An Eastern Learning Paradox: Paradoxes in Two Korean Mathematics Teachers' Pedagogy of Silence in the Classroom

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ABSTRACT: Eastern philosophies of education such as Confucianism and Taosim advocate the use of silence in the teacher-pupil tradition of pedagogy. We investigate contemporary classrooms in Korea, and study whether teachers in Korea today incorporate this method implicitly or explicitly in their classrooms. Empirical data in the form of video-taped classroom lessons and the analysis of the videos reveal the learning paradoxes that arise from a rote adherence to constructivism by teachers that are trained within a larger Confucian society.

KEYWORDS: Confucianism, constructivism, culture, learning paradox, mathematics teaching, silence, Korea.

Introduction

Regardless of seemingly inappropriate practice – passive in learning – students in East Asian countries continuously demonstrate relatively high performances on international studies of mathematical achievement (Mullis, Martin, Gonzalez, & Chrostowski, 2004; OECD, 2004). Researchers have frequently questioned the paradoxical phenomenon that students do not engage in active learning but perform very well, and most studies and discussions conclude that this type of classroom teaching could, in fact, be meaningful in some cultures (Leung, 2001; Huang & Leung, 2005; Mok, 2003; Wong, 1998; Lopez-Real, & Mok, 2002; Li, 2006). For example, Leung summarizes the practices in East Asian mathematics classrooms as:

> Classroom teaching is conducted in a whole class setting, and given the large class size involved, there are virtually no group work or activities. Instruction is teacher dominated, and student

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> involvement is minimal. Memorization of mathematical facts is stressed and students learn mainly by rote. There is ample amount of practice of mathematical skills, mostly without thorough understanding. (2001, pp. 35-36)

Based on these distinctive features of classroom teaching practice, Leung (2001) concludes that there is an East Asian identity in mathematics education, which would contribute to a sharing of best practices with other cultural traditions. However, the aforementioned seemingly inappropriate classroom teaching practice is difficult to link to best practice. Instead, it could be interpreted the opposite way. In particular, in Clarke and co-authors study of 2006, rarity of student to student conversations in Korean mathematics classrooms was understood as they did not play any role in learning. If that is the case, then most Korean math classroom teaching could be considered as useless in learning, which is not true (**Lee, 2010)**AUTHOR: NO Lee 2010 shown in references - please ADD****. Therefore, it is necessary to develop a more specific theoretical concept to discuss this type of classroom practice: that is, rare conversations or silent class. This study aims to develop a theoretical concept to understand East Asian math classroom teaching in a more meaningful way by analyzing two Korean middle school math teachers' rationale, beliefs, and perspectives on teaching that could be categorized as silent class.

A Conjecture of a Theoretical Perspective for Korean Math Classroom Teaching

Re-Conceived Constructivism in Korea

The two main philosophies of the 1990s – radical constructivism – elaborated by **Glaserfeld (1984, 1991)**AUTHOR: Glaserfeld NOT in included in references - Please ADD**** – and social constructivism – put forth by Ernest (1991), were actively discussed and had a huge impact on mathematics education in Korea (Korean Ministry of Education, 1997; Woo, 1995; **Yim, 1999**AUTHOR: NOT included in references - Please ADD****; Lee, 1999; Park, 1995; Park, 2001), just as they did in other countries. The seventh Korean National Mathematics Curriculum, which took effect in 2000, focused on "learner-centered" teaching to address constructivism in mathematics education (Korean Ministry of Education, 1997). *Embodying Constructivism*, newly published sets of mathematics textbooks focused on activities that prompted students to engage in knowledge construction. According to

Pang (2004), the main doctrines of these newly developed textbooks were to (a) relate mathematical concepts or principles to real-life contexts, (b) encourage students to participate in concrete activities, (c) propose key questions that stimulate mathematical reasoning and or thinking, (d) reflect on mathematical connections, (e) emphasize problem solving processes, (f) assess students' performance during a play or games, and (g) to provide students with various problems for computational proficiency (p. 49). Nonetheless the aforementioned seven doctrines were widely acknowledged, and they were found to be challenges to the majority of Korean math teachers in classroom teaching (**Lee, Jung, Na, & Kim, 2010 **AUTHOR: NOT included in references - please ADD****).

Several researchers have actively employed the "learner-centered" approach in classroom teaching experiments, and a number of successful stories have been reported (Park, 1996; Park, 1999; Choi, 2000). For example, Park (1996), after reviewing relevant literature on constructivism, devised four teaching and learning principles: student-centered individualization, questioning-oriented interaction, a meaning-oriented activity, and reflective abstraction. Park applied the four principles to mathematics lessons and reported that participants became more actively involved in learning and even showed more excitement for the learning process itself.

Once research and practice in Korean mathematics education related to constructivism started to become wide-spread, objections and skepticism of the movement began to mount from several researchers (Woo, 1995, 2000; **Yim & Hong, 1998;** Lee, 1999; **Yim, 2000**; **Kang, 2004; Nam, 2007)**AUTHOR: SEVERAL AUTHORS referenced, but NOT included in Reference List - Please ADD: Yim & Hong, 1998, Yim 2000, Kang 2004, Nam 2007 ****. In particular, Woo (1995), investigating the underlying epistemological stance of radical constructivism to determine how it either supports or differs from Piaget's and Plato's perspective, wrote:

> The question to be raised here is whether child-centered radical constructivism supports Piaget's theory, which is considered the epistemological psychological background of the discipline-oriented and structure-oriented "the New Math." Moreover, it is important to note that Piaget's mathematical epistemology does not deny Platonism. (p. 2)

Woo (1995) concluded that students were unskilled at discovering a concept from facts presented to them or reflecting upon other students' opinions via discussions based on nothing (p. 7). He also claimed that children were unable to construct knowledge on their own at too early an age. Moreover, Woo writes “the harmonization of teaching and the natural development of students” (p. 11) and not the sole emphasis on student participation, is of utmost importance. In her paper, Lee (1999) analyzed the teaching episodes of researchers who followed constructivism and concluded that researchers likely faced extreme inappropriate didactic phenomena such as the “Jordain effect” or the “Topasz effect,” both of which are discussed in Brousseau’s 2007 book. In addition to possible problems of inappropriate extreme didactic practices, **Yim (2000**AUTHOR: NOT in references - Please ADD**)** points out that the constructivist learning theory lacks clear criteria by which to evaluate instructional effectiveness from a constructivist perspective.

As mentioned previously, Korean mathematics education has adopted constructivism, which is mainly exemplified by “learner-centered” teaching. Though it is widely understood that a learner should not be a passive recipient of knowledge but an active constructor of knowledge, Korea’s adoption of constructivism is lined with objection and skepticism. A“learner-centered” approach to classroom teaching is criticized for its inappropriate didactic phenomena. Moreover, many math teachers feel constructivism or a “learner-centered” approach to teaching is not suited to the Korean math classroom environment since most class sizes are large and students are reluctant to partake in discussion (**Lee, 2010**AUTHOR: Not included in references - Please ADD**)**. Therefore, instead conceding constructivism, a movement to identify an alternative perspective to classroom teaching has been mounted.

One alternative perspective, detailed by Lee (1983, **1995 **AUTHOR: Please CLARIFY - 1998 and 1999 IN references but NO 1995 - Please CLARIFY <u>or ADD 1995</u>****, 2000) reflects Korean traditional ideas on education and has attracted interest from several renowned math educators. Lee (1983) categorizes knowledge as: “doing-knowledge” (hereinafter referred to as DK) or practical knowledge such as what a plumber possesses for doing his job and “seeing-knowledge” (hereinafter referred to as SK); theoretical knowledge such as what a mathematician has. He proclaims DK to be so apparent that it does not require any explanation but drill, and in contrast, SK is often so abstract and vague that it requires in-depth investigation (Lee, 1983, p. 70). Lee considers SK to be the more important aspect of learning in school, and as such, concludes that teachers who lead students to SK construction are engaging in more meaningful teaching and learning in the classroom. Woo (2004, 2007), an advocate of Lee's distinction between DK and SK, finds both aspects in school mathematics but claims that an aspect of SK should be more carefully considered in the math class. To do this, Woo suggests math teachers practice finding the hidden meaning and/or fundamental structure of knowledge in school mathematics. This SK-intensified perspective is explicitly employed in **Nam's 2007**AUTHOR: Please ADD Nam 2007 to References**** study where she re-conceptualizes constructivism by combining constructivism and structuralism. She writes:

> Constructivism focuses on students' self-construction of knowledge, but teachers could inadvertently inject subjective knowledge. Therefore, it is not possible to organize content in terms of students' developmental stages without first investigating a particular content area in the school mathematics in-depth. Structuralism focuses on mathematical knowledge structure and should be pursued in the teaching and learning of mathematics. However, it is not without shortcomings in its explanation on how a structure forms with regard to a student's serial learning experiences. Hence, it is necessary to consider the construction of a mathematical structure, not solely emphasize its construction. (p. 162)

Nam emphasizes not only the need to design effectual learning environments but also teachers' devotion to the development and betterment of knowledge understanding in the combined perspective. Her perspective is referred to as "re-conceived constructivism" throughout this study.

Epistemology and the Teachers' Role in Re-Conceived Constructivism

Though constructivism as it is currently followed in Korea takes on various forms, it mostly emphasizes knowledge structure as it is connected to Nam's 2007 re-conceptualized perspective, which limits teachers' freedom to regulate learning items or conditions (Lee, 2010). Hence, it could be that Korean mathematics teachers are strongly guiding students towards "collective consideration" and "collective exploration" of a structure rather than providing them with opportunities to "literally construct" the structure independently. Teachers are likely centering on the result of a construction instead of the creation process. Consequently, they may opt not to follow a learner-centered teaching approach when the construct is deemed too far from its creation process. This Korean mathematics teacher practice shows a part of Korean math teachers' didactic contract (Brousseau, 2007); that is, teachers pre-conceive important aspects of focus for a lesson and decided how to proceed with teaching. Korean math teachers'didactic contract may be one of the justifications for why Korean math teachers insist on silent and controlled classroom teaching (Lee, 2010).

According to re-conceived constructivism, a learner's mind gradually takes on its own individuality – humanity and the logical norm of experiences through persistent learning and practicing(Nam, 2007).The traditional Korean philosophy as explicated by the two Lees (ÝüÑ, ×Ýì'), Korean ancient philosophers, also emphasizes "seeing" the outside world through the silent inner-workings of the mind in order to cultivate humanity and thelogical norm (Lee, 1998, 2000). In the Analects, the inner-workings of the mind to learn are represented to be "the silent treasuring up of knowledge" (The Analects, 7: 2). Therefore, it is likely that the Korean math classroom could be understood by interpreting how silence or inner-workings of the mind, instead of talking, is utilized.

To analyze how silence is used in the math class, it is necessary to build an epistemological stance, which differs from constructivism. Lee (1998, 2000) provides a perspective, which is mainly about seeking the middle (ñé) or balance between the two extremes when seeking knowledge. He claims an individual's mind consists of "two-folds:" a "lower fold" and an "upper fold." While the lower fold deals with experiences, the upper fold manages logic or norm. The lower fold develops concepts through experience whereas the upper fold understands concepts developed from the lower fold by structuring cases with logical norm. The lower fold then applies the upper fold's structured concept to new experiences. Mindful conscious awareness of structuring experiences with the upper fold and then applying the result to a new experience leads one to harmonious flow between the two folds of the mind. It is at this level of enlightenment that learners love to cultivate their minds. Eventually, according to Lee (2000), education will make it possible for one to reach the status of self-attainment (í»Ôð), a level in which harmony with the outside world is possible through the mind. Also, at this level, one naturally seeks the middle ground instead of one of the extremes. This results in the cultivation of humanity which in turns sparks enjoyment of independent learning. It is noticeable that interest or enjoyment is a result of learning, not a motive.

The role of teachers in re-conceived constructivism is to enlighten the two-fold structure of students' minds; otherwise, students may become trapped in the lower fold where things appear irregular and variety seems unstructured (Nam, 2007; **Woo & Kang, 2007**AUTHOR: Woo & Kang 2007 not included in references - Please ADD****). To prevent this lower fold entanglement from happening, mindful conscious awareness of "how" and "why" an individual views a lower fold as being varied when configuring it with the upper fold and vice versa is very important. Mindful conscious awareness of the interaction between the two folds is similar to the concept, meta-cognition, discussed by **Schoenfeld (1992**AUTHOR: Not included in references - Please ADD**)**. Also, it is connected to the thought that learning has more to do with forming attitudes than cognitive work; persistent aspiration of the middle via the awareness until learning becomes enjoyable. This perspective is advocated by Confucius: "They who know the truth are not equal to those who love it, and they who love it are not equal to those who delight in it." (The Analects, 6:20). Shim (2008) interprets Confucius' philosophy as: teaching is not so much about knowledge but a way of life; hence, teachers are model humans seeking a harmony between the two folds of their students' mind and between their learners' minds and the outside world, not simply knowledge transmitters. In addition, Shim explains the role of teachers in relation Confucius' perspective as:

> (Interpreting Confucius' teachings) The role of teachers is to guide their students to find the way to proceed when they want very much to understand or realize something but cannot. Furthermore, teachers help their students express their opinions accurately when the latter are desperately looking for the right words to express their ideas but cannot find them. Thus, the role of teachers is secondary to the efforts of the learners. Even if teachers show learners the way, the latter must respond by expressing their own ideas. This point is relevant to the fact that the main focus of Confucian learning is to become a man of character through the practice of good conduct. Becoming a man of character is almost wholly dependent on the learner himself; he needs to reflect on himself as well as develop good traits and discard bad ones. Confucius regards this kind of continuous reflection and reformation as the love of learning. (p. 522)

In keeping with Confucius teaching, Koreans believe that students show their love for learning and enjoyment of learning when they emulate the teacher's exemplary behavior and practical explanations (Lee, 2010). In other words, it could be that this belief, has lead a majority of Korean math teachers to regard silent classes wherein the teacher guides students to in-depth thinking to be the best practice. This research case study aims to further the theory on this practice by analyzing two Korean middle school math teachers' rationale and purposes for silencing their classes.

Beliefs on Silence in Teaching

Teachers' belief on the teaching of mathematics is founded on personal experiences and the cultural environment of a society (Thomson, 1992; Pajares, 1992; Schmidt, Mcknight, Cogan, Jakwerth, &Houang,1999). Indeed, research has provided plenty of empirical evidence that teacher beliefs on the teaching of mathematics impact teaching practices in the class (Raymond, 1997; **Brown & Borko, 1992** AUTHOR: Not included in references - please ADD****; Thompson, 1992; Ernest, 1991; **Cooney, 1985**AUTHOR: Not included in references - please ADD****). Korean educators are skeptical of constructivism because most in-service math teachers never personally experienced that particular style of learning in their own schooling, yet the teachers are generally eager to have students engage in knowledge construction (**Lee, 2010**AUTHOR: ADD to references**). One possible assumption for this eagerness to pursue constructivism is that it is government-driven. Educational reform stresses a student-centered approach, so curriculum development and textbook authorization were heavily influenced by this reform. It could also be that Korean mathematics teachers, leaders in their communities, typically have had careers spanning ten or more long years. These teachers have been taught to follow constructivism practices throughout their years of teacher education study. Paradoxically, there still exist a number of Korean mathematics teachers that believe in silent and controlled math classes (Lee, 2010). This tendency to fashion silent controlled classes hails from a Confucius culture, which is very similar to the learning situations in other East Asian countries (Watkins & Biggs, 2001; Huang & Leung, 2005; Lopez-Real & Mok, 2002).

During the Choseon Dynasty (1392-1910), Korea was greatly influenced by Confucius philosophy, and the viewpoints of Lee (×ÝüÑ, 1501~1570)and Lee (×Ýì', 1536~1584), who explicated the philosophy. The philosophy placed more value on silence than on speech. Even today, Koreans hold tight to the belief that it is more virtuous to express one's thoughts politely after having mulled over an idea for some period of time than to impulsively speak incomplete thoughts. In addition to the notion of valuing silence, Kim (2002) discusses the relationship between silence and thinking in Eastern culture. She claims talking and thinking are considered to be interdependent in the Western intellectual tradition, but not in the East. She writes:

> Since ancient Chinese civilization, East Asians did not assume the connectedness between talking and thinking. Not only are philosophical and religious discussions on language and thought and a tradition of debate largely absent, but also, East Asians believe that states of silence and introspection are considered beneficial for high levels of thinking, such as the pursuit of the truth. (p. 829)

Another explanation on the role of silence in thinking by East Asian people is given by **Nisbett, Peng, and Norenzayan (2001)**AUTHOR: Not included in references - please ADD****. Nisbett et al. claims East Asian people are used to think synthetically in an air of silence; consider many aspects at the same time rather than break the whole up into its elements and to adopt a holistic style of reasoning in which many elements are held at the same time in thought in order to grasp the gestalt of the parts. In contrast, people from Western cultural contexts tend to adopt an analytic style of reasoning in which objects are broken up into their component elements (**Fiske et al.,1998; Lin, 1935; Nakamura, 1964; Needham, 1962; Nisbett et al., 2001; Peng & Nisbett, 1999).**AUTHOR: NONE of these authors cited are included in references - please check your references and ADD**** that are other deliberate culture-related aspects that have influenced mathematics education.

One such cultural influence is the idea of being "examination-oriented." Leung (2001) claims the examination-oriented culture of East Asian education is an extrinsic motivation for learning. Leung hypothesizes that East Asian mathematics teachers, through personal professional development, acquire detailed understanding of the specific types of knowledge that are crucial to student achievement success as professional development and strive to convey this knowledge in their classes. In other words, class emphasis is on achieving good scores on examinations as well as preparation for examinations. Systematically varied exercises are generated and believed to foster students' application of knowledge when resolved (Huang & Leung, 2005). Since examinations are utilized to identify student achievement levels, teachers believe examination preparation should be reflected in class lessons.

The examination-oriented environment in Korea may actually have a positive effect on mathematics learning; its negative effectsare also fully recognized (see **Woo, 1998**AUTHOR: There is only WOO 1992 and 1995 in references NO 1998 - Please CHECK AND CLARIFY - ADD if necessary**; **Huh, 1998**AUTHOR: ALSO NO Huh 1998 - please ADD****). However, Woo (1998) claims mathematics educators and teachers should find ways of promoting the development of students' intrinsic motivation to learn mathematics and to "see" the world with mathematical eyes rather than continuously focusing on efficient paths to examination success. Huh (1998) found that a majority of Korean senior high school students experience intense anxiety during mathematical tests as well as awaiting test results. Huh and other related studies have prompted several groups of mathematics teachers to voluntarily investigate how to minimize the negative effect of examination-based mathematics lessons and design new innovative alternative teaching approaches.

Emphasis on practice is considered another cultural influence in East Asian mathematics education (Li, 2006; Leung, 2006; Park, 2004; Lee, 2010). For example, in a study by Li (2006) it was found that "most Chinese students, teachers, and even parents believe that mathematics is a subject everyone could learn well since it is not intelligence but diligence that is essential for success" (p. 131). Complementary practice and rich explanation is believed to be another main teaching tradition in East Asian countries. Several researches have revealed unique explanation strategies practiced in East Asian mathematics classrooms that pursue conceptual understanding. In one such research, Huang and Leung (2005) found that mathematics teachers facilitate conceptual learning as well as procedural learning through the so-called "variation" strategy detailed below.

> Conceptual variations served the purpose of building and understanding concepts, while procedural variations were used for reviewing previous knowledge and introducing the new topic, consolidating new knowledge, developing a strategy to solve problems with the new knowledge, and preparing for further learning implicitly. These two dimensions of variation were created alternatively for different purposes of experiencing the enacted objects of learning. (p. 36)

Based on their observation of classroom teachings, Huang and Leung (2005) conclude that Chinese teachers were indeed engaging students in active learning as they guided them through the lesson. Similarly, **Lee (2010a; 2010b**AUTHOR: NEITHER 2010a or 2010b are**

included in references - Please ADD BOTH**) also report that how Korean math teachers succeeded in enhancing students' knowledge construction and conceptual understanding. It could be said that cultural influences on mathematics education mold its uniqueness in Asia, which has been superficially described as silent. Therefore, it is necessary to investigate teacher thinking underlying the "quiet" learning environment. This study aims to examine this teacher thinking and respective philosophies in terms of purpose, belief, and rationale for engaging students in active thinking while maintaining a silent controlled class, a practice deeply rooted in Korean culture. The present study examines the teachings of two Korean middle math teachers to gain insight into why it is necessary to preserve a silent class even when students engage in active thinking. Findings of this study are expected to shed light on how Korean mathematics teachers balance Korea's cultural tradition of learning through silence with the pursuit of reform – encouraging active student participation.

The Study

Empirical Context and Participants

Two teachers (Ms. Seo and Ms. Kim; females) partook in this study. Both were selected after partaking in a professional development program offered by the researcher in 2006. The researcher surveyed 32 middle school teachers' perspectives on classroom teaching by asking two questions: a) Do you make use of the constructivist approach in your classroom? and b) Do you usually silence students and make them concentrate on you in the classroom? As expected, Table 1 illustrates that 81% (26 out of 32) of the respondent teachers maintain an air of silence in the classroom; 62% (16 out of 26) of the respondent teachers thought they made use of the constructivist approach although maintain an air of silence in the classroom. Ms. Seo was one of the teachers from this category of teachers and Ms. Kim was one of the teachers who thought she did not make use of the constructivist approach.

	Constructivist	Non-constructivist
Silencing	16	10
Non-silencing	4	2

****AUTHOR: There appears to be something missing from this sentence below: Please CHECK and VERIFY****

keep think clearly aware of current educational reform: the "pursuit of student-centeredness" and were willing to put the

idea into practice. They were not, however, confident in the lesson planning and implementing of lessons based on "constructivist teaching."Like other Korean math teachers, they still emphasized silence in their classes. Both teachers were experts who had about ten years of experience and were good at communicating their ideas to students and perceiving their students' responses. The expectation was that they wouldprovide realistic explanations for the need felt by Korean mathematics teachers to have students remain silent during the lesson.

Data

Eighteen lessons led by Ms. Seo and 22 lessons led by Ms. Kim were observed and video-recorded throughout the 2007 school year. One lesson by Ms. Seo and two lessons by Ms. Kim were excluded because they were atypical. For example, during the lesson, recorded immediately before the midterm examination period, Ms. Seo summarized and reviewed prior lessons as well as answered questions from students. Thus, 37 lessons in total were analyzed in this study. Teacher behavior after utterances such as "Now, let's be quiet!" "Please be silent and focus here!" "Listen attentively to my explanation!" and "Don't speak!" were considered intentional "quieting" of students. Post-lesson semi-structured interviews, averaging an hour per interview, were conducted with teachers to clarify the purpose of quieting students. The main data of this study were field notes, transcribed video-recordings, and teachers' explanations on the quieting of their classes. Teacher behavior and their explanations for insisting on silence in the class were categorized and analyzed.

Data Analysis

Qualitative codes were derived from literature on East Asian mathematics teaching perspectives (Watkins & Biggs, 2001; Huang & Leung, 2005; Lopez-Real & Mok, 2002) and repeated observation of recorded lessons and teachers' explanations for the silent atmosphere using techniques from grounded theory (**Glaser & Strauss, 1977; Corbin & Strauss, 1998**AUTHOR: NOT included in references - please ADD****). There were 257 episodes during lessons and 210 interview comments which provided crucial and supportive evidence of the "pedagogy of silence" flourishing in Korean mathematics classes. Thirteen codes for teacher intent emerged from the analysis of four lessons (two from each participating teacher) and follow-up interviews.

One colleague was asked to mark lesson and follow-up interview data sections critical for the understanding of silence in mathematics classes and the strategies used to maintain the silence. The emerged initial codes were used to interpret another two lessons and comments from follow-up interviews. Reliability amongst coders was calculated at 96%, and after discussion, all disagreements over data were resolved. Finally, four categories containing 13 codes for teacher intention were agreed upon (see Table 1).

Table 1. Categories and reasons for silencing

Category	Teacher intent
I. Emotional encouragement(EE)	To assure studentsexclude inappropriate thoughts
	To assure students "consciously" recall prior knowledge
	To assure students persistently studying
	To encourage students to set goalsfor learning and life
II. Seeing knowledge(SK)	To guide students to see the definition of a concept
	To guide students to see the image of a concept
	To guide students to see the beauty and residue of the knowledge
III. Seeing the meta-skill(SM)	To encourage students to see context
	To encourage students to see similarities or differences from their prior knowledge
	To encourage students to grasp key elements (words and conditions) in statements and problems
	To lead students to see and describe the value of knowledge
?.Mastering SK and SM (MSK, MSM)	To guide students to "automatically" use knowledge
	To guide students to "automatically" use meta-skill

The four categories in Table 1 are describedin detail next.

Emotional encouragement (EE). EE is defined as a teacher intent encouraging students to be ready and willing to study. In an air of silence, students concentrate on teacher's behavior and explanation, and in a calm but sincere manner, they follow the teacher's lesson (**Hirabayashi, 2006, p. 55**AUTHOR: Not included in references -**

please ADD**). The teacher is considered an expert or a learned figure in the subject matter (Leung, 2006, p. 43); that is, a master (Hirabayashi, 2006, p. 55), so students are expected to respect and obey the teacher not only cognitively but also emotionally. Through emotional encouragement, the teacher engages students in all cognitive and achievement levels in active learning.

Seeing knowledge (SK). SK is defined as a teacher's purposeful guidance of students to observe and see the knowledge that is being taught as an object before performing operations with that knowledge. The teacher achieves this by attracting and directing student attention to the new knowledge, not by directly leading them to the knowledge but engaging students in active learning (**Lin, 2010**AUTHOR: Not included in references - please ADD****). Students gain enlightenment of a concept, an algorithm, a principle, and a structure not only by making sense of mathematical knowledge but also by feeling the beauty or the potential contained in mathematical knowledge. Eventually, students realize the need to seek mathematical standards or "see" with mathematical eyes (Lee, 2000; **Nam, 2007**AUTHOR: Not included in references - please ADD****).

Seeing meta-skills (SM). SM refers to a teacher intent to guide students to grasp and "intelligently imitate" meta-skills (**Polya, 1954; Rowlands, 2004**AUTHOR: Neither included in references - please ADD BOTH**)**. The teacher offers an implicit meta-skill by which to handle explicit mathematical knowledge (Nam, 2007). Highlighting the features of a concept, procedure, or problem, the characteristics of a context and its related conditions, the combinations of mathematical facts, thinking patterns or habits, and personal stories concerning the learning of mathematics are all conferred while maintaining silence amongst students.

Mastering SK and SM (MSK, MSM). MSK and MSM refers to a teacher encouraging students to automatically "see" knowledge and meta-skills so that they can reach "self-attainment (í»Ôð)" (**Woo & Kang, 2007**AUTHOR: ONLY Woo 2007 is included in references NOT WOO & KANG - please CHECK AND CLARIFY - If necessary ADD WOO & KANG 2007**)**. Students develop an "earnest attitude toward studying" (Leung, 2006) while imitating SK and SM as they are observed. Mere imitation without speculation could never lead students to true humanity, so students must learn how to be silent, and silence advances learning through intelligent imitation.

Findings

Distribution of Silence Usage

As Table 2 illustrates, Ms. Seo and Ms. Kim had mostly teacher-directed math lessons. Both teachers dominated the lesson (see LS in Table 2), and each used silence in a slightly different proportion, though it is not significantly different, $P^2(2, N=3)=6.43$, $p< .05$. Ms. Seo focused more on SM (μ =5.35) than SK (μ =4.53). Likewise, Ms. Kim also focused more on SM (μ =4.65) than SK (μ =3.95). Whereas Ms. Seo was found to focus relatively less MSK and MSM (μ =2.88), Ms. Kim significantly placed great emphasis on MSK and MSM (μ =4.25),$P^2(2, N=1)=5.6$, $p< .05$.

TABLE 2 HERE

A total of 277 silence-type practices were identified for 17 of Ms. Seo lessons, with a mean of 16.3. Moreover, the range for each lesson was between 14 and 20 silence uses. For the 20 lessons led by Ms. Kim, a total of 331 silence-type practices were identified, with each lesson having a mean of 16.6. Ms. Kim's range for each lesson was between 13 and 22 silence uses. These findings clearly indicate that both teachers heavily stressed silence in the class during their lessons.

Silence Usage for EE

Both teachers believed that since studying mathematics is difficult and requires contemplation, emotional encouragement will lead students to study hard. The teachers also considered teaching to be personal and emotional as well as institutional and cognitive. In addition to guiding students to exclude distracting thoughts, they emphasize attitude cultivation; that is, one should recall or restructure prior knowledge in order to construct something new. The teachers also regarded successful mathematics learning to be correlated with persistence and as such, strongly emphasized setting goals for learning and in life (see Table 1). Ms.Seo summarized her reason for the use of silence in the removal of distracting thoughts as:

> *One of my high school math teachers told me to get rid of distracting thoughts before the onset of each lesson by*

> *meditating. It was really helpful in my high school years, so I am following his advice and teaching my students to the same. I usually begin each class with a one-minute long contemplation session because stepping into the world of mathematics is not easy. Moreover, we are living in a noisy and complicated world.*

Ms. Kim began each of her classes with either a minute long music appreciation session or a round of singing. Since she believed the study of mathematics requires high concentration, observations found her waiting for students to clear their minds of distracting thoughts by maintaining silence in the class. Once an air of silence was achieved, Ms. Kim believed students were ready to think and behave like learners who sincerely wanted to appreciate mathematics. Although both teachers directed students' thinking, they made sincere attempts to engage students in the search for new patterns or aspects closely related to their prior knowledge. Both teachers were exceptional at guiding students towards the investigation of a proposed construct by pretending to be genuinely excited at their proposals. Ms. Kim's ability to funnel students' mathematical eyes towards the underlying structure of parallel equations – two equations with the same two variables – was impressive to observe. She avoided explicit explanation of the topic by exerting a unique pull of student attention as follows:

> *Is there anything special about these two equations? Can any pair of equations be solved? We usually try jump right into the solving of given problems, but what we really need to do is decide if they are solvable or not before proceeding to solve them. Sounds difficult? Difficult, it is. Yes, I suspect this is probably more difficult than anything you've ever done. (Keeps silent for a few seconds) So, what can I say? Nope, the answer isn't in your textbook. Well, maybe it is. I don't know. I doubt anyone can see it. I couldn't see it either at first. Ga-Jin, why are you smiling? Have you spotted something? Please keep it a secret. The rest of the class needs more time to think it over. Let's keep thinking class.*

Encouraging students to be persistent in thinking, finding patterns, ideas, and structures and practicing conceptual analysis and applications were frequently followed by instructions to be quiet. Teachers explained these persistent silencing techniques as the esprit of mathematics and the main drive behind mathematics learning. While emphasizing persistence, teachers were also found to be guiding students towards the setting of goals for their learning and lives. Ms. Kim mentioned:

> *A student should know what he/she can do at a certain stage and what he/she has to do to reach the mathematics learning set by him/herself. Sometimes each student needs to set a goal for his/her life to increase persistency in studying. Without goals, I think, students lose their willingness to study mathematics.*

Both teachers' overall interventions were characterized as "emotional" since the interventions often drew students' attention through "emotional encouragement," which is ironic because both teachers declared mathematics a discipline by which student logical thinking ability is cultivated independent of emotion. Interestingly, Ms. Seo was observed appealing to students' emotions as she encouraged them to solve problems.

> *Just think how sad the mathematician, who discovered the method of solving this problem, would be if we don't figure out how to solve it. How pitiful his life would be! So, let's try our best to solve it.*

Ms. Seo also encouraged students to practice computing skills by appealing to their frustration. She would tell students to image the frustration at being able to understand and solve problems but make silly mistakes in computation or waste time on the actual computation. This observation will be further in the following section.

Silence for SK. To guide students to "see" concepts, patterns, and structures, both teachers revised contexts and representations in their respective textbooks. Ms. Seo argued that the textbook context was usually too vague and contained complex information, which was not authentic, so it needed revision. In one interview, she said:

> *I rarely see the value of the real-life context presented in the textbook. It is detrimental students who are easily distracted by vague and complex information. I prefer to directly guide students to think about the meaning of the concept defined in the textbook, which uses unfamiliar language, rather than wait for students to abstract the meaning from contexts. Personally, I find most students simply become confused and don't know what to do when asked to abstract a concept from context. I usually provide background information, which is closely related to a concept as students ponder the language used in the definition.*

Ms. Kim was also frequently observed requesting students to generate personalized images of a concept while striving to understand the concept. For instance, when teaching students how to solve equations, she was often heard saying "*Please try to create an image of the equation* *you are investigating. It's not necessary to explicitly explain your image's appropriateness for the equation because it could be anything. With that in mind, try to improve upon your image as you study the equation.*" Sometimes she only gestured her directions; she didn't say a word to students. For example, to make students ponder the characteristics of linear functions, she pretended to draw the graph of a linear function in the air and guided students to do the same. Students showed their understanding of linear functions with such gestures.

Noticeably, both teachers engaged students in the practice of hypothesizing a"mental object"by having students build an image of a concept or an algorithm in their minds. Teachers argued that the more students became aware of the difference between their "mental objects"and the one offered in the textbooks, the more their understanding of the definition of the desired concept matured. The two teachers felt that by becoming aware of gaps between their constructs and the actual definition of a concept, students showed evidence of development. Ms. Seo proclaimed students could feel the beauty of a concept, an algorithm, or a structure by focusing on the gap or differences. She supported her claim by discussing how, historically, mathematicians made various mistakes on elaborations of their definitions. She also added that silence in the classroom allowed students to "de-mystify mathematics."

Teachers believed they needed to provide students opportunities to retain "residual" information, something that they gradually come to know as they study, something not typically evaluated on examinations while they learn concepts. For example, Ms. Seo encouraged students to contemplate the meanings or usages of the words "finite" and "infinite" in other contexts after summarizing students' learned knowledge of a"finite decimal number" and a"infinite decimal number." The teachers tried to extend students' space of knowledge so that it was not limited to the concepts learnt in the lesson. Ms. Kim also asked students to think about other possible kinds of functions in addition to linear functions. Both teachers gave"openness" in order to cultivate students' capacity in learning of mathematics by guiding students to think divergently.

Silence for SM. Both teachers believed that although seeing a structure, not merely the surface of a context or a problem, is difficult, it is an essential part of mathematics learning. They tried to facilitate students' thinking beyond context or a problem to pursue better understanding. Then, for meta-skills, "epistemological investment" was also seen to be important aspect in learning for the two teachers. Ms. Seo frequently used the so called "what if-not" strategy when she invited students to focus on a meta-skill during the class to solve a problem as seen below.

> Problem: Sang-A is buying drinks and fruit for Mi-Yeon's birthday party. It costs 800 Korean won for a melon and 400 for an apple. How many melons and apples can Sang-A buy with 4800 Korean won.

Ms. Seo encouraged students to understand the problem context by identifying and recognizing important facts, expressions, and/or conditions. She asked students to "*Picture the texts context in your head before choosing information you consider important or need to solve it*" after creating an atmosphere of silence in the classroom. The search for and recording of key words and phrases were suggested strategies used by the teachers to help understand the problem context. For the problem above, Ms. Seo also guided students to develop ideas on how to solve the problem, to dig into generalizations of their developed ideas, to verify their generalizations, and to reflect on all performed actions. Several proposed ideas for solving the problem were discussed in the class and similar problems were also examined. Similar properties, contexts, and problems were categorized by students following the teacher's direction. Interestingly, the value of discussed concepts, problems, representations, and problem solving strategies were debated amongst students without direction from the teachers. Meta-cognitive behavior was frequently encouraged by the teachers to pursue to understanding and constructing mathematics.

Ms. Kim stressed SM as much as she stressed SK in mathematics though she focused less proportionally on SM than Ms. Seo. She explained her teaching style as:

> *I totally agree with Polya's means to cultivate student capacity, the so called, "Know-How" and "Know-What" of problem solving. Imitating, here, is a very useful learning strategy, I think. I always make an effort to encourage students to habitually use meta-skills such as recalling similar problems, drawing pictures, changing perspectives, and specializing. I often ask students to see why and how to use such skills for learning of mathematics after silencing.*

Silence for MSK and MSM. Teachers proclaimed that better understanding of concepts can be built by mastering the desired concepts. Furthermore, they believed learners should master all knowledge learnt; otherwise, learners are not "authentic learners." Ms. Kim stressed mastering significantly more than Ms. Seo (see Table 2). She explained the importance of mastering learnt knowledge as:

> *Mastering knowledge learnt through analysis allows one to fully understand. Therefore, I invite students to mimic by actions, I mean, to practice or master what I have taught them so far. For instance, the ability to see a structure or pinpoint key words from the context of a problem should be mastered by students. To ensure they master what they've learnt at home as well as in class, I insist on silence in the classroom and ask students to pay attention to mastering activities.*

During the lessons, the teachers were seen, on occasion, allotting time for the mastering of knowledge learnt; that is, the teachers did not just mention the importance of mastering the knowledge. Memorization was also encouraged or imposed when teachers used silence as the means of mastering knowledge. Both teachers expressed the purpose mastering knowledge as "to use knowledge and meta-skills automatically."

Discussion and Conclusion

Like the classrooms discussed in the research of **Clark (2009)**AUTHOR: NOT in references - please ADD**, student to student conversations were rarely observed in the two participating teachers' math classes. Student initiated teacher to student conversations were also rare. Most teaching and learning activities could be labeled "teacher-dominated" as described by other studies on East Asian mathematics lessons (Leung, 2001; Clark, 2009; Mok, 2003; Huang & Leung, 2005). This finding indicates that teachers are not following the educational reform requirement in place since the end of the 1990s in Korea, in which "student-centeredness" is stressed as the most crucial aspect of teaching and learning. Nevertheless, the two teachers involved in this study clearly voiced their belief in constructivism and that they have been working hard to realize it in their classrooms. Hence, this study illustrates why and how Korean math teachers, although they work towards constructivism in education and application of the current educational reform perspective which is based on constructivism, continue to employ a traditional approach to teaching recognized as the "pedagogy of silence."

The main reason why the two teachers were reluctant to open initiation of discourse from students and attract students' attention through the use of silence use found to be directly related to belief in learners' psychology. The teachers felt most Korean students to be quite sensitive about making mistakes in public. In interviews both teachers said most students are seriously afraid of losing face in front of peers when answering the teacher's questions. In particular, teachers said that low achieving students are easily distressed emotionally when prompted to participate by teachers. In Korean culture, speech is usually produced after completion of speculation or study. Incomplete speech is considered more inferior to silence and even harmful since speech requires an audience and impacts other's perspectives (Lee, 1998, 2000; **Woo & Kang, 2007**AUTHOR: Please check/confirm references - ONLY Woo 2007 is included in reference?**). Hence, silence in Korean math classes, which is practiced by teachers, does not imply failure in the adapting of the reform idea or constructivism. Instead, it could be the best means of compromise. That is, through this teaching approach, teachers realize constructivism while working within the constraints of cultural perspectives on education.

As preciously discussed in the conceptual framework section, though constructivism had a strong impact on Korean math education, it has not gone without backlash. Regardless, rich discussion among renowned Korean math educators on "constructivism" and traditional perspectives towards education related to "Confucianism" has brought about a distinctive approach to mathematics education, the "pedagogy of silence." Findings in this study reveal teachers' intention and the strategies used for quieting the class during a math lesson. Four critical teacher rationales for silence were identified as EE, SK, SM, and MSK/MSM.

Teachers emotionally encouraged (EE) students to mentally prepare for the study of mathematics and to proceed with their study in silence. Directing students to (a) look at pictures, (b) listen to music, (c) sing songs, (d) recite rules or factual knowledge, and (e) tell or listen attentively to personal stories as well as the rewarding or punishing of behavior and utterances were EE techniques used to guarantee silence. Teachers had students participating in SK activities while classes were kept as silent as possible. Teachers would directly explain knowledge; that is, define a concept they deemed exhibited knowledge to let students to see it. Then teachers varied definition explanations for certain concepts to prompt students to ponder the concepts from various perspectives, which is much like the approach used by the teacher in Huang and Leung's 2005 study. However, unlike the teacher in that study, the two teachers facilitated the development of students' images of a concept by raising awareness of the gap between the concept definition and their image of the concept. By doing so, students were setting goals for their learning; for instance, students had to re-examine the concept definition by narrowing the gap or revising their image of the concept.

SM was another frequently encouraged approach adopted by the two teachers once the class had been silenced. The two teachers believed they were implementing "thought experiments" through which students learnt specific concepts mentally. The teachers pretended to analyze a problem context or a real-life situation via certain specific statements, conditions, phrases, and/or structures. Then, teachers encouraged students to select one of the mentioned clues or thinking paths to learn concepts or solve problems. Their focus on meta-skills using hypothetical learning paths released students from the fear of losing face in front of peers and each student became responsible for the selected clues or thinking paths. Teachers considered MSK and MSM essential learner behavior, so the teachers themselves, tried to master SK and SM. They believed they were behaving like role models for the learners.

REFERENCES

Brousseau, G. (2007). *Theory of didactical situations in mathematics.* Dordrecht, NL: Kluwer Academic Publishers

Cho, Y.D. (2009). Understanding Korean middle and secondary school classroom teaching and teachers' instructional activities: "Optimization behavior for teaching." *Proceedings of the 35th Conference of the Korea Society of Educational Studies in Mathematics* (pp. 1-27). Seoul, Korea.

Choi, C.W. (2000). A case study of elementary mathematics class in a constructive view. *Research in Mathematics Education, 10*(2), 229-246.

Clarke, D.J., Keitel, C., & Shimizu, Y. (Eds.). (2006). *Mathematics classrooms in twelve countries: The insider's perspective.* Rotterdam, NL: Sense Publishers.

Ernest, P. (1991). *The Philosophy of mathematics education.* London, UK: The Falmer Press.

Freudenthal, H. (1981). Major problems of mathematics education. *Educational Studies in Mathematics, 12,* 133-150.

Huang, R. & Leung K.S. (2005). Deconstructing teacher-centeredness and student-centeredness dichotomy: A case study of a Shanghai mathematics lesson. *The Mathematics Educator, 15*(2), 35-41.

Kim, H.S. (2002). We talk, therefore we think? A cultural analysis of the effect of talking on thinking. *Journal of Personality and Social Psychology, 83*(4), 828-842.

Korean Ministry of Education. (1997). *Mathematics curriculum*.

Lee, H.W. (1983). *Living, knowing and education*. Seoul: Seoul National University.

Lee, H.W. (1998). *Goal and difficulty of education*. Seoul: Gyoyook Book Publishing.

Lee, H.W. (2000). *Theory of education in Neo-Confucianism*. Seoul: Sung-Kyung-Jae.

Lee, K.H. (1999). Mathematics education and constructivism. *Research in Mathematics Education, 9*(1), 51-80.

Leung, F.K.S. (2001). In search of an East Asian identity in mathematics education. *Educational Studies in Mathematics, 47,* 35-51.

Leung, F.K.S. (2006). Mathematics education in East Asia and the West: Does culture matter? In F.K.S. Leung, K.D. Graf, & F.J. Lopez-Real (Eds.), *Mathematics education in different cultural traditions: A comparative study of East Asia and the West* (pp. 21-46). New York: Springer.

Leung, F.K.S. & Park, K.M. (2002). Competent students, competent teachers? *International Journal of Educational Research, 37*(2), 113-129.

Li, S. (2006). Practice makes perfect: A key belief in China. In F.K.S. Leung, K.D. Graf, & F.J. Lopez-Real (Eds.), *Mathematics education in different cultural traditions: A comparative study of East Asia and the West* (pp. 129-138). New York: Springer.

Lopez-Real, F.J. &Mok, I.A.C. (2002). Is there a Chinese pedagogy of mathematics teaching. *Perspectives in Education, 18*, 125-128.

Ministry of Education, Technology, and Science. (2007). *Mathematics curriculum*.

Mok, I.A.C. (2003). The story of a “teacher-dominating” lesson in Shanghai. Paper presented as part of the symposium *Social interaction and learning in mathematics classrooms in Australia, Germany, Hong Kong, Japan, the Philippines, Sweden, and the United States* at the 10th Biennial Conference of the European Association for Research on Learning and Instruction, Padova, Italy.

Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., & Chrostowski, S.J. (2004). *TIMSS 2003 international mathematics report*. Chestnut Hill, MA: International Study Center Lynch School of Education Boston College.

OECD. (2004). *Learning for tomorrow's world: First results from PISA 2003*. Retrieved May 11, 2010 http://www.oecd.org/dataoecd/1/60/34002216.pdf

Pajares, M.F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research,62*, 307-332.

Pang, J.S. (2004). In Korea sub-commission of ICMI, *The report on mathematics education in Korea*, 85-92.

Park, K.M. (1995). Constructivism in mathematics education. *Research in Mathematics Education, 5*(1), 217-223.

Park, K.M. (2001). In search of an Asian identity in mathematics education. *Math Love, 25*, 143-144.

Park, K.M. (2004). Factors contributing to Korean students' high achievement in mathematics. In Korea sub-commission of ICMI, *The report on mathematics education in Korea*, 85-92.

Park, K.M., Jeong, Y.O., Kim, H.K., Kim, D.W., Choi, S.I., & Choi, J.S. (2010). A research on the developmental plan for mathematics education in elementary and secondary school. Korea Foundation for the Advancement of Science & Creativity.

Park, M.G. (1999). The constructivist teaching experiment. *School Mathematics, 1*(2), 512-528.

Park, Y.B. (1996). *A study in the constructivist development in teaching and learning mathematics*. Unpublished Doctoral dissertation. Retrieved May 10, 2010 from http://library.snu.ac.kr/

Peterson, P.L., Fennema, E., Carpenter, T.P., & Loef, M. (1989). Teachers' pedagogical content beliefs in mathematics. *Cognition and Instruction, 6*(1), 1-40.

Raymond, A.M. (1997). Inconsistency between a beginning elementary teacher's mathematics beliefs and teaching practice. *Journal for Research in Mathematics Education, 28*(5), 550-576.

Schmidt, W.H., McKnight, C.C., Cogan, L.S., Jakwerth, P.M., & Houang, R.T. (1999). *Facing the consequences: Using TIMSS for a closer look at U.S. mathematics and science education*. Boston, MA: Kluwer Academic Publishers.

Shim, S.H. (2008). A philosophical investigation of the role of teachers: A synthesis of Plato, Confucius, Buber, and Freire. *Teaching and Teacher Education, 24*, 515-535

Stein, M.K. & Brown, C. (1997). Teacher learning in a social context: Integrating collaborative and institutional processes with the study of teacher change. In E. Fennema & B.S. Nelson (Eds.), *Mathematics teachers in transition* (pp. 155-191). ****AUTHOR: Please ADD Place and Name of Publisher.****

Thompson, A.G. (1984). The relationship of teachers' conceptions of mathematics and mathematics teaching to instructional practice. *Educational Studies in Mathematics,15*, 105-127.

Thompson, A.G. (1992). Teachers' beliefs and conceptions: A synthesis of the research. In D.A. Grouws (Ed.), *Handbook of research on mathematics teaching and learning* (pp. 127-146). New York: Macmillan.

Watkins, D.A. & Biggs, J.B. (2001). The paradox of the Chinese learner and beyond. In D.A. Watkins & J.B. Biggs (Eds.), *The Chinese learner: Cultural, psychological, and contextual influences* (pp. 3-26). Hong Kong: Comparative Education Research Centre, The University of Hong Kong.

Wong, N.Y. (1998). In search of the "CHC" learner: Smarter, works harder or something more? Plenary lecture, in H.S. Park, Y.H. Choe, H. Shin, & S.H. Kim (Eds.). *Proceedings of the ICMI-East Asia Regional Conference on Mathematical Education, 1*, 85-98.

Wong, N.Y. (2006). From "entering the way" to "exiting the way": In search of a Bridge to span "basic skills" and "process abilities". In F. K.S. Leung, K.D. Graf & F.J. Lopez-Real (Eds.), *Mathematics education in different cultural traditions: The 13th ICMI study* (pp. 111-128). New York: Springer.

Woo, J.H. (1992). A Korean perspective on mathematics education. *Research in Mathematics Education, 2*(1), 119-131.

Woo, J.H. (1995). Radical constructivism versus Piaget's operational constructivism in mathematics education. *Research in Mathematics Education, 5*(1), 1-17.

Woo, J.H. (2000). Principles and methods of mathematics teaching. Seoul: Seoul National University.

Woo, J.H. (2004). School mathematics as a major subject for "humanity education."*School Mathematics, 6*(4), 313-324.

Woo, J.H. (2007). School mathematics and cultivation of mind. In J. Woo, H. Lew, K. Park, & D. Seo (Eds.) *Proceedings of the 31st Conference of the international group for the psychology of mathematics education, Vol. 1*, (pp.65-93). Seoul, Korea: The Korea Society of Educational Studies in Mathematics.

NOTES TO AUTHOR:
Items cited in Text and NOT included in references. PLEASE ADD:

-Lee 2010
-Glaserfeld l984, 1991
-Yim 1999
-Lee, Jung, Na, & Kim 2010
-Yim & Hong, 1998
-Yim, 2000
-Kang 2004
-Nam 2007
-Lee 1995 (Please Clarify - see p. 4 in text)
-Woo & Kang 2007
-Schoenfeld 1992
-Brown & Borko 1992
-Cooney 1985
-Nisbett, Peng, and Norenzayan 2001
-Fiske et al.1998;
-Lin, 1935
-Nakamura, 1964
-Needham, 1962
-Nisbett et al., 2001
-Peng & Nisbett, 1999
-Woo, 1998 (only 1992 and 1995 in references NO 1998 - Please CLARIFY - see Note in Text p. 10)
-Huh, 1998
-Lee 2010a; 2010b (see p. 10/11)
-Glaser & Strauss, 1977
-Corbin & Strauss, 1998
-Hirabayashi, 2006
-Lin, 2010
-Polya, 1954
-Rowlands, 2004
-Clark 2009

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