interaction patterns. Participants in this study consist of an experienced physics teacher and 60 students who take his 2 science classes. The students are in their 1st grade and taking a science subject, 'integrated science', which is general science course for high school students at the same age in Korea. I observed 10 science lessons with field notes to examine their classroom interactions, in particular typical patterns of participation during science classes,

with video recording from three angles in the classroom. After collecting data from that science classes, I analyzed the videos recorded and identified their interactions which happen to science classes. Their diverse interactions are coded and categorized in accordance with standards established.

In this process, I selected one of science lessons to get a more careful understanding of what sort of participation type is existing in the science class and investigated that lesson in detail to check students' discourse and actions. In this analysis, their discourse is figured as the frequency of their talk during the science class and their participation is counted when they have an action and talk which has an intention related to the science class. In this analysis, I identified 4 types of participation patterns which are participatory and discursive, participatory and non-discursive, non-participatory and discursive, and non-participatory and non-discursive, in accordance with their discourse and participation in the science class. In the result of this analysis, there are most number of students in the category, non-participatory and non-discursive, which is corresponded with general expectation to Korean students. However, I found out that their conception of participation in the science class is way different from the result of the analysis when I conducted a survey and interview with students in the science class later. More number of students answered that they are participatory in the science class. The noticeable point in the survey is that considerable number of students were found in the category, non-discursive and participatory, which is opposite to view that participation is normally accompanied with active verbal expression. In the interview with some interesting students, this tendency is continued in a consistent perspective in which they are participatory even though they do not make much discourse in the science class. They considered 'listening to the science teacher and focusing their attention on his talk as a proper type of participation in the science

class in the interview. This suggests that there is a possibility of another type of participating which is dominant at the site of a typical high school in Korea.

After this finding, I got an interest in the reason why the specific type of participation exists in the science class, which could be an example of science classes of a typical high school in Korea. To investigate this question, I introduceda sociocultural theory (Bourdieu, 1986; Sewell, 1992; 1999) about structure and agency dialectic perspective as a theoretical lens. I selected a case of student, MS, to examine how structure the student has impact on his agency to access proper material and human resources which also shape his interaction pattern in the science class. At each level of structure, i.e. micro – classroom level, meso – school level, and macro – national and cultural level, I examined what factors have influenced on MS's classroom interactions and tried to expand this issue into typical high school students in Korea.

5.1.1 Focus of the Study

In this study, I examined the classroom interaction between students and teachers in the socio-cultural perspective with observation, survey, and interview with them. I explored how the structure at each level – micro, meso, and macro, impact on their classroom interactions as following a case of student, MS.

The following two overarching research questions guided my research:

1. What are typical patterns of interactions between teachers and students and students and their peers in science classrooms in Korea?
2. What are student preferences regarding interactions in science classrooms and how do their understanding of the rules and expectations for engaging limit or afford their participation in small

group and whole class interactions?

Answered in chapters 3 and 4, these questions served to frame my inquiry. In an effort to organize and discuss the findings that were most relevant to my research in this final chapter, I briefly re-visit the themes that emerged from my study in this section, namely: a) a specific interaction type, non-discursive and participatory, exists in science classes in Korea,b) a student interaction could be shaped by the structure he/shehas and the structure at each level could limit or afford his/her behavior and attitude during science classes, and c) typical patterns of classroom interactions in a specific field could appeared as a collective trait affected by social and cultural structures.

5.2 LIMITS OF THE RESEARCH

From the beginning of this research, I faced much limitation to conduct and continue to investigate this study, which come from diverse factors from determination of proper a school as a good example to application of the result of this study. For instance, ironically, rich experience in high school site as a veteran physics teacher could hinder from examining carefully students' behavior from an objective point of view because everything happen to me in a typical high school in Korea is regarded as a matter of course. It is not much to say that this research began with the strong contradiction which I have already been too accustomed to. Therefore, not problematizing that issue like me is genuine problem in the education system in Korea.

Beside this basic question, I refer to other limitationsto be worthy of consideration for further studies such as a)lack of researches to investigate classroom interactions in science class in Korea, b) constraints on time to study to

applychange in classroom interaction of a student in science classes, and c) duplicity between reality and ideals in the classroom situation

5.2.1 Lack of researches to investigate classroom interactions in science class in Korea

As mentioned previously, there are lots of limitation in the process of this study. Above all, it is hard to find proper Korean researches I could refer to and utilize as a good example to develop. Of course, it is normally difficult to find suitable cases of researches which fill a need and suggest a clue to solve problems perfectly in overall situation. However, the number of researches which have classroom interaction as a them is insufficient to refer in Korea. If the theme of studies is narrowed into classroom interaction 'in science', it could be more difficult to find a proper research in Korea to review. This limitation reflects on the situation in which there is not enough discussion in Korea about classroom interaction in education circumstance needless to say in science education. This situation also comes from the contradiction which I suggested as an interesting problem in this research as the instructional strategies such as inquiry, collaboration, and argumentation are introduced from global educational trend but are not enacted in Korean science classes properly without cultural and historical approach.

5.2.2 Constraints on time to study to apply change in classroom interaction of a student in science classes

Every social circumstance is flexible and changeable as time goes by and not staying in one posture. With place constraints such as in the science classroom, in a typical high school, and in Korea, time constraint to examine students' interactions enough over time is one of considerable problems in the research. For example, a

student I am interested in during this research has shown different attitude according to time change. If Ihad more time to observe her interaction in the science class, I could examine how the structure she has impact on her interaction and change her interaction pattern over time more carefully.

5.3 CONCLUSIONS

In the analysis of a science lesson, I could verify the possibility of another type of interaction pattern, non-discursive and participatory, during the science class in M high school. This interaction pattern which observed in a typical high school is not only confined to a specific case in that science classroom but also considered as general interaction type in science classes in Korean high school. Their conception to regard participation is normally appeared as non-verbal action, listening to teacher's talk, and this conception of participation is pervasive among students at the observation, the survey, and the interview commonly. They believed the non-discursive and participatory attitude is important and effective method in science classes in Korean high school. This finding suggest that Asian student including Korean students are not passive and reluctant to participate in science classes actively and try to participate in science classes in a different way, paying attention and concentrating on teachers' talk and science contents. This attitude could lead them to get a high academic achievement but lack of enjoyment and interest in science subject.

5.3.1Structure at each level impacts on a student's classroom interactions during science class

The reason why students in the science classroom in M high school have a specific pattern of interaction could be explained in the socio-cultural perspective in which

students classroom interactions are shaped by the structure they have. To investigate their learning environment as a structure, an individual and collective trait of interactions in the science class could be interpreted in a cultural, social, and historical context. According to the sociocultural theory (Sewell, 1999), an agency which an individual has could be afforded and limited by his/her structure, schema (rules, attitudes, and beliefs) and resources (material and human). In the science classroom, many things could play a role of a structure. I categorized these structures which could be found in the classroom setting during science class into three layer of structure, micro (in the classroom), meso (in the school), and macro(cultural and national) level. At each level of structure, I verified what factor has an effect on a student's interaction during the science class while examining the results of observation of video records, surveys, and interview with students. Especially, I followed MS's specific interactions in the science class to identify the impact from each level of structure. Consequently, I could get some evidences that some factors actually have influenced on MS's specific interactions during the science class and tried to expand this result to general cases with other data collected to understand overall students' interactions. For instance, MS's interaction pattern according to the type of class has been appeared differently as he shows more energetic attitude in the small group activities. Also, such a tendency has been appeared among students in that science class similarly to MS through the result of observations, surveys, and interviews.

5.3.2Each level of structure is related to each other and upper level of structure could limit lower level of structure

Each level of structure has relation with each other at the science class in M high school and this relation of structures has multiple and complex effect on an

individual in the science class. In addition, macro level of structures could afford or limit lower level of structures and play a role to shape collective trait based on socio-cultural background. For instance, Confucianism and dependency on tests in Korean society make a specific impact on the science classes in a typical high school. In this influence, the belief that people could promote their social position through important exam to enter a good university could limit the school policy to run their science curriculum in more effective way and the teacher in the classroom manage his/her science classes in accordance with more appropriate type of class, i.e. instructor-led classes. In this situation, students' agencies are limited without enough usage of talk. The limitation in chance of talk during science classes is identified previously. These relations between structures at the same level and each level could shape a collective and specific type of classroom interaction pattern in the science class.

5.4 IMPLICATIONS

As mentioned previously, researches which dealt with classroom interactions including participation and engagement in science classes are not much so that there is more need to develop the discussion about more culturally adaptive education system in Korea through more studies about classroom interactions in science classes in Korea. The contradictions exist in overall Korean science education site as Korean students have high academic achievement but lack of enjoyment and interest in science subject, and also they are recognized as passive and non-productive students despite their active participation with listening to and concentrating on teachers' talk and class contents. To understand this problematic issues in a legitimate way, studies approach this issue in the social-cultural perspective should be developed more to improve Korean education better.

Therefore, this research to understand student and teacher interactions in Korean high school science classrooms from a structure and agency dialectic perspective could be a valid suggestion and help to determine how to organize education strategies at each level of site.As education stakeholders at each level rethink students' classroom interactionsin the socio-cultural perspective, they could make proper determinations to plan educational tasks at each position while considering educational issues in the cultural context. Concerning educational problems in the socio-cultural perspective, educational officials in national organization could avoid indiscriminately acceptingglobal educational trends and adopt culturally suitableeducation system to Korean students. Establishingeducation system to better fit Korean educational contexts make schools and other educationinstitutescan run their organizations in more effective and rational policy. In the classroom, science teacher could understand their students' behaviors based on their cultural and social background, which could help them to make a better learning environment with considering suitable classroom culture for their students.

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국문초록

구조와 행위주체의 변증법적 관계의 관점에서 이해한 한국 고등학교 과학교실에서의 학생과 교사의 상호작용: 교육과 연구에 대한 제언

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과학교육과 물리전공

이 연구는 한국 학생들의 과학 수업 참여과정에서 보여지는 교실 침묵 현상에 대한 이해를 주제로 계획되었다. 경험이 풍부한 교사가 가르치는 고등학교 1학년 두 개 학급에서 총 10번의 과학수업을12주에 걸쳐 수집한 영상 녹화 자료에 대한 분석을 기반으로 하는 민족지학적 연구로 진행되었다.과학수업에서 수집된 음성과 영상 녹화 자료는 교사가 학생들과 수업하는 동안 어떠한 순환 유형이 발생하는 가를 파악하기 위해 meso와 micro 수준에 편집되고 분석되었다. 영상 녹화 자료들 중 일부 영상 장면들은교사와 학생들과의 인터뷰과정에서 교실 상호작용을 이해하기 위한 참여자들의 기억을상기시키는데 사용되었다. 연구자는 60명 학생들의 설문응답과 21명 학생들과의 인터뷰를 통해 학습환경에 대한 다양한 선호도와교사와 학생들간의 음성적 비음성적 참여 유형을 확인하였다. 또한, 영상 녹화 자료와학생들의 설문자료 간의비교 분석으로 과학 수업에 활발히 참여 또는 관여하는 것에 대한 학생과 교사의인식의일치와모순을밝히고자 노력하였다.

연구자는사회과학적이론을 이론적 틀로 적용하여 학생들의 언어적 비언어적 참여를 제한하고 허용하는 macro, meso, micro 수준의 구조의 역할을 연구결과로부터 확인하였다.예를 들어,시험준비에 집중하는 분위기, 좋은 교수 학습이 무엇인가에 대한 사회적 기대, 경직된 교육과정 운영들은 교실 밖 상황에서 벌어지는 영향 요인이나 한편으로 교실 수준 (micro level) 에서의 교사화 학생의 수업을 구조화 할 수 있다. 과학 수업에서 교사와 학생들이 언어적 또는 비언어적으로 적극적으로 참여할 수 있는 분위기를 조성하는 것을 한국 과학의 목표로 설정한다면 이 연구는 연구자들, 교육자들 그리고 교육 행정가들이 각각의 구조 수준 (macro and meso level) 에서 최우선적으로 참여하여야 됨을 강조하며마지막 제언으로, 한국의 문화적 맥락에서 학생들의 침묵이 과학 교수 학습에 미치는 영향과 역할에 관해 문제를 제기하는 바이다.

주요어:교실상호작용, 참여와 관여, 구조와 행위주체, 한국의 문화적 맥락

학번: 2013-21415