

Exploring how Korean teacher's attitudes and self-efficacy for using inquiry and language based teaching practices impacts learning for culturally and linguistically diverse students: Implications for science teacher education

Jennifer Park

Seoul National University, REPUBLIC OF KOREA

Hye-Eun Chu

Macquarie University, AUSTRALIA

Sonya N. Martin

Seoul National University, REPUBLIC OF KOREA

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Demographic trends in Korea indicate that the student population is becoming more diverse with regards to culture, ethnicity and language. These changes have implications for science classrooms where inquiry-based, student-centered activities require culturally and linguistically diverse (CLD) students to connect with their peers and successfully navigate both everyday and content specific language. This study introduces the K-TASILT (Korean Teachers' Attitudes and Self-efficacy for Inquiry and Language based Teaching) questionnaire, which we designed to investigate Korean teachers' conceptions of diversity, inquiry teaching, and language education to help explore attitudes and self-efficacy towards teaching inquiry and language skills to CLD students. An analysis of 144 primary and secondary schools teachers' responses revealed that they have fairly positive attitudes towards CLD students and positive self-efficacy for teaching inquiry, but they also have limited self-efficacy for implementing effective language teaching supports for using inquiry teaching with CLD students. We raise questions about the ways in which teachers' attitudes and beliefs about inquiry teaching and language acquisition could shape teaching practices that limit or afford opportunities for CLD students to participate in school science. We offer implications for science teacher education programs in Korea focused on enhancing diversity and

Correspondence: Sonya N. Martin,
Earth Science Education, Seoul National University, Seoul, Republic of Korea.
E-mail: sonya.n.martin@gmail.com

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content specific strategies for supporting language learning.

Keywords: culturally and linguistically diverse students, teacher self-efficacy, inquiry, language learners, multicultural education

INTRODUCTION

Understanding how science teachers' beliefs and attitudes about the learners in their classroom influence their instructional practices and classroom behaviors is an important area for research in science education, especially if the beliefs teachers have about their students shape their practices in ways that disadvantage some science learners over others. Research in science education has shown that teachers' beliefs and attitudes towards science can have a significant impact on how they implement curriculum (Cronin-Jones, 1991; Haney & McArthur, 2002), how they view the roles of students and teachers (Bryan, 2003; Martin, 2006), what they view as the goal or purpose of science education (Mansour, 2009), and even their tendencies to encourage and enable students to engage in student-centered, open-ended scientific inquiry projects (Bencze, Bowen, & Alsop, 2006). These studies have shown that for teachers to create effective science learning environments for their students, they need to be aware of their personal beliefs about science and about teaching and learning. Other studies have found that teachers' cultural beliefs (related to social norms, customs and values) (Wang, 2004; Martin, 2006) and personal biases regarding gender (Jones & Wheatley, 1990; She, 2000), race and ethnicity (Atwater, Lance, Woodard, & Johnson, 2013), linguistic ability (Lee, Luykx, Buxton, & Shaver, 2007; Im & Martin, 2015; Martin, Wassell, & Scantlebury, 2013), and student ability (Kirch, Bargerhuff, Cowan, & Wheatly, 2007) can also influence their decisions and actions in the science classroom. Currently, there is a dearth of research examining how teacher beliefs and attitudes may impact learning for culturally and linguistically diverse (CLD)¹ students. This is

¹ In this study, we use the term Culturally and Linguistically Diverse (CLD) students to be more inclusive of five groups of students who would be identified as being different from native-Korean students. CLD students includes children from 1) international marriages in which one parent is ethnically Korean and one who is not (다문화학생), 2) children whose parents are both racially/ethnically non-Korean (외국인- which includes children of foreign migrant workers and/or immigrant non-Koreans, 3) children who are ethnically Korean, but not born in Korea (재외국민 or 동포), 4) children who are refugees from North Korea or were born to refugee parents in South Korea (탈북학생), and finally, 5) all children living in Korea who do not speak Korean fluently. This category could include any of the previously mentioned children, as well as native Korean students who have lived abroad and attended schools in another country and who then return to Korea (귀국자학생).

State of the literature

- Korean society is becoming increasingly diverse and these changes are reflected in changing demographics in school-age children.
- Korean teachers have limited experience or formal training to prepare them to effectively communicate with culturally and linguistically students and parents and they lack professional development to help them address issues related to language learning or cultural difference, especially in content area subjects such as science.
- Research exploring connections between teacher beliefs and classroom practices have found teachers' beliefs about and attitudes toward culturally and linguistically students and their parents can have a significant impact on students' academic achievement.

Contribution of this paper to the literature

- We discuss the development and validation of an instrument designed to measure Korean teachers' self-efficacy and instructional practices in three categories: attitudes about cultural and linguistic diversity, inquiry, and language teaching.
- We highlight factors that influence teachers' efficacy and the association it has to their attitudes toward teaching inquiry and language skills to CLD students.
- Our research has implications for Korean science teacher education programs about the need to teach content specific strategies that promote language learning and the need for multicultural education coursework.

especially true in classrooms where teachers use inquiry teaching strategies that emphasize language use and social interactions between CLD students and their peers. This study seeks to fill this gap by exploring these issues in the context of Korea where a recent rise in immigration has resulted in a rapid increase in CLD student population in the public school system.

In this paper, we describe the development of K-TASILT (*Korean Teachers' Attitudes and Self-efficacy for Inquiry and Language based Teaching*), an instrument designed to explore Korean teachers' attitudes and self-efficacy towards teaching inquiry and language skills to CLD students. In addition to discussing our method for ensuring validation and reliability, we also share findings from survey implementation that suggest Korean teachers' attitudes and beliefs about cultural and linguistic diversity have the potential to impact how CLD students experience school and science. We use our findings to draw attention to some of the challenges Korean teachers and CLD students face when teaching and learning science content in inquiry-based classrooms. Building from these findings, we raise questions about the need for programs designed to support Korean teachers to better understand diversity and to be able to implement multicultural and second language education strategies, especially in content specific classrooms where CLD students are learning science. We conclude by raising more questions for future research and by discussing the implications of our work for researchers and science teacher educators in educational contexts that are largely homogenous with regards to language, ethnicity, and culture, but like Korea, are becoming more diverse.

Because classroom diversity is a recent phenomenon in Korea, in the sections that follow, we draw both from domestic and international studies where researchers have explored similar issues to support our rationale for addressing this issue in Korea. We begin by discussing trends in demographic data that show how immigration is affecting Korea's K-12 student population. Then we introduce the concept of teaching self-efficacy and expectancy outcomes in relation to teachers' beliefs about diversity, inquiry teaching, and language learning.

Changing demographics in Korean society

Over the last twenty years, Korea has experienced an unprecedented shift in the population as globalization has brought an influx of migrant workers, international marriages, students studying in Korea from abroad, as well as refugees from North Korea (Lee, 2008). These changes in human migration to Korea have resulted in many challenges for a society that has experienced a relatively homogenous population for centuries (Ahn, 2012; Choi, 2010). Often described in the literature as being both culturally and linguistically homogenous, Korea is known for expressing a strong sense of nationalism based on the belief that Koreans share a single ethnicity and language (Shin, 2006; Lee, 2013). The view that Korea represented "one race of people" was emphasized through education and in the media in an attempt to build a strong nation-state following Korea's 1945 independence from 30-years of Japanese occupation and a 1950-1953 civil war that divided the country (Park, 1989). Commonly used terms, such as, 단일 민족 (danil minjok), meaning "one people" (Watson, Park, & Lee, 2011) and 우리 (uri), meaning "we" or "ours", reflect this belief and are used to denote ownership or membership to a collective or

Because we believe the terminology used to describe people has important implications for how they are positioned as participants in society, in our research, we choose to use the term non-Korean (비한국인) rather than foreigner (외국인), to describe someone who is not ethnically Korean (Cha, 2015). We believe this term to be more inclusive.

group, including belonging to Korean society². While some scholars have contested this assertion that the Korean people represent a “pure race” (Lee, 2005; Choe, 2012), the same ideology that has served to bond the people of South Korea into a more cohesive country has historically served to demarcate lines of exclusion for those who do not share Korean ancestry and the Korean language. As a result, Korean society has been slow to integrate people from other cultures, resulting in the marginalization of people identified as foreigners or 외국인 (oegugin) (Kim, 2012; Kang, 2013). This kind of marginalization can have a negative impact on the experiences of CLD families when interacting with school officials and CLD students, especially when engaging in student-centered inquiry activities used in science classrooms.

Currently, immigrants in Korea represent less than 4% of the overall population, but this number is expected to rise steadily over time. In less than one generation, Korea’s immigrant population has already increased by 1,350%. According to immigration statistics, the number of foreigners³ living in Korea in 1995 was only 123,881 (KOSIS, 2014). But by 2005, the number had increased by about 500%. As of February 2015, the total foreigner population had increased to 1,797,618 people (KOSIS, 2015). The two most common reasons for these changes in Korea’s population are employment and marriage opportunities for unskilled and uneducated immigrants from economically disadvantaged countries in the region. Other sources of immigration are much smaller and include mostly people with short-term visas, such as students, researchers, and language teachers. Today Korean teachers are increasingly expected to communicate with parents who are less likely to be fluent in Korean, who have limited experiences with education in their sending country or with the Korean education system, and who are likely to be disadvantaged economically and socially. In the sections that follow, we briefly introduce the biggest sources of CLD children in Korea’s public schools. The purpose is to provide context for understanding how teachers’ negative attitudes about these children and their families could potentially impact teaching and learning opportunities in the science classroom.

Migrant workers, expats, and their children

The largest group of immigrants to Korea are foreign workers from China and other countries in Southeast Asia who come as “industrial trainees” to do intensive labor for low wages in low-skilled industry jobs. From 1997-2007, there was a 170% increase (387,000 to 1,046,000) in visas issued for these labor positions (Kang, 2010). Referred to as “migrant workers”, there are many accounts detailing discrimination and human rights violations of these workers by their employers (Kang, 2010). As of 2015, an estimated 209,000 workers are believed to have overstayed their visas, remaining as illegal aliens with even fewer legal rights and protections (Korea Joongang Daily, 2015). Legislation was passed in 2003 to provide an education for the children of undocumented workers (Cho & Yoon, 2011), but as of December 2014 an estimated 20,000 children of undocumented workers were not enrolled in school (Kim, 2014). In addition to “migrant workers”, there are also an increasing number of foreign workers with higher status visas (researchers, professors, and business owners). Referred to as “expatriates” or “expats”, the children of these workers tend to be enrolled in private schools where they are typically instructed in their native language (i.e., English, Mandarin, or Russian) and are taught by teachers who tend to be foreign nationals, rather than Korean. Conversely, children of migrant workers tend to be educated solely in public

² In this paper, we use Revised Romanization to transliterate Korean into English. For more information about this system, please visit http://www.korean.go.kr/front_eng/roman/roman_01.do

³ In this case, the term foreigner refers to a person living in Korea without Korean citizenship.

schools, if at all. As a result, when Korean teachers interact with families who have emigrated from other countries, they more likely to have low socioeconomic status, limited education and limited Korean language proficiency, and limited social power.

Marriage immigrants and their children

Marriage immigrants are the second largest group, but they make up a much smaller portion of the total immigrant population. In 2010, more than 10% of all marriages registered in Korea were international marriages⁴ (Kim, 2012). Various social factors have been identified as contributing to this trend, including the country's declining birthrate, expanded rights and education for Korean women who choose to delay marriage in order to pursue careers, and because women are migrating from rural areas to the cities, male farmers are left with fewer marriage prospects (Jones & Shen, 2008). Since the mid-1990's, more than half of all international marriages have occurred between female immigrants and Korean men. Previously, very few Korean men married foreign women. Today, the vast majority of these marriages are to ethnic Korean Chinese women (known as cross-border brides), followed by women from Vietnam, the Philippines, and other Southeast Asian countries (known as mail-order brides) (Lee, 2008; Jones & Shen, 2008). Similar to migrant workers, marriage immigrants face stigma and persecution in Korean society. Because female marriage immigrants tend to be uneducated, have limited Korean language proficiency, and are 10 or more years younger than their Korean husbands, they are not well-received by many people in society.

In Korean, multiracial or multiethnic families are referred to as multicultural families (다문화가족 *damunhwa gajeok*). A recent study found that nearly 41% of multicultural families surveyed had experienced some type of discrimination (Kang, 2013, as cited in Brannen & MacLellan, 2014). Other studies note that stress on these families is resulting in a growing number of divorces (Jones & Shen, 2008), which further compounds the negative perceptions native Koreans have about international marriages. Children born in these marriages are referred to as multicultural students (다문화학생 *damunhwa haksaeung*)⁵ and they are significant because they represent the fastest growing population in the country. As recently as April 2014, multi-ethnic children⁶ made up more than 1% of all school age children (Jeon, 2014) and more than 85% of these children are enrolled at the elementary level (Provincial Government Statistics, 2013).

Because of employment and housing opportunities, some regions attract more immigrant and multicultural families than others. Gyeonggi-do province, which includes the largest urban center in Korea, has the largest immigrant population. Between 2010 and 2014, there was a 47% increase in the number of non-Koreans (from 337,821 to 492,720) living in the region. From 2008 until 2014, this province saw a whopping 367% increase in CLD students (11,131 to 51,960) in the school district (Provincial Government Statistics, 2013). The CLD student population in this region is predicted to continue growing by about 14% each year, meaning the demand on the readiness of teachers in these classrooms will also increase. These

⁴ This term describes marriages between an ethnically/ nationally Korean person and a person who is not.

⁵ The term multicultural is used differently in the established international research literature, which can cause some confusion when reporting findings in international contexts. In addition, because the term is not inclusive of the diversity that exists in classrooms, we prefer to use CLD, which encompasses all non-traditional Korean students, including children of mixed ethnicity, foreign immigrants who are not Korean, North Korean refugees, etc.

⁶ Because the majority of international marriages occur between Korean men and women who are racially categorized as being "Asian", we do not describe the children as being multi-racial or bi-racial, which is more commonly used in the international research literature.

changes not only affect large cities. In 2010, nearly one-third of all marriages in rural areas were international marriages – so the increase in multicultural students in rural regions is even more pronounced and poses even greater challenges to the schools and teachers.

Studies have found that the children of these mixed marriages face many obstacles at school, including academic challenges related to Limited Korean Proficiency (LKP) and social issues related to bias and discrimination by teachers and students against multicultural families. A recent survey found that about 30% of multicultural children did not attend school at all and that, because they stay home with their mothers, they are not learning to speak Korean proficiently (Strother, 2012). Women migrating to Korea for marriage tend to have less formal education so they have fewer experiences navigating education systems in their home country. Coupled with limited literacy skills in Korean, immigrant mothers face many barriers that can impede their ability to effectively advocate for their child's education. In Korea, women are traditionally expected to act as the main liaison between the school and home. This poses unique challenges for Korean teachers and the mothers of CLD children who currently have limited resources available to support them to interact with one another positively and successfully.

North Korean Refugees and their Children

A much smaller group of CLD students include children who have either escaped from North Korea or who have been born to one or more parents who are North Korean refugees. As of March 2014, there were 26,483 North Korean refugees living in Korea, and 40% are between the ages of 10-29 (Sung & Mo, 2014). Research shows that many North Koreans live in poverty, with up to 40% receiving government assistance (Park, Yoon, & Cho, 2007). In addition to challenging socio-economic issues, many refugees face physical and psychological health issues, and refugees and their children must contend with discrimination against North Koreans that is prevalent in schools and society (Sung & Mo, 2014). North Korean children have relatively low enrollment in school compared to native Korean students. In 2005, roughly 49% of North Korean students were enrolled in middle school and less than 7% in high school compared to native Koreans 94% and 92% (respectively). In 2014, the dropout rate for North Korean students in middle school and high school ranged between 4.2% and 7.5% compared to 1.2-1.3% among South Korean students (Sung & Mo, 2014). While these children are ethnically Korean and they speak Korean, differences in their speech patterns and pronunciation make North Koreans easily distinguishable from native Korean peers. Some recent studies have shown these students tend to have lower achievement in school and suffer bullying and social isolation due to poverty, difference in appearance, and cultural differences (Cho & Yoon, 2011). Students born to North Korean refugees are relatively small in number, but data suggests these students are at the greatest risk for failure and drop out school. While Korean teachers may share ethnicity and language with these children and their families, the political, social, cultural and economic differences serve as potential barriers to effective interaction, similar to the other groups of immigrant children and families.

Impact of changing demographics on education for CLD students in Korea

While immigration is contributing to demographic changes in Korea, there are other more salient issues impacting this shift in population dynamics, including the fact that Korea has one of the lowest birthrates in the world. In 2014, the number of Koreans aged 9 to 24 dropped below 10 million for the first time since data began being collected in 1970 (Jun, 2014). The impact on schools is already visible as

schools around the country are reducing the number of classes for each grade level and are combining multiple schools to save money and resources. As a result, many schools are closing and in some rural areas, children are being educated in “one-room” schoolhouses with less than 30 students. Currently, the total number of students enrolled at the 6th grade level is approximately one-half of the students enrolled at the 12th grade level, meaning in 6 years the student population is expected to drop by about 50%. Viewed as a crisis in education, this decline in Korea’s school age population is only expected to accelerate in the decades to come (Jun, 2014). In addition to the low birthrate, Korea is also an “aging society”. In 2015, people aged 65 or older made up more than 13% of the population and Korea will become a “super-aged society” in the next decade as more than 20% of the population will be over the age of 65. As a result, by the year 2030, the working age population will drop to only about 60% of the total population (to ~ 33 million people) (KOSTAT, 2015). For these reasons, the need for foreign workers is only expected to grow in the coming decades and the federal government is struggling to develop immigrant reform efforts and family support policies designed to encourage family growth and continue to build a workforce to support the aging society.

These changes have a direct impact on schools and teachers. Only a few years ago, Korean teachers were unlikely to ever encounter CLD students in the classroom, but soon this will no longer be the case. Today, nearly all CLD students attending Korean public schools are mainstreamed into content area and grade level classrooms. This means the teachers who are responsible for the learning of these students are being tasked with teaching content, such as science, while also helping these students to develop Korean language and an understanding of cultural and social norms expected in the classroom. Because the inclusion of these students in K-12 classrooms is a relatively recent phenomenon, teachers and schools are not well equipped to support the social and linguistic needs of CLD students (Cho & Yoon, 2011), especially with regards to effective pedagogical practices and interventions for CLD students in science. In the sections that follow, we describe some of the research arguing teachers’ beliefs and attitudes about cultural and linguistic diversity can impact learning experiences for CLD students and we discuss how teachers’ attitudes and beliefs about cultural differences and language learning can impact their inquiry teaching efficacy and outcome expectancy.

As a result of globalization, migration and immigration, countries all over the world are experiencing huge demographic shifts (OECD, 2011). In Europe, countries such as Switzerland and Luxembourg have reported large growth in immigrant populations (28% and nearly 40%, respectively) (OECD, 2013; Eurostat, 2015), and in 2015, Australia’s foreign-born population was reported to be 28% of the total population (ABS, 2015). And even while the foreign-born population in the United States is only 13% (NCES, 2010), only about half of foreign-born immigrants indicated they were proficient in speaking English (Pew Research Center, 2015). While teacher educators in many Western countries have been struggling to address the educational needs of immigrant and multicultural students for decades, issues related to increased diversity in schools are only beginning to emerge in many Asian countries. For example, in the last decade, countries like Taiwan and Singapore have seen considerable growth in their immigrant populations. Like Korea, Taiwan has seen a considerable increase in the arrival of contracted migrant workers and international marriages (Lin, 2012), both of which have resulted in an increasingly diverse student population at the elementary school level where teachers are not trained to support their needs as learners (Hsin, 2011). Singapore has seen a nearly 26% increase in the immigrant population in the last decade, which is a considerable number for a city-state with a population of only about 5.5 million (Yeoh & Lin, 2012).

While the socio-historical development towards multiculturalism is unique in each of these countries, a shared consequence is an increase in the cultural and linguistic diversity of the population of students entering the education systems in these countries. As a result, teachers in all of these nations face many challenges to accommodate these students. At the same time, many of these education systems are placing increased emphasis on utilizing an inclusion education model which means that these CLD students are often “mainstreamed” into general education classrooms where they are instructed by content area teachers (i.e., science, math, social studies) who may have little or no training to support their social, cultural, or linguistic needs. For this reason, we believe the findings from our research can have important implications for researchers, teacher educators, and classroom practitioners in the larger international context. In the sections that follow, we introduce the theoretical framing for our questionnaire by discussing research exploring the potential for teacher attitudes, beliefs, and self-efficacy to impact on CLD students’ learning.

Impact of teacher beliefs on CLD students’ learning

Studies conducted in countries with diverse student populations have found teachers’ negative attitudes about CLD learners is linked to lowered student achievement (Pettit, 2011b; Stoddart, Pinal, Latzke & Canaday, 2002), revealing a critical link between teacher beliefs and classroom practices that can negatively impact CLD students. Teachers who lack awareness about students with linguistic, racial, and cultural differences may misunderstand students’ communication patterns (Heath, 1983; Delpit, 1995), undervalue students’ life experiences and prior knowledge (Nieto, 1993), and may hold negative expectations regarding their parents’ involvement, or lack of, with the school (Colombo, 2005). Other studies have found that teachers often hold deficit views of CLD students’ cognitive abilities (Sacks & Watnick, 2006) and many mainstream teachers (including science teachers) erroneously believe that CLD students need only two years to develop academic language proficiency (Pettit, 2011a). Instead, language acquisition theorists estimate it may take 4 to 7 years for advanced students (Hakuta, Butler & Witt, 2000) and up to 10 years for students with weak native language literacy levels (Collier, 1987) to develop the everyday and academic language necessary to be considered fluent in a second language (Short & Fitzsimmons, 2007). As a result, teachers often hold inadequate expectations for CLD students’ abilities to comprehend content and utilize language effectively (Walker, Shafer, & Liam, 2004).

This is particularly true in science, where teachers are more likely to incorporate invalid, ineffective assessments that measure language ability rather and conceptual understanding (Gándara, Rumberger, Maxwell-Jolly, & Callahan, 2003) and they are less likely to effectively engage CLD students in inquiry-based, student-centered science classrooms (Gándara, et al., 2003). Research shows that students’ cultural and linguistic backgrounds disadvantage them academically (Vang, 2005), especially in content areas, such as science (Garcia, Kleifgen & Falachi, 2008) where teachers ask students to make sense of abstract science concepts, often while using technical academic language that is more cognitively demanding than the language needed for everyday conversation. Although Ohkee Lee and colleagues found that (2006) inquiry-based science instruction can reduce the linguistic burdens that prevent CLD students from learning science – other studies have found that content area teachers tend to hold negative, unwelcoming attitudes towards including students in mainstream classrooms. Jenelle Reeves (2006) review of the literature on teachers’ attitudes towards language learners found that mainstream teachers’ negative attitudes tended to be related to negative perceptions about the added burdens these students would place on them (i.e., the need to develop lessons to

accommodate these learners), about the impact these learners would have on their peers (i.e., taking time and resources from other students), and generalized negative perceptions about the race and ethnicity of students. In particular, several studies (Barton, 1998; Lee & Fradd, 1998; Lee & Buxton, 2011) focusing on issues negatively impacting science learning for CLD students have found that science teachers' commonly held belief that teaching science content is unrelated to the larger socio-historical-cultural contexts in which science is taught and learned is seen to be an important factor limiting CLD students' opportunities to experience science learning environments created to support them to be successful. Particularly, these beliefs are thought to impact teachers' efficacy for effectively teaching CLD students. In the sections that follow, we offer a brief overview of the research describing the relationship between beliefs and self-efficacy.

Relationships between beliefs and teacher efficacy

A teacher's sense of efficacy is a judgment of her/his abilities to produce certain outcomes related to student engagement, learning, or achievement among students who may be difficult to teach (Tschannen-Moran & Hoy, 2001). Research about teachers' self-efficacy has been built upon Bandura's (1977) research in which he posed that belief in one's abilities was a powerful drive influencing the motivation to enact practices necessary to meet one's goals. Bandura (1993; 2001) reasoned that self-efficacy beliefs influence teacher's emotions and motivations that enable them to enact certain practices in the classroom, such as expending substantial effort to meet a goal or being persistent and resilient when faced with obstacles. Science teaching self-efficacy describes a teacher's belief about their ability to teach science effectively and to affect student achievement as a result of certain classroom teaching practices (Riggs, 1988; Ramey-Gassert, Shroyer, & Staver, 1996). Teacher efficacy studies are one way that researchers have attempted to make sense of teachers' practices and decision-making in the science classroom, especially with regards to overcoming barriers of teaching science at different levels and with different groups of students (Enochs & Riggs, 1990; Riggs & Enochs, 1990; Ramey-Gassert, Shroyer, & Staver, 1996; Mansour, 2009; Cakiroglu, Capa-Aydin, & Hoy, 2012).

While many researchers agree that higher self-efficacy results in more positive outcomes (Bandura & Locke, 2003; Tschannen-Moran, Woolfolk, Hoy & Hoy, 1998; Tschannen-Moran & Hoy, 2007), if a teacher has limited expectations for a student's learning, it could affect the effort the teacher will expend to teach the child. Perceptions about CLD students and their families may affect a teacher's evaluation of a student's academic ability and expectations for student performance. This is known as *outcome expectancy*, which Bandura (1986) describes as an individual's estimate that performing a task at an expected level will result in a predicted outcome. A variety of external contextual factors, such as family background, economic status, or the school environment have been found to affect teachers' outcome expectancy regarding which students can learn science (Riggs, 1988). Outcome expectancy reflects the degree to which teachers believe they have the ability overcome any external factors and support their students to be successful (Tschannen-Moran & Hoy, 2001). Thus, teacher efficacy is widely acknowledged as being context specific (Bandura, 1986; 1997; Tschannen-Moran, Woolfolk, Hoy & Hoy, 1998), meaning that contextual considerations have a bearing on what teaching strategies are chosen by teachers as a consequence of their efficacy beliefs. This explains why even when teachers have similar scientific knowledge, they may enact different teaching practices because their beliefs about their students, the content, and their own abilities as a teacher all influence the way they teach (Mansour, 2009). For Korean teachers who lack experience or expertise in teaching science to

CLD students, they may lack confidence in their ability to support these students, which could lower their teaching self-efficacy.

In this study, we examine the effects of Korean teachers' attitude and teaching self-efficacy on inquiry outcome expectancy, which could be one of the factors that support teachers to practice inquiry teaching and language teaching approaches with CLD students in their science classrooms. We also explore how Korean teachers' attitudes towards cultural and linguistic diversity impacts on their self-efficacy for teaching CLD students using inquiry teaching or language teaching methods. To do so, we developed an instrument to measure teachers' attitudes of (1) their perceptions about changes occurring in Korean society and their beliefs about the benefits or disadvantages associated with this increased diversity, (2) their knowledge and beliefs about how cultural differences have an impact on teaching and learning and their knowledge about what factors influence language development, (3) their knowledge and beliefs about effective use of inquiry teaching in diverse classrooms, and (4) their knowledge and beliefs about the need to implement pedagogies that benefit CLD students when engaged in student-centered inquiry activities.

This instrument will enable us to better understand Korean teachers' expectations for the effectiveness of using inquiry and language instructional strategies with CLD students, which can help us predict whether teachers are likely to enact these practices when teaching these students. We look at four separate dimensions of Korean teachers' efficacy when teaching CLD students, including, (1) efficacy for inquiry instructional strategies and knowledge, (2) efficacy for language teaching strategies and knowledge, (3) inquiry teaching outcome expectancy, and (4) language teaching outcome expectancy to help us identify specific areas of concerns for teachers and to target potential relationships between these domains, which we can then use when designing professional development and teacher education programs in the future.

CONTEXT FOR THIS STUDY

The goal of this study is to understand Korean teachers' attitudes and teaching efficacy regarding CLD students and inquiry teaching in an effort to expand science teacher educators' ability to prepare pre- and in-service teachers to better meet the needs of this rapidly expanding subgroup of science learners. To explore this topic, we considered the following questions:

1. What are Korean teachers' teaching efficacy and attitude towards cultural and linguistic diversity?
2. What are the predictors that show significant effects on outcome expectancy of inquiry teaching for CLD students? Which sub-scales (such as attitudes and knowledge about cultural and linguistic diversity, outcome expectancy, teaching efficacy, and knowledge efficacy) show a significant correlation?
3. What variables (such as language learning experiences or experiences of interactions with people who are CLD) influence Korean teachers' attitudes and teaching efficacy?

The short-term goal of this project is to gain a more multifaceted picture of the challenges facing Korean science teachers when instructing CLD students in schools. The long-term goal is to address current gaps in the research on teacher practices that benefit or constrain science learning for CLD students. The broader goal is to disseminate the findings to K-12 educators, science teachers, educators, researchers, school administrators, and policymakers who can positively transform teacher education and professional development to better support science teaching and learning for CLD students in Korea.

METHODS

This study is part of a larger three-year, longitudinal mixed-methods study exploring teacher practices and beliefs related to teaching CLD students in the Korean science classroom. However, in this paper, we focus on quantitative research findings from the first year of the project in which we focused on development, validation, and survey implementation of a three-part questionnaire.

Questionnaire development

The *Korean Teachers' Attitude and Self Efficacy for Inquiry and Language based Teaching* (K-TASILT) was developed using the Subject-Centered Scale Methods (called individual difference scales), where scores reflect differences among respondents in terms of their standing on the scale's dimensions. We developed three separate subsections for the questionnaire by extracting and developing item-statements from literature focused on understanding teachers' knowledge about diversity, inquiry and language learning⁷. Below we describe the literature that informed our development of each questionnaire. While each questionnaire could be used independently, in this study, they are used in concert to measure Korean teachers' attitudes and self-efficacy for using inquiry and language teaching practices with culturally and linguistically diverse students.

Attitudes toward cultural and linguistic diversity (ATCALD)

A large number of item-statements were generated from teacher education literature focusing on multicultural competence and self-efficacy in the subscale areas, (see, Byrnes & Kiger, 1994; Byrnes, Kiger, & Manning, 1996; 1997; Horenczyk & Tatar, 2002; Guyton & Wesch, 2005; Jackman, et al, 2001; Munroe & Pearson, 2006; Ponterotto, 1995; and Ponterotto, et al, 1998; Park, et al., 2008; Youngs & Youngs, 2001) to explore teachers' attitudes and beliefs about increased cultural, racial and ethnic diversity in Korean society. We also developed item-statements designed to measure teachers' attitudes towards language use and knowledge about language development and teaching strategies that support second-language acquisition. To do so, we drew from the literature about teachers (including science teachers) and language learners (see, Cummins, 1981; Collier, 1987; Gee, 2005; Echevarria, et al, 2009; Echevarria, et al, 2004; Honigsfeld & Cohan, 2008; Lee & Fradd, 1998; Lee, 2003; Lee, Buxton, Lewis, & LeRoy, 2006; Lee, Luykx, Buxton, & Shaver, 2007; McIntyre, et al, 2010).

Inquiry teaching efficacy for Non-Korean Students (ITENKS)

For items examining knowledge and practices in self-efficacy related to inquiry teaching, we drew from literature examining the role of inquiry teaching in promoting dialogue and interactions between students and teachers, as well as students and their peers (see, NRC, 1996; 2000; AAAS, 1989; Bransford, Brown, & Cocking, 1999), to design items to measure teachers' beliefs, knowledge, and practices regarding inquiry teaching. In this research, we conceptualize inquiry as both an instructional approach and an instructional outcome (Abd-El-Khalick, et al., 2004). Taken as an instructional approach, inquiry is viewed as pedagogical strategies enacted to help students develop understandings of science content. As an instructional outcome, inquiry is something students learn "to do" by engaging in

⁷ Both the RTOP and SIOP observation protocols have been used to collect baseline data about Korean teachers' inquiry and language instructional practices as part of a classroom ethnography we have conducted for the larger project. However, we will not discuss those findings in this paper.

inquiry activities through which they can be expected to develop scientific knowledge and ways of seeing the world, as well as acquire inquiry related skills (such as generating questions, designing and carrying out investigations, and articulating explanations or models to justify their observations and conclusions). Thus our view of inquiry requires teachers to understand inquiry as a pedagogical approach for developing scientific knowledge, as well as an understanding of the scientific processes necessary for supporting students to reason and think critically to develop meaning and to communicate their ideas within a larger community.

To help frame some items that incorporate both meanings of inquiry, we adapted several items from a previously developed instrument, the *Reformed Teaching Observation Protocol* (RTOP) (Sawada, et al, 2000). The items from the RTOP examine teacher understanding of pedagogical knowledge related to inquiry teaching, including teacher's knowledge and beliefs about students as science learners, assessment in science, and reform teaching practices (focusing particularly on strategies that engage students in constructing their own knowledge through interactions with others, conduct inquiry investigations, and build a consensus of understanding in the science classroom). Items developed from the RTOP reflect a reformed view of science teaching (Anderson, 2002) in which the roles for teachers and students are changed to re-position teachers less as dispensers of knowledge and more as facilitators of student learning. These items also reflect a shift in the expectations for students as learners from being passive and completing teacher prescribed tasks to being self-directed learners to being actively engaged in directing their own learning. In this research, we argue the need to focus on factors influencing inquiry teaching efficacy and expectancy outcomes rather than "science" teaching efficacy because we think a teacher's beliefs about cultural difference and language learning have greater potential to negatively impact CLD students' learning experiences if the teacher does not have a solid understanding of the importance of social interactions and language use when engaging in student-centered, inquiry activities.

Language teaching efficacy regarding Non-Korean Students (LTENKS)

For items examining knowledge and practices in self-efficacy related to language teaching, we drew from language education research (see ATCALD review above) and we adapted items from the *Sheltered Instruction Observation Protocol* (SIOP) (Echevarria, et al, 2006; 2009; 2011). SIOP was designed to evaluate a teacher's use of instructional practices that make language and content comprehensible for Language Learners (LL) in Sheltered Instruction (SI) classes, which generally refer to content-based classes that only contain LL students. SIOP is a type of Content-Based Instruction (CBI), which refers to instructional approaches that facilitate both content and language learning (Stoller, 2004). In SI classes, teachers use a set of teaching strategies that lower the linguistic demand of a lesson without compromising the integrity of the subject matter. By modifying speech rate, relating instruction to student experience, and making use of demonstrations, visuals, graphic organizers, or group work, teachers reduce language demands that make content more accessible for students who are not proficient in the language of instruction. While the SIOP model is intended for use in SI classrooms, in US public schools, mainstream teachers in science classrooms are often trained to use SIOP teaching strategies to support content-based instruction for both native speakers and language learner students (Honigsfeld and Cohan, 2008). The LTENKS contains item-statements designed to measure teachers' knowledge and beliefs related to language acquisition theories, how to plan effective instruction, instructional strategies that support language development, and understanding students as language learners.

We also designed some statements to measure outcome expectancy based on the teachers' self-efficacy toward teaching CLD students and toward inquiry-based instruction. The outcome expectancy is one of the subscales in self-efficacy of inquiry teaching and language teaching. We collectively examined the items, checked for clarity and wording, and eliminated redundant items. Initially 113 items were developed, including 40 items to collect demographic background (items 1-40) and a total of 73 items combined in each of the three main scales: ATCALD (36 items, ATCALD-K: items 41-56, ATCALD-A: items 57-76), ITENKS (18 items, ITENKS-KE: items 77-82, ITENKS-TE: items 83-88, ITENKS-OE: items 89-94) and LTENKS (19 items, LTENKS-KE: items 95-101, LTENKS-TE: items 102-107, ITENKS-OE: items 108-113). At the end of face validation and Cronbach alpha analysis process, half of items in ATCALD-K were deleted because of item duplications and low inter-correlations between items. Half of items that measure cognitive aspects in LTENKS-KE were also deleted. At the end of this process, 57 statement items and 40 demographic background questions remained (See Table 1).

Table 1 is the *K-TASILT* questionnaire with 57 items that covered three main scales. Each scale had a different number of items under each subscale and each of the competency areas had adequate item representation (with at least 4 items per area). In the ATCALD, there were 26 items, examining teachers' knowledge (7 items) and attitude (19 items) on diversity. In the ITENKS there were 16 items, examining teachers' knowledge efficacy (5 items), teaching/instructional efficacy (7 items), and outcome efficacy (4 items) when using inquiry to instruct CLD students. In the LTENKS there were 15 items, examining knowledge efficacy (4 items), teaching/instructional efficacy (6 items), and outcome efficacy (5 items) when using

Table 1. K-TASILT (*Korean Teachers' Attitudes and Self-efficacy for Inquiry and Language based Teaching*) questionnaire scales, its subscales, and description of the type of questions

Scale	Subscales	Description	Cronbach alpha value
Demographics background information	(40 items)	Gender, age, teaching experience, language learning experience, experiences with diverse students/families	
Attitudes towards cultural and linguistic diversity (ATCALD)	Knowledge (7 items)	Knowledge and awareness about growth of cultural and linguistic diversity in Korea	$\alpha=0.5$
	Attitude (19 items)	Attitude and beliefs about the benefits and challenges with CLD population in Korea; tolerance/acceptance of cultural and linguistic diversity	$\alpha=0.7$
Inquiry Teaching Efficacy for Non-Korean Students (ITENKS)	Knowledge efficacy (5 items)	Knowledge and understanding of inquiry science teaching and learning and its benefits toward CLD students	$\alpha=0.8$
	Teaching efficacy (7 items)	Likelihood to act based on knowledge and attitude, understanding and executing inquiry instructional practices that benefit or do not benefit CLD learners	$\alpha=0.7$
	Outcome Expectancy (4 items)	Likelihood for increased student achievement in response to teacher's inquiry-based instructional practices for CLD students	$\alpha=0.7$
Language Teaching Efficacy for Non-Korean students (LTENKS)	Knowledge efficacy (4 items)	Knowledge about language development and understanding of challenges associated with language learning, including how language learning impacts on students' ability to communicate their understanding of concepts in different content areas	$\alpha=0.5$
	Teaching efficacy (6 items)	Ability to diagnose strengths and weaknesses of CLD learners, understanding about how to effectively provide opportunities for CLD students to utilize native language, ability to effectively implement sheltered instruction practices for CLD students, understanding about how to modify language and adapt content to be accessible for different language ability levels	$\alpha=0.7$
	Outcome Expectancy (5 items)	Likelihood for increased student achievement in response to teacher's use of sheltered instruction practices and accommodation practices for CLD students	$\alpha=0.8$

inquiry to instruct CLD students. The Cronbach alpha reliability in each subscale of each of the three questionnaires showed 0.7 to 0.8, with the exception of the Knowledge subscale for ATCALD (measuring knowledge and awareness about increasing cultural and linguistic diversity in Korea) and the Knowledge subscale for LTENKS (measuring knowledge about language development and understanding challenges associated with acquiring a second language). These two subscales showed Cronbach Alpha reliability of 0.5, which is still acceptable when item measurement is connected to aspects of knowledge understanding (Nunally & Bernstein, 1994).

Based on a Likert scale of (1) strongly disagree to (4) strongly agree, we viewed the data to consider the ways in which teacher attitudes and knowledge about science and language acquisition can shape teaching practices, which could limit or afford opportunities for CLD students to participate in school science. In developing the scales, approximately 25% of the items were re-worded in a negative direction to control some forms of response bias. Clarity checks were completed to make sure this re-wording did not obscure the item meaning (see Table 1 for an overview of the scales and category description). Following this process, independent card-sorts were conducted to see if the 57 item statements could be easily re-assigned to the respective scales. In each card sort, three subscales emerged, *attitude/ knowledge*, *teaching practices*, and *outcome expectancy*. The factor analysis for item validation in each subscale/subsections and path analysis for examining interrelationships between subsections/subscales will be conducted in our next study in designing professional development program stage.

Subscales

The *K-TASILT* delineates teaching competencies organized within the subscales of *Attitude/ Knowledge*, *Teaching practices*, and *Outcome Expectancy*. The *Attitude (A)* subscale refers to a teacher’s awareness of his or her own value biases and how these biases translate into culturally insensitive teaching practices, the need to check biases and stereotypes, and the need to develop a positive orientation toward cultural and linguistic diversity in Korea. In this sense, attitude is connected to being both aware of ones attitudes and beliefs about diversity and being knowledgeable about diversity. The *Knowledge (K)* subscale refers to a teacher’s perceptions and knowledge of his or her own worldview, as well as the worldview of his or her students and their families. In addition, this subscale refers to culture-specific information, such as impact of racism on CLD students, models of acculturation and accommodation for diverse learners, especially in the context of using student-centered inquiry strategies and when teaching students who are not proficient in the language of instruction. The *Teaching (T)* subscale refers to a teacher’s ability to translate awareness and knowledge into culturally sensitive and relevant pedagogies that support CLD students who are not proficient in Korean to successfully engage in inquiry-based activities that also support second language acquisition and development. The *Outcome Expectancy (OE)* subscale refers to the expectation that students’ academic proficiency will begin to improve as teachers’ pedagogies become more culturally sensitive and supportive to the needs of CLD students as science and language learners. We drew from earlier research by Enochs and Riggs (1990, see STEBI) and Roberts and Henson (2000, see SETAKIST) because

Table 2. Comparing subscales between Science Teaching Efficacy Belief instrument (STEB), Self-Efficacy Teaching and Knowledge Instrument for Science Teachers (SETAKIST), and the Korean Teachers’ Attitude and Self-Efficacy for Inquiry and Language based Teaching (K-TASILT)

Subscales	STEBI	SETAKIST	K-TASILT
Teaching efficacy	0	0	0
Outcome expectancy	0		0
Knowledge efficacy		0	0

we are interested in how teaching efficacy and knowledge efficacy is connected to outcome expectancy. We expanded on these earlier studies in our development of *K-TASILT* by considering how knowledge efficacy and teaching efficacy, related to language and inquiry, influences student outcomes (see Table 2).

Content validity checks

Three experts in science teacher education rated each of the 57 items on clarity (1=ambiguous to 5=clear) and on domain appropriateness (1=not relevant to education in inquiry-centered classrooms with linguistically diverse students and 5=most relevant). The Item Content Validation Index (I-CVI) value range from 0.9 to 1 is considered acceptable. Items that were scored as less than 0.9 on both clarity and appropriateness were revised for clarity and/or domain appropriateness (Lynn, 1986). Each researcher had expertise in equity research in science, especially in the context of CLD student populations or with instrument development and validation. All items were initially developed in English and then translated into Korean before a second, more intensive round of content validation. The second author, who is the statistician for this project and who is a native Korean speaker, supported the development and validation efforts in both English and Korean and helped to maintain consistency throughout the translation process. The second author emigrated from Korea, first to Singapore and more recently to Australia, to work as a science education researcher. She has lived outside of Korea for nearly ten years. She brings an insider-outsider perspective to our research.

Translation, focus group interviews, and content validity (in Korean)

Once the items were checked for content validity, the entire questionnaire was translated from English to Korean to be used with the target population. Following the translation of the items, a second content validity check was conducted in Korean in three 1-hour focus groups with a total of six teachers selected from a science teacher education masters program. The teachers were interviewed to assess reactions to the scale format, content, and phrases of words. The respondents liked the scales, were pleased with its format, and thought the items were clear and well worded. Group members also believed the scales served as a good stimulus for discussion on diversity issues in Korean contexts, especially with regards to challenges using inquiry-focused teaching strategies with CLD students.

The focus group interviews were conducted in Korean and were video recorded and transcribed into Korean, and then translated into English so that all members of the research group could access the findings. Videos from the interviews were also collected to provide some context for these teachers' personal experiences with CLD students and parents and to learn how teachers believe CLD students are treated in Korean schools. The first author and a graduate student conducted all of the interviews in Korean. These researchers were trained and briefed about the interview process by the third author, who is a qualitative researcher focusing on equity issues in science education for CLD students. The first author is ethnically Korean, but was born and raised in the United States. She identifies herself as Korean-American and is proficient in Korean. The third author is Caucasian-American and has lived and worked in Korea as a science education researcher for almost five years. She is proficient in Korean at the elementary/intermediate level. Both the first and third authors bring an outsider-insider perspective to our research.

After the questionnaire was revised based on the teacher feedback, we conducted a second round of content validity with nine native Korean-speaking experts from different fields (including science education, language education, and multicultural education). The process for content validity was the same as described above and

any item with item content validity index (I-CVI) of less than 0.8 was revised and finalized for the survey implementation (Lynn, 1986).

Participants

We gathered data from 144 public school teachers working in elementary (48.0%), middle (36.6%) and high (15.4%) schools throughout Seoul and neighboring suburbs. The majority of the participants were women ($n=119$; 82.6%), and the rest were men ($n=25$; 17.4%). About 68.8% of teachers ($n=99$) reported that they had experience teaching CLD students at some point in their teaching careers, and the remaining 30.6% ($n=45$) reported no experience with this population of students. Participants' years of teaching ranged from one to forty, and the average number of years teaching was twenty. All of the teachers were native-Korean speakers and one-quarter ($n=36$) spoke a language other than Korean. A majority of participants ($n=87$; 60.4%) reported they had received no training to support them to work with CLD students, but close to 40% ($n=57$) indicated they had received some type of training. Only a few teachers ($n=14$) reported they had taken college coursework, but one-third of the teachers ($n=46$) had attended professional development. Less than 3% of all teachers in the study ($n=3$) had experienced both types of training.

Data collection

The teachers participated in the survey utilizing both a paper and an online version, which was distributed via email using a link to Survey Monkey. Initially we asked 10 teachers to participate in the survey and then each teacher referred co-workers to complete the questionnaire, and so on, until a total of 155 teachers were surveyed. Data collected from Survey Monkey indicated that most participants took about 20-25 minutes to complete all three sections of the *K-TASILT* questionnaire. To elicit additional feedback regarding the questionnaire (wording of the statement items and clarity of terms), we invited 10 teachers to participate in a short post-survey interview. When asked about the time needed to read and respond to all 97 items, the teachers indicated they found the items were easy to read, the online system was easy to navigate, and they did not experience fatigue during the process. Thus, we concluded it was acceptable to have participants complete all three questionnaires in one sitting.

Data analysis

For the analysis, we used SPSS version 22 to investigate teachers' attitudes and self-efficacy for inquiry and language teaching using data collected from the *K-TASILT*, which consists of three-scaled questionnaires – the ATCALD, ITENKS, and LTENKS. Each questionnaire has 2-3 subscales (see Table 1). These subscales were included for item analysis, correlation analysis, standard multiple regression analysis, and MANOVA analysis.

For the multiple regressions analysis, the dependent variable was the outcome expectancy (OE) for inquiry teaching, which is one of the ITENKS subscales (refer to Table 1). This variable measures teachers' expectancy of students' outcomes when they incorporate strategies designed to enhance language development with inquiry teaching strategies. The other seven subscales served as independent variables to help explore which of these variables showed a significant association with teachers' expectations for student outcomes when using inquiry teaching. For this reason, as long as the ANOVA analysis, which was conducted as a part of regression analysis, shows significance, then the variance of the dependent variable and the significance of our model above can be used without being concerned about the size of R squared (Bedeian, 1994; Fichman, 1999).

The percentage of positive teachers' responses to the *K-TASILT* in each subscale was calculated and analyzed. In our analysis, we counted teachers' responses as positive when they answered strongly agree and agree. However, if a teacher strongly agreed with a negatively written item statement, we reverse-coded the response as positive and if they strongly disagreed with a positive statement, we coded the response as negative. This allowed us to gauge teacher responses to negative and positive item statements. Also, descriptive statistics and correlations of variables between each subscale were computed, followed by a standard multiple regression analysis.

MANOVA analysis was conducted to investigate the influence of demographic and teacher experience variables on the subscales of ATCALD, ITENKS and LTENKS. There were three groups of demographic variables, including teachers' general information (age, teaching subjects and educational background), teachers' experiences with CLD students (teaching experiences), and teachers' own experience as learners (taking courses/professional development programs on diversity and education, and foreign language studying experiences). For this MANOVA analysis, standard scores, $50 \pm (10 \times z\text{-score})$ were used for the group comparison across the three dependent variables, ATCALD, ITENKS and LTENKS. We selected these variables based on our review of the literature on teaching self-efficacy and science teaching self-efficacy which indicate that years of teaching experience (Gandara, Maxwell-Jolly, & Driscoll, 2005), vicarious experiences with CLD students and families (Gay, 2002; Reeves, 2006; Pettit, 2011b), travel and exposure to diversity (including personal experiences with diversity and language learning) (Garmon, 2004; Dee & Henkin, 2002; Youngs & Youngs, 2001; Byrnes, Kiger & Manning, 1997) are all important factors to consider when trying to predict how teachers' experiences and knowledge can influence their beliefs and attitudes about their ability to effectively teach CLD students (Fraser, 2014; Kitsantas, 2012; Siwatu, 2007; Ramey-Gassert, Shroyer, & Staver, 1996).

FINDINGS AND DISCUSSION

Our analysis of the data revealed that the Korean teachers who participated in this study hold a variety of conceptions about how to effectively teach CLD students. In this section, we will share findings from the percentage of positive responses on each subscale, multiple regression analysis, and variable analysis. In the sections that follow, we first report on teachers' positive responses for each subscale in each questionnaire and then we share the findings from the regression analysis.

Teachers' positive responses

In this analysis, we aggregated teachers' responses for all three questionnaires to determine teachers' attitudes and self-efficacy for teaching CLD students (see Tables 3-5). Specifically, we focused our attention on areas where the percentage of positive answers fell below 50%, as these areas indicated negative attitudes and low self-efficacy for using inquiry and language teaching practices with CLD students.

ATCALD responses: Knowledge and Attitude subscales

In the ATCALD questionnaire, there are knowledge and attitude subscales. The Knowledge (K) subscale has two item groups: 1) teachers' awareness about the expansion of the CLD population in Korea and 2) awareness about the need/value for professional development to support CLD students as learners. The Attitude (A) subscale consisted of three item groups: tolerance/acceptance of 1) expansion of CLD population in Korea, 2) teaching CLD students, and 3) the parents of CLD students. Table 3 shows teachers' positive responses in each subscale. In the knowledge subscale, the first item group resulted in the lowest mean percentage of

Table 3. Mean and range of percentage of positive responses on each subscale in the Attitudes towards Cultural and Linguistic Diversity (ATCALD) questionnaire

Subscale	Item group	Examples of items (%)	Mean (%)	Range (%)
<i>Knowledge</i> (7 items)	Awareness about expansion of CLD population in Korea (3 items)	41. The majority of non-Koreans living in Korea are Chinese (status of legal nationality) (44%)	57	44 - 77
	Awareness of need for PD to support CLD students (4 items)	45. Teachers do not have enough professional development to effectively teach CLD student (86%)	88	86 - 93
<i>Attitude</i> (19 items)	Tolerance/Acceptance of expansion of CLD population in Korea (4 items)	57. It is desirable to have culturally and linguistically diverse people living in Korea (69%)	71	69 - 88
	Tolerance/Acceptance for teaching CLD students (9 items)	58. It is difficult to understand students with different cultural backgrounds (51%)	83	51-99
	Tolerance/Acceptance for teaching CLD students (6 items)	76. Students who are not fluent in Korean language cannot easily understand concepts in subjects such as science (27%)	73	27 - 95

positive responses (57%), however, overall the mean percentages of positive responses were fairly high (71-88%) for all other item groups in the ATCALD questionnaire (See Table 3).

In this section, we report on some of the items to which teachers responded less positively. We found that teachers were not well informed about who makes up the immigrant population in Korea. For example, less than half (44%) of teachers responded positively to item 41, indicating that the majority of teachers are not aware that the largest source of immigrants is from mainland China. Nearly all of the teachers (86%) acknowledge the need for additional professional development programs to improve their ability to effectively teach CLD students (item 45). From the responses to items in the *Attitude subscale*, we found that even while teachers had mostly positive affective attitudes (69%) toward increasing diversity in Korea (item 57), teachers had more negative attitudes (53%) about their ability to effectively communicate with non-Korean students (item 68) and only 68% of teachers agreed that non-Korean students could do well in school academically or socially (item 70). In addition, only a few teachers (27%) believed that a students' limited Korean language fluency would not limit their conceptual understanding in science (item 76). Teachers responded most positively (99%) when asked whether effective teachers should take into consideration students' cultural and linguistic differences in order to modify classroom content and instruction to fit the learner (item 66). Finally, nearly all teachers (95%) agreed that the parents of CLD students needed to be taught how to effectively support their children to do well in the Korean school system (item 71).

Overall, these responses reflect Korean teachers' strong positive attitudes about the potential benefit of implementing differentiated instructional strategies that account for CLD students' learning needs, but they also suggest that teachers have somewhat negative perceptions about diversity in Korean society. In the section that follows, we examine teachers' responses regarding self-efficacy of knowledge about inquiry and how to effectively implement inquiry and the potential for CLD student learning when using inquiry in the classroom.

ITENKS responses: Knowledge efficacy, Teaching efficacy and Outcome Expectancy subscales

The ITENKS questionnaire includes knowledge efficacy, teaching efficacy, and outcome expectancy subscales. The items in these subscales measure teachers' knowledge about inquiry and social learning theory, teachers' efficacy and beliefs

about their ability to implement inquiry teaching strategies in the classroom, and teachers' outcome expectancy for student learning when implementing inquiry activities. The mean percentage of positive responses regarding teachers' knowledge about inquiry teaching was quite high (86%). In addition, teachers were very positive (92%) that the use of inquiry instructional approaches with CLD students would result in increased achievement and performance. This indicates that Korean teachers have high outcome expectancy for CLD students learning when using inquiry instructional methods (See Table 4).

Table 4. Mean and range of percentage of positive responses in each subscale of the Inquiry Teaching Efficacy for Non-Korean Students (ITENKS) questionnaire

Subscale (item number)	Examples of items (% of positive responses)	Mean (%)	Range (%)
<i>Knowledge Efficacy</i> (5 items)		86	76 – 98
Knowledge and understanding of inquiry science teaching and learning and its benefits toward CLD students	77. I know the steps necessary to teach inquiry-based lessons effectively (76%)		
<i>Teaching Efficacy</i> (7 items)		77	31 – 96
Likelihood to act based on knowledge and attitude, understanding and executing inquiry instructional practices that benefit or do not benefit CLD learners	83. I feel like I have the necessary skills to effectively teach Korean as Second Language (KSL) students using inquiry strategies (31%)		
<i>Outcome Expectancy</i> (4 items)		92	81 – 97
Likelihood for increased student achievement in response to teacher's inquiry-based instructional practices for CLD students	90. Even teachers with good inquiry teaching abilities cannot help to improve Korean as Second Language (KSL) students' achievement (81%)		

In general, we found that the mean percentage of positive responses was moderately high (77%) regarding teachers' ability to effectively employ inquiry instructional practices. However, when asked about their ability to effectively implement inquiry strategies with CLD students (item 83), teachers responded less positively (only 31%). This indicates that teachers are much less confident in their ability to support CLD students, which may be reflective of the limited opportunities most Korean teachers have had to actually teach CLD students. Teachers' high mean positive response regarding knowledge about inquiry teaching methods (86%) and efficacy for utilizing inquiry in the classroom (77%) both reflect positively on the Korean teacher education system as it is an indication that teacher education programs have effectively prepared teachers about inquiry teaching. Inquiry was introduced as part of the Korean science curriculum over 40 years ago and since that time there has been much progress in the development and implementation of student-centered inquiry teaching approaches in both pre-service and in-service professional development programs (Kim, 2015). However, in Korea there is currently a shift towards inquiry teaching, especially at the elementary levels where the majority of Korea's CLD students are enrolled. This places a heavy burden on elementary teachers who have received little or no coursework focused on how to teach students with Limited Korean Proficiency (LKP) or how to facilitate social learning among CLD students. In addition, elementary teachers in Korea tend to have limited science content preparation and would have had few opportunities as science learners to experience inquiry or participate in a student-centered classroom. As a result, Korean teachers' confidence and self-efficacy regarding science content and inquiry teaching with CLD students may be limited.

We believe our findings about elementary teachers' beliefs about CLD students have implications for elementary science teacher education beyond Korea as many studies have consistently find that elementary teachers lack the science content knowledge and science-specific pedagogical content knowledge needed to teach

science at the primary levels (Appleton, 2003; Duschl, Schweingruber, & Shouse, 2007). In addition there are studies indicating that elementary teachers do not have the training necessary to effectively adapt materials to support science learning for CLD students (Lee, 2003; Lee, et al., 2007). As a result, elementary teachers are limited in their ability to engage students in interactive discourse that supports divergent thinking and conceptual understanding (Newton, Driver, & Osborne, 1999; Shallcross, et al., 2002) and students lack opportunities to participate in hands-on activities (Nowicki, et al., 2013) or to engage in peer-to-peer interactions that help students to gain proficiency in “talking” science (Roth, 2002; Barton & Tan, 2009) – all of which can result in achievement gaps for CLD students (Tao, Oliver, & Venville, 2013). However, a recent study (Settlage, et al., 2009) examining science teaching self-efficacy for diverse learners suggests that some degree of “self-doubt” may be useful in promoting “reflection and revision of practices” that could help teachers to better support diverse learners. We agree this would be useful if teachers are made aware of their beliefs and supported to examine their practices with a goal of transforming them. This is a central goal of our continued research in our work with teachers and teacher educators in Korea.

In the section that follows, we examine teachers’ responses regarding self-efficacy of knowledge about language theory, how to effectively implement language teaching strategies, and the potential for CLD student learning when using those strategies.

LTENKS responses: Knowledge efficacy, Teaching efficacy and Outcome Expectancy subscales

The LTENKS questionnaire contains similar subscales as ITENKS. The items in the LTENKS subscales measure teachers’ knowledge about language development and theory about language learning, teachers’ efficacy and beliefs about their ability to implement language teaching strategies in the classroom, and teachers’ outcome expectancy for student learning when implementing language instructional strategies for CLD students. Teachers’ mean percentage of positive responses to items in knowledge efficacy and teaching efficacy subscales were rather low, 48 % and 56%, respectively (See Table 5).

Table 5. Mean and range of percentage of positive responses on each subscale in the *Language Teaching Efficacy for Non Korean Students (LTENKS)* questionnaire

Subscale (number of items)	Examples of items (% of positive responses)	Mean (%)	Range (%)
<i>Knowledge Efficacy (4 items)</i>			
Teachers are aware and understand how people learn languages and how to plan	100. I am aware of resources available to help me to communicate more effectively with parents who do not speak Korean. (20%)	48	20 – 70
<i>Teaching Efficacy (6 items)</i>			
Teachers develop/modify instructional strategies to better prepare and work with CLD students	108. I am well prepared to work together with culturally and linguistically diverse students in my classroom (44%)	56	44 – 74
<i>Outcome Expectancy (5 items)</i>			
Teachers’ usage of sheltered instructional modifications improve CLD students’ language skills and understanding	110. If I provided students with opportunities to integrate content learning with language learning activities, students would be better able to learn the content (81%)	83	81 – 90

Especially, teachers showed low self-efficacy (20%) related to their knowledge regarding how to access resources to help them to effectively communicate with parents who do not speak Korean (item 100). Teachers also reported low self-efficacy (38%) related to their knowledge about how to use standard Korean notation, grammar, and vocabulary to effectively teach CLD students (Item 101).

More than half of the teachers (58%) responded positively regarding their ability to design lessons that account for differences in students' Korean language proficiency levels (item 102) and most Korean teachers indicated (70%) that they understood there are different stages of second language learning (item 98). However, less than half (44%) indicated they felt sufficiently prepared to work with CLD students in their classroom (item 108). In research in special education contexts, one study found that teachers with low self-efficacy are less likely to implement innovative teaching strategies or to take responsibility for students who require additional support (Allinder, 1994). Another study by Kathryn Wentzel (1998) found that when students perceived a lack of care or support from their teachers, they tended to misbehave and to have lower achievement in comparison to their peers. These findings are troubling because it could mean that Korean teachers' low self-efficacy for supporting CLD students could have a significant impact on students' motivation to learn and achieve (Tschannen-Moran & Hoy, 2001).

However, with regards to the outcome expectancy subscale for language teaching, more than 80% of teachers indicated that the use of language teaching strategies could positively impact students' learning outcomes. For example, 81% of teachers indicated that the integration of content learning with language learning activities could enhance CLD students' content learning (item 110). These results indicate that while Korean teachers may have low self-efficacy with regards to their own knowledge about language development and language education theory, they are more positive about the potential for knowledge about language theory and instructional strategies to support their CLD students' learning. Wentzel (1994) found that students' perception of support from their teacher strongly correlated to student interest in school and was also a positive predictor of student effort and the tendency for students to develop positive relationships with their teacher and peers. This finding is heartening because our results indicate that the teachers in our study have relatively positive outcome expectancy for students' learning should they be provided the skills needed to teach them. We believe this suggests positive potential for providing professional development for Korean teachers to be better prepared to teach CLD students with appropriate language teaching strategies that could both improve their language skills and positively impact on their inquiry learning.

Multiple regression analysis

In this section, we show the correlation coefficient table created when conducting a multiple regression analysis. In Table 6, the variables are: two Attitude subscales (Knowledge and Attitudes) towards CLD students/family in ATCALD, two subscales, Knowledge Efficacy (KE) and Teaching Efficacy (TE) for inquiry and language teaching in the ITENKS and LTENKS each, as well as two Outcome Expectancy (OE) subscales measuring teachers' expectancy for increased CLD student achievement in response to teachers' implementation of teaching strategies that support inquiry learning and language development in ITENKS and LTENKS.

Table 6. Correlation between subscale variables on all three questionnaires (N=144)

Variable	1	2	3	4	5	6	7	8
ITENKS-OE (1)	1.00							
ITENKS-KE (2)	0.20**	1.00						
ITENKS-TE (3)	0.15*	0.48**	1.00					
ATCALD-K (4)	0.20**	0.05	-0.06	1.00				
ATCALD-A (5)	0.40**	0.34**	0.37**	0.12	1.00			
LTENKS-KE (6)	0.01	0.02	0.12	0.18	0.18*	1.00		
LTENKS-TE (7)	-0.04	0.23**	0.31**	0.06	0.09	0.06	1.00	
LTENKS-OE (8)	0.51**	0.21**	0.10	0.12	0.42**	0.07	0.16*	1.00
Mean \pm SD	3.04 \pm	3.06 \pm	2.87 \pm	2.91 \pm	2.98 \pm	2.55 \pm	2.62 \pm	2.96 \pm
	0.31	0.40	0.37	0.34	0.32	0.95	0.77	0.39

**p<0.01 *p<0.05

Subscales labeled as follows: A for attitude, K for knowledge, KE for knowledge efficacy, TE for teaching efficacy, and OE for outcome expectancy.

We found that most subscale variables were significantly and positively correlated with each other, with the exception of the Knowledge (K) subscale for ATCALD and the Knowledge Efficacy (KE) subscale for LTENKS. There is no significant correlation found between any subscale except Outcome Expectancy (OE) of inquiry teaching (ITENKS) and the Knowledge (K) subscale of the ATCALD and between Attitude (A) subscale for ATCALD and the Knowledge Efficacy (KE) subscale of the LTENKS. In addition, there was no significant correlation between the Knowledge (K) subscale of ATCALD and the Attitude (A) subscale of ATCALD. In Figure 1, high-end medium strength variables were reported to understand the importantly correlated variables ($r \geq 0.38$) in this research.

As shown in Figure 1, the strongest correlation ($r=0.51, p<0.005$) in this research was between the Outcome Expectancy (OE) subscales in ITENKS and LTENKS. The second strongest correlation ($r \geq 0.48, p<0.005$) was between Teaching Efficacy (TE) in ITENKS and LTENKS. The third strongest correlation, with a correlation coefficient above 0.38, was between the Attitude (A) subscale in ATCALD, the Outcome Expectancy (OE) subscales in LTENKS and ITENKS, and between Attitude (A) subscale in ATCALD and Teaching Efficacy (TE) subscale in ITENKS.

Since this study examined the effects of Korean teachers' attitudes and self-efficacy on outcome expectancy for inquiry teaching with CLD students, we conducted a multiple regression analysis to investigate those variables that had a significant association with Outcome Expectancy (OE) on the ITENKS (See Table 7).

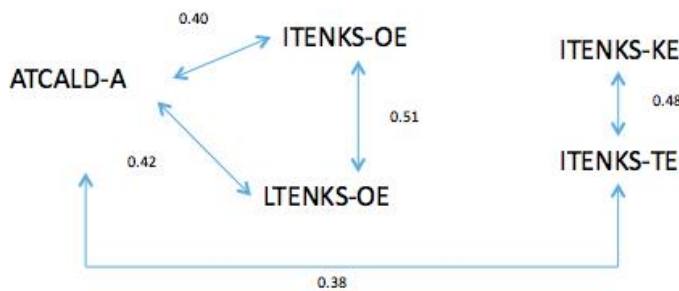


Figure 1. Variables with higher-end medium strength correlations ($r \geq 0.38, p<0.005$).

ATCALD-A: Attitudes toward cultural and linguistic diversity Attitude

ITENKS-OE: Inquiry teaching efficacy for Non-Korean students Outcome Expectancy

ITENKS-KE: Inquiry teaching efficacy for Non-Korean students Knowledge Efficacy

ITENKS-TE: Inquiry teaching efficacy for Non-Korean students Teaching Efficacy

LTENKS-OE: Language teaching efficacy regarding Non-Korean students Outcome Expectancy

Table 7. Results of the multiple regression analysis of Korean teachers' attitudes and self-efficacy on inquiry outcome expectancy (ITENKS-OE)

Variables	Estimate (Beta)	Estimate (B)	t	Tolerance	VIF
Intercept		1.029	3.497		
ITENKS - KE (2)	0.041	0.031	0.509	0.728	1.374
ITENKS - TE (3)	0.096	0.081	1.127	0.651	1.537
ATCALD - K (4)	0.161	0.144	2.246*	0.925	1.082
ATCALD - A (5)	0.170	0.165	2.037*	0.682	1.467
LTENKS - KE (6)	-0.066	-0.021	-0.930	0.943	1.060
LTENKS - TE (7)	-0.168	-0.067	-2.269*	0.866	1.154
LTENKS - OE (8)	0.33	0.340	5.571**	0.789	1.268

* $p<.01$, ** $p<.001$

Subscales labeled as follows: A for attitude, K for knowledge, KE for knowledge efficacy, TE for teaching efficacy, and OE for outcome expectancy.

In the multiple regression analysis, the dependent variable was the Outcome Expectancy (OE) subscale in ITENKS (see Table 7). This subscale measured teachers' expectancy for increased performance and achievement for CLD students when implementing inquiry approaches in the classroom. The independent variables are: the Knowledge (K) and Attitudes (A) subscales from the ATCALD questionnaire; the Knowledge Efficacy (KE) and Teaching Efficacy (TE) from the ITENKS questionnaire; and the Knowledge Efficacy (KE), Teaching Efficacy (TE), and Outcome Expectancy (OE) from the LTENKS questionnaire. The total variance explained by this model as a whole was 35% ($F=10.5, p<.001$).

In this model, four variables were statistically significant. We believe that teachers who have a positive Outcome Expectancy (OE) for using effective language teaching approaches with CLD students are more likely to have a positive Outcome Expectancy (OE) for CLD students' learning when using inquiry teaching approaches because we found that LTENKS-OE had a higher beta value ($\beta=0.433, p<.001$) than any of the other variables. This finding is understandable when we consider that the Outcome Expectancy (OE) for the LTENKS and ITENKS measured teachers' beliefs about the potential for improving CLD students' learning opportunities when effectively implementing specific teaching strategies. For this reason, even if teachers expressed differences in self-efficacy regarding their *knowledge about* inquiry, language education theories, *ability to use* inquiry or language strategies, we can still measure teachers' attitudes and beliefs about the likelihood that a CLD student could learn if that student was provided the tools and instructional strategies needed to support them to be successful. Thus, even if teachers report having limited knowledge about inquiry and language education theories and limited knowledge about how to effectively implement inquiry or language teaching strategies, we can still predict that teachers with high LTENKS-OE scores will have strong positive ITENKS-OE scores or vice versa.

We found other variables that were also associated with ITENKS-OE. For example, both LTENKS-TE and LTENKS-KE were negatively associated, however, only LTENKS-TE was significant ($\beta = -0.168, p<.01$). This would suggest that when any content-based teacher, including science teachers, has more knowledge about language development, language education theories, and about language teaching strategies they are less confident in their ability to effectively support CLD students to learn when using inquiry strategies. This may be because teachers with more knowledge about the challenges CLD students face as language learners lower their expectations for these students to be successful when engaging in inquiry-based activities. We also found that teacher Knowledge (K) and Attitudes (A) in ATCALD were both significantly associated with ITENKS-OE (ATCALD-K: $\beta =0.161, p<0.01$; ATCALD-A: $\beta =0.170, p<0.01$). This means that when teachers had more positive attitudes about linguistic and cultural diversity in Korea, they also had higher outcome expectancies for CLD students' inquiry learning. Finally, we found teachers who have high self-efficacy related to knowledge about inquiry or about how to effectively use inquiry strategies (ITENKS-KE and ITENKS-TE) had no significant association with teachers' outcome expectancy for CLD students' learning when using inquiry in the classroom (ITENKS-OE).

This finding suggests that simply having knowledge about inquiry and being confident to effectively implement inquiry teaching with students does not prepare a teacher to effectively teach CLD students by using integrated inquiry teaching. Because research has shown that teachers with low self-efficacy for teaching are less likely to try new strategies and may avoid activities they find difficult to implement (Ashton & Webb, 1986), we think it is important for content area teachers who are confident in their use of inquiry to be provided targeted professional development to improve their use of language supports so they may be more likely to implement

inquiry with CLD students in their classrooms. As discussed previously, confidence in one's ability can effectively blind a teacher to the self-doubt that could help him/her to advance professionally (Settlage, et al., 2009). As such, teachers may be unable to appreciate the value and need for implementing the inquiry or language teaching practices that would benefit CLD learners. Ohkee Lee and Cory Buxton (2011) found that for CLD students, equitable science learning opportunities occur only when teachers are able to value and respect the "experiences that students bring from their home and community environments" and when teachers can "articulate this cultural and linguistic knowledge with disciplinary knowledge" while also offering "sufficient educational resources to support science learning" (p. 278). For this reason, we believe the teachers in our study would benefit from teacher education programs and professional development programs designed to help teachers effectively integrate language teaching approaches and inquiry teaching. This is a significant focus for our on-going research and we believe that *K-TASILT* could be a useful tool for helping us to measure changes in teachers' attitudes about cultural and linguistic diversity and improved self-efficacy for implementing inquiry and language teaching strategies as a result of their participation in targeted professional development activities. We anticipate we will be able to contribute more knowledge about the kinds of professional development that can help to transform teachers' attitudes and teaching self-efficacy in the future.

Demographic and personal experience variable analysis

In this final section, we conducted MANOVA analysis to determine which demographic variables and personal experience variables significantly influenced each of the subscales. Eight demographic variables were grouped into three categories: *general information*, *experience with CLD students*, and *experiences as a learner*. The *general information* category has two attributes, which were teachers' age and grade level taught. The category for *experience with CLD students* considers whether CLD students are enrolled in the teacher's school or whether teachers have had experience teaching them in their own classroom. The *experience as a learner* category includes information about teachers' personal experiences learning a second language or whether they have participated in a teacher education program and/or professional development program focused on how to effectively teach CLD students. Variable analysis revealed important factors that could have an impact on teachers' attitudes towards CLD students and on teacher self-efficacy for using inquiry teaching strategies with CLD students. These variables were identified from the literature on teaching self-efficacy and science teaching self-efficacy that show internal factors (i.e., teacher characteristics, attitudes, and interests), external factors (i.e., student variables and school environment) (Riggs, 1988; Ashton & Webb, 1986), and antecedent experiences related to inquiry teaching and teacher preparation (Ramey-Gassert & Shroyer, 1992), and vicarious experiences (i.e. with diversity) in and out of school can be important factors that influence on teaching self-efficacy (Bandura, 1997; Ramey-Gassert, Shroyer, & Staver, 1996).

General information category

For teachers' general information, we examined two variables, including which grade level the teacher instructed and the age of the teacher. Grade levels were divided into primary and secondary school levels and age groups were divided as 21-30, 31-40, 41-50 and older than 50. In Korea, the mandatory age for retirement for public school teachers is 63, so we did not include any additional categories for age. Specifically, we wanted to investigate these variables' influences on teachers' attitudes towards CLD students and on teachers' self-efficacy with regards to effectively implementing inquiry teaching and language teaching approaches in classrooms serving CLD students (See Table 8).

Table 8. Influence of general variables, teachers' teaching grade and age, on three questionnaires, ATCALD, ITENK and LTENK (N=143)

Variables		Mean \pm Standard Deviation							
		ATCALD		ITENK			LTENK		
		Knowledge	Attitude	Knowledge	Teaching	Outcome	Knowledge	Teaching	Outcome
				e	Efficacy	Efficacy	e	Efficacy	Efficacy
				Efficacy			Efficacy		
Teaching grade	Primary school (n=74)	50.8 \pm 9.8	52.4 \pm 10.1	51.5 \pm 10.5	52.0 \pm 10.1	50.7 \pm 10.3	50.4 \pm 4.5	51.7 \pm 12.6	50.2 \pm 10.0
	Secondary school (n=70)	49.2 \pm 10.2	47.6 \pm 9.4	48.6 \pm 9.2	47.9 \pm 9.6	49.3 \pm 9.8	49.6 \pm 13.6	48.3 \pm 5.9	49.9 \pm 10.1
	F	0.77	8.57*	2.67	6.23*	0.66	0.20	4.09*	0.01
	Eta ²	0.01	0.06	0.02	0.04	0.01	0.00	0.03	0.00
Age	20-30 (n=40)	51.4 \pm 11.3	49.1 \pm 8.7	51.2 \pm 9.0	49.7 \pm 6.9 ^{ab}	48.7 \pm 10.3	48.9 \pm 17.7	51.9 \pm 15.4	49.9 \pm 10.6
	31-40 (n=43)	49.6 \pm 9.9	52.1 \pm 12.8	52.2 \pm 10.9	53.1 \pm 10.1 ^b	51.8 \pm 11.1	51.1 \pm 4.2	49.1 \pm 6.9	50.0 \pm 11.0
	41-50 (n=38)	49.1 \pm 10.1	48.1 \pm 9.0	48.1 \pm 9.6	46.9 \pm 12.2 ^a	49.5 \pm 9.9	49.3 \pm 4.5	49.4 \pm 7.4	52.2 \pm 9.7
	50 above (n=22)	50.1 \pm 8.2	51.1 \pm 7.1	47.5 \pm 9.7	49.8 \pm 9.1 ^{ab}	49.7 \pm 7.2	51.1 \pm 4.3	49.7 \pm 6.1	47.0 \pm 6.4
	F	0.39	1.26	1.86	2.89*	0.74	0.46	0.65	1.24
	Eta ²	0.01	0.03	0.04	0.06	0.02	0.01	0.01	0.03

* <0.05

Note: Different superscripts indicate significant difference between ages.

Teachers' grade level

Primary grade teachers were generally found to have positive attitudes toward cultural and linguistic diversity and, interestingly, primary grade teachers also had more positive beliefs about their knowledge and teaching self-efficacy across all subscales compared to secondary school teachers. However, only three subscales, including attitude towards cultural and linguistic diversity (ATCALD-A: Primary school, 52.4 ± 10.1 ; Secondary school, 47.6 ± 9.4 ; $F=8.67$, $p<0.05$, $\eta^2=0.06$), inquiry teaching efficacy (ITENKS-TE: Primary school, 52.0 ± 10.1 ; Secondary school, 47.9 ± 9.6 , $F=6.23$, $p<0.05$, $\eta^2=0.04$), and language teaching efficacy (LTENKS-TE: Primary, 51.7 ± 12.6 ; Secondary, 48.3 ± 5.9 , $F=4.09$, $p<0.05$, $\eta^2=0.03$) were significant. This finding is not surprising when you consider that elementary teachers are generally trained using multidisciplinary approaches that support them to engage in cross-curricular teaching by integrating various subjects in their lessons. For example, teachers may integrate mathematics and science instruction or language arts and history, even science and society. In fact, there has been a strong push in the Korean science curriculum in the last ten years to emphasize socio-scientific issues (SSI) and Science, Technology, Society and Environment (STSE) (Choi, et al, 2011; Lee, et al, 2013). Evidence of this trend is visible in the curriculum standards, textbooks, and activity guides for science teachers (Song, 2006; Ministry of Education and Human Resources, 2007; Kim, Yoon, Ji, & Song, 2012). Due to the nature of the Korean secondary schools' focus on college entrance exam preparations, fewer opportunities may exist for secondary school teachers to design lessons that incorporate content from other disciplines or even to utilize student-centered inquiry teaching approaches in any classroom (Kang, Han, Jeong, & Noh, 2001; Park, Chu, & Martin, 2015). Other research has shown that secondary level teachers working with language learner students report lower levels of perceived teaching efficacy than elementary level teachers (Fraser, 2014). In Korea, secondary

school teachers have fewer experiences in both inquiry teaching and teaching CLD students because the majority of Korea's CLD student population are elementary age children and younger. Thus, we anticipate that secondary level teachers would require more support to help prepare them to effectively teach CLD students.

Teachers' Age

We found that teachers aged 21-30 were more aware of Korea's increasing cultural and linguistic diversity (ATCALD-K) and teachers in this age group also had higher self-efficacy for language teaching (LTENK-TE) than teachers in other age groups. These findings suggest that younger teachers may be more knowledgeable about cultural and linguistic differences than older teachers. This could be due to many factors, including social studies and the foreign language curriculum in K-12 schools, which would have exposed these teachers to learn more about global issues, languages, and cultures compared to older teachers who did not experience these curricula changes in school. Also, teachers in this age group reported having more chances to study or travel outside of the country and reported having more foreign language learning experiences. We anticipated that traveling and increased exposure of other cultures would result in positive attitudes toward increased diversity. Instead we found that teachers aged 31-40 had the most positive attitudes toward increasing cultural and linguistic diversity (ATCALD-A), even though they had fewer international travel experiences.

In addition, we expected that teachers aged 21-30 would also have the highest self-efficacy on their knowledge about inquiry (ITENKS-KE) and inquiry teaching (ITENKS-TE) because these teachers would have benefitted from teacher education programs that are more likely to introduce social learning theories and inquiry teaching strategies, but we found that teachers aged 31-40 had the highest self-efficacy for all ITENKS subscales - Knowledge Efficacy (KE), Teaching Efficacy (TE), and Outcome Expectancy (OE). The only statistically significant difference found between any age group was related to the inquiry-teaching efficacy (ITENKS-TE) subscale for teachers aged 31-40 and 41-50 (31-40: 53.1 ± 10.1 , 41-50: 46.9 ± 12.2 ; $F = 2.89$, $p < .01$, $\eta^2 = 0.06$). Teachers above the age of 50 reported the lowest self-efficacy for knowledge about inquiry teaching (ITENK-KE), which we reasoned makes sense as teachers in the oldest group would have been born just after the war or in the early 1960s-1970s and these teachers would have become young adults in the 1980s, when Korea was undergoing radical political, social, and economic change. During this time period, education at the secondary and tertiary levels was often disrupted due to nationwide political unrest and the teacher education programs emphasized traditional approaches to science education with little or no emphasis on student-centered teaching and learning. Unlike the older teachers, those born in the 1980s and later would have experienced more student-centered learning as primary and secondary school students and would have more exposure to education and training to help implement the current national science curriculum, which emphasizes inquiry. It may be possible that because teachers in the youngest age group (21-30) have less teaching experience, they may be less confident in their inquiry teaching self-efficacy, but we need to examine this issue more closely in the future.

Experiences with CLD students

We examined two variables for teachers' experiences with CLD students: whether the teacher had experience of having non-Korean students enrolled in their school and whether the teacher had any experience actually teaching CLD students in their own classroom. The teachers were asked to affirm their responses to each item with a "Yes" or "No". The answers to these questions were used to investigate how their experiences with CLD students (either in their school or classroom)

influenced their attitudes toward CLD students and CLD families as well as whether their experiences impacted their self-efficacy related to the knowledge about inquiry/language theory, inquiry/language teaching strategies, and outcome expectancy for inquiry teaching and language education for CLD students.

In our analysis, teachers who reported having more personal experiences with CLD students, either in their school or in their classroom, scored higher on both attitude and knowledge (ATCALD-A/K) towards CLD students and their families (CLD students enrolled – Yes: 51.3 ± 9.9 , No: 46.3 ± 9.6 , $F=7.16$, $p<0.05$, $\eta^2=0.05$; experience teaching CLD students – Yes: 51.1 ± 9.4 , No: 47.2 ± 10.8 , $F=4.25$, $p<0.05$, $\eta^2=0.03$) and they also had higher self-efficacy for most of the subscales on the ITENKS and LTENKS. However, the effect of teachers' personal experiences with CLD students was significant only for teachers' knowledge about cultural and linguistic diversity (ATCALD-K) and for teachers' outcome expectancy (OE) for CLD student learning when using inquiry teaching (ITENKS-OE) and language education strategies (LTENKS-OE) (CLD students enrolled – Yes: 51.1 ± 9.3 , No: 46.9 ± 11.2 , $F=4.98$, $p<0.05$, $\eta^2=0.03$; experience teaching CLD students – Yes: 51.1 ± 10.3 , No: 47.6 ± 9.0 , $F=3.9$, $P<0.05$, $\eta^2=0.03$).

Our findings suggest that teachers who have experiences with CLD students have more knowledge about the changes occurring in Korean society and are more likely to believe that their effective teaching can overcome obstacles, such as limited language proficiency, to help CLD students learn. This is an important finding that confirms other research (Echevarria, Vogt, & Short, 2009; Youngs & Youngs, 2001) showing that teachers who believe CLD students are capable of learning when provided language supports, such as scaffolding, extended wait time, or modification of instructional materials, are more likely to try these methods to support CLD students to learn. These findings help to expand on previously reported research showing that teachers may be more willing to implement innovative strategies and curriculum ideas as a result of higher self-teaching efficacy.

Experiences as learner

For teachers' experiences as a learner, we examined three variables, including whether the teacher had experience taking multicultural education courses, studying in a foreign country, and/or experiences learning a foreign language. The teachers were asked to affirm with a "Yes" or "No" to these questions and their answers were used to investigate how their experiences as a learner influenced their attitudes toward CLD students and CLD families and whether their experiences impacted their self-efficacy related to the knowledge about inquiry/language theory, inquiry/language teaching strategies, and outcome expectancy for inquiry teaching and language education for CLD students

We found that teachers who had received some type of educational program or professional development on how to effectively teach CLD students had the most significant impact on teachers' self-efficacy regarding knowledge of how to teach using inquiry instructional strategies (ITENKS-KE). Teachers who reported having completed some form of diversity teaching coursework or professional development also showed a significant increase in their self-efficacy regarding knowledge of how to teach CLD students using inquiry instructional strategies (ITENKS-KE) (Yes: 59.0 ± 9.0 , No: 49.0 ± 9.6 , $F=13.8$, $p<0.05$, $\eta^2=0.09$). Also, teachers who reported being fluent in a language other than Korean had more knowledge about cultural and linguistic diversity (ATCALD-K) and they had higher self-efficacy for all subscales on the ITENKS and LTENKS. However, the effect of teachers' language learning experiences were significant only for teachers with increased knowledge about cultural and linguistic diversity ATCALD (K) (Yes: 53.8 ± 9.6 , No: 48.6 ± 9.8 , $F=7.84$, $p<0.05$, $\eta^2=0.05$). We anticipated that these teachers would have more appreciation for language education theory and recognize the challenges learners face when

acquiring a second language. We also expected these teachers to have higher outcome expectancies (OE) for CLD students, but we found no significant impact. Finally, we discovered teachers who had experience living abroad were more knowledgeable about cultural and linguistic diversity (ATCALD-K) (Yes: 57.2 ± 11.2 , No: 49.2 ± 9.5 , $F=9.25$, $p<0.05$, $\eta^2=0.06$) and showed increased outcome expectancy (OE) for CLD students' learning when using inquiry teaching strategies (ITENK-OE) (Yes: 56.2 ± 12.5 , No: 49.2 ± 9.5 , $F=6.7$, $p<0.05$, $\eta^2=0.05$). However, they were less aware of the students' language learning development and theory about language learning (LTENK-KE) (Yes: 43.2 ± 27.6 , No: 50.0 ± 10.4 , $F=8.15$, $p<0.01$, $\eta^2=0.05$).

These findings indicate that the Knowledge (K) subscale for ATCALD and teaching self-efficacy for ITENKS (TE) and LTENKS (TE) are positively influenced by teachers' experiences as learners, but these experiences do not necessarily impact teachers' outcome expectancy for CLD students' learning when using inquiry (ITENK-OE) and language teaching/learning strategies (LTENK-OE) and theories (LTENKS-KE). Thus, we believe that teacher preparation programs and professional development should be carefully designed to introduce teachers to research and practical examples that promote the use of a student-centered inquiry teaching approach while also providing students necessary language support that expands learning opportunities for CLD students with varying Korean language proficiency levels. In addition, our data suggests that developing teacher education programs that expose teachers to more language learning opportunities or to teaching experiences in other cultural contexts could improve their attitudes toward diversity while also improving their knowledge self-efficacy and teaching self-efficacy about how to ameliorate the challenges CLD students face when engaging in student-centered inquiry activities with limited language proficiency.

CONCLUSIONS

From our analysis, we have learned that the teachers surveyed have fairly positive attitudes towards CLD students, especially if CLD students were in their school or classroom. However, the teachers in our study tended to have less positive attitudes towards the parents of CLD students. In addition, the teachers have positive self-efficacy for teaching inquiry, but they have limited self-efficacy for implementing effective language teaching supports for using inquiry to teach CLD students. Finally, we found several factors influenced positively on teacher attitudes and self-efficacy, including age, years of teaching experience, whether teachers have had opportunities to study languages other than Korean or to travel or live outside of Korea, and whether teachers have had professional development to enhance understanding about diversity. In this section, we discuss the findings in more detail and then we offer some implications for our work in the final section of the paper.

Attitudes towards cultural and linguistic diversity

Overall, we found that teachers' awareness about the current population shift is limited and that Korean teachers tend to have some misconceptions about the changing population dynamics in Korea. However, these findings are understandable as these changes have taken place over a very short period of time and the full impact of Korea's increase in diversity will not be apparent for several years to come. In addition, while teachers' attitudes towards CLD students are fairly positive, they hold some deficit perspectives regarding students' abilities to learn and to be integrated in the school community and their attitudes about the parents of CLD students are considerably less positive (refer to Table 3). Unfortunately, these attitudes are correlated to outcome expectancies. Other research (Settlage, et al., 2009) found that positive attitudes about science and science teaching did not necessarily impact on teachers' classroom practices. In our study, when teachers

held positive attitudes, they also had higher outcome expectancies for both inquiry teaching and language teaching. This was also confirmed by our multiple regression analysis (refer to Table 7). Various studies have revealed important connections between teachers' beliefs and attitudes and how they teach (Knopp & Smith, 2005; Pajares, 1992; Bryan, 2012).

Self-efficacy related to language teaching

The teachers in our study expressed limited knowledge about language education theories, including how language develops and about second language acquisition, and teachers reported limited self-efficacy about how to effectively teach CLD students (refer to Table 5). At this time, most Korean teachers have yet to encounter a CLD student in their own classroom and as a result, they may have higher self-efficacy regarding their ability to support these students to be successful in inquiry-based classrooms (refer to Table 4). Our data suggests Korean teachers are aware they are lacking necessary knowledge and skills to support CLD students to develop their language. As a result, we believe they do not feel prepared to teach CLD students when using inquiry and they also have limited expectations for CLD students' learning based on their efforts to teach using either language or inquiry teaching strategies. We especially found that the outcome expectancy for language teaching is a particularly important factor if teachers intend to use inquiry teaching in science classrooms with CLD students.

Interestingly, the elementary teachers in our study expressed more knowledge and self-efficacy than secondary teachers about how to effectively integrate curriculum such as, language arts, science, and mathematics. These findings are not surprising as it is common for elementary teacher education programs (both in Korea and internationally) to emphasize the value of content integration for improving students' science literacy skills. Both elementary and middle years teachers tend to be responsible for teaching various subjects and they often have coursework designed to support learners to enhance reading and writing in the context of science. Today there are many curriculum resources available to support teachers to integrate language arts and science (see McKee, McKee, & Ogle 2005; Freeman & Taylor, 2006). However, research shows that secondary level teachers tend to have more content-related coursework that lacks a content integration focus (Barwell, 2005). This could explain why the secondary teachers in our study (including math and science teachers) failed to recognize the language demands of the curriculum. Other studies have shown that secondary level science teachers hold limited conceptions about literacy teaching and learning whereby they tend to think of reading and writing as basic skills to be developed in the elementary grades or by language teachers (Brinton, Snow, & Wesche, 2004; Tan, 2011). As such, science teachers do not expect to teach reading and writing to students even though there are considerable needs for specialized science literacy skills that would support students to be able to comprehend science textbooks and science specific text, such as diagrams, graphs, and tables.

Expecting CLD students, who may not be proficient in Korean, to use language to describe, hypothesize, explain, justify, argue, and summarize their science understandings (Rosebery & Warren, 2008) has important implications for the opportunities these students have to actively and equitably engage in science learning. If teachers intend to effectively engage CLD students in inquiry based learning that emphasizes critical thinking and problem solving, predicting, explaining, and asking questions, then they must be able to support these students to engage in positive social interactions with their peers and be able to help these students to draw on both everyday Korean language and academic language to construct scientific knowledge and communicate their science learning to others.

Thus, our research suggests that both elementary and secondary level teachers would especially benefit from professional development designed to target the different literacy and language teaching needs they are likely to encounter with regards differences in content/curriculum and the varying literacy needs of the CLD students they teach.

Self-efficacy related to inquiry teaching

Currently in Korea and in many countries around the world, there is a great emphasis on the use of inquiry teaching methods to engage students in actively “doing science” in order to learn science (NRC, 1996). These science reform efforts are evident in the Korean national science curriculum and revised textbooks (Lee, Abd-El-Khalick, & Choi, 2006; Choi, et al., 2011). In addition, there has been considerable research in Korea concerning science teaching and learning using collaborative learning (Kwak, 2001; Kang, Han, & Noh, 2002; Wong, 2003; Hwang & Park, 2011), argumentation (Lee, Choe, & Kim, 2010; Maeng, Park, & Kim, 2013; Yun & Kim, 2011), and modeling (Lee, et al., 2012; Cho, Nam, & Lee, 2014; Lee, Cho, & Nam, 2015). The types of changes taking place in science teaching practices as described in these studies are especially visible in Korean elementary classrooms.

Because primary and middle grades students face less pressure to prepare for the annual Korean college entrance exam, it is possible these teachers to spend more time implementing student-centered teaching practices and laboratory-based exploration. Similar to findings reported by many international studies exploring primary grades science teaching, elementary teachers in Korea tend to have limited science content preparation and would have had few opportunities as science learners to experience inquiry or participate in a student-centered classroom. As a result, these teachers’ confidence and self-efficacy regarding science content and inquiry teaching with CLD students may be especially limited compared to secondary teachers. Limitations in content knowledge means that teachers are more likely to struggle when implementing inquiry strategies that encourage students to ask questions, plan and conduct investigations, use appropriate tools and techniques to gather data, work with peers to solve problems, and communicate scientific arguments with empirical evidence. In addition, because inquiry generally requires engaging with peers in social learning activities, elementary age students who may be limited in their ability to produce the language that is necessary for engaging in social and cognitive discourse will be at a disadvantage (Stoddart, et al., 2002; Rosebery, Warren, & Conant, 1992).

We advocate for classrooms that attempt to place CLD students in the position of actively engaging in science investigations to raise and answer their own questions. Encouraging CLD students to participate in inquiry tasks generally requires greater interaction between the student and their peers, which can provide a positive environment for developing social language if the activity is well structured to support the CLD students and their peers. Because student-centered, inquiry-based classrooms offer more opportunities for language learners to negotiate meaning with peers using multi-modal forms of communication – we believe that learning science as inquiry has potential to offer the kind of learning environment that fosters language acquisition for both everyday language and academic language. When teacher education programs support teachers to expand their pedagogic knowledge beyond the lens of their subject disciplines (Arkoudis, 2005), they are positioned to help students to engage with language and texts in their subject domains in ways that expands students’ conceptual understanding and content learning (Richardson-Bruna, Vann, & Escudero, 2007). By introducing content area teachers to tools, such as the *Sheltered Instruction Observation Protocol* (SIOP), we can support teachers to expand their use of language teaching strategies that can

improve CLD students' understanding of academic language used to describe science concepts and content (Echevarria, et al., 2004; Echevarria, et al., 2009; Larsen-Freeman & Anderson, 2013). By integrating discipline specific language and literacy skills with scaffolding techniques that use both inquiry-based science concepts and language-based techniques, we can support teachers to implement content-specific strategies and to adapt curriculum and instruction to meet the needs of CLD students that improve teachers' pedagogical strategies and their confidence and comfort when teaching CLD student populations to learn science as inquiry (Durgunoglu & Hughes, 2010; Echevarria, et al., 2006).

Factors influencing on attitudes and self-efficacy

Our study suggests there is an influence of grade level on Korean teachers' attitudes towards cultural and linguistic diversity. Specifically, teachers at the elementary level have significantly more positive attitudes about CLD students and their families (refer to Table 8). This finding is interesting since more than 85% of all CLD students are currently enrolled in schools at the primary level, so these teachers have more "contact" with this population of students. We also learned that teachers' travel experiences positively influenced their knowledge about diversity (ATCALD-K) and outcome expectancy for CLD student learning when using inquiry (ITENKS-OE). This finding was interesting to us and we will try to probe this connection between teachers' experiences to travel abroad and their confidence in their ability to support CLD students' learning using inquiry. Youngs and Youngs (2001) assert that increasing opportunities for teachers to be exposed to cultural diversity helps to eliminate biases, which result in increased positive feelings towards CLD students. Similar to our research, they found a positive correlation between teachers who have reported living abroad at some point in their life with having higher self-efficacy for teaching CLD students in the classroom.

However, while we found that teachers' educational experiences, time living abroad, or learning a foreign language did positively influence their knowledge about diversity, it did not positively influence teachers' attitudes about CLD students and their families. This finding is important because it demonstrates that simply having knowledge about diversity is not enough to impact teachers' beliefs and practices when working with CLD students and their families. We cannot simply design learning experiences that focus only on expanding teacher knowledge and awareness, we must also work to engage teachers in meaningful activities and experiences that support them to interrogate their beliefs and biases and reflect on how their attitudes could influence their classroom practices.

IMPLICATIONS

As a result of historical patterns of immigration and migration, the research on diversity and equity issues in science education has been conducted mainly in Western countries. We believe Korea's educational issues are similar to, but distinct from much of the earlier research that has been published about CLD students. This study contributes novel research about the challenges that teachers and learners face in countries that are facing radical changes in their population as a result of globalization. In this section, we discuss additional implications for our findings related to policy, teacher preparation, and educational research and classroom practice.

Policy to support improved educational outcomes for CLD students

As reported earlier, Korea has long been characterized as a homogenous society that has experienced rapid changes in the population in less than one generation.

Unfortunately, the academic policies and certification requirements that govern teacher education programs present bureaucratic and financial barriers that generally prevent programs from reacting quickly to changes in society. This has important implications for policy makers who have the ability to press for changes and initiatives that can support teacher education programs and school districts to make the changes needed to support teachers and students. Several different branches and organizations in the Korean government are working to manage immigration and associated education issues. In recent years, several policies have been passed to provide more rights and supports to immigrant families and their children – including policies that impact on access and enrollment into the public school system. These policies are really critical. However, more needs to be done.

Currently in Korea, there are no KSL certification programs so schools with CLD students have no access to teaching professionals with expertise in second language acquisition and language teaching. While there are teachers trained in English as a Foreign Language (EFL) education, the theory and pedagogy associated with foreign language education is somewhat different from what is needed for supporting students to acquire a second language in an immersion context. Thus we would like to advocate for policies that expand teacher education initiatives for developing Korean as Second Language (KSL) programs and policies that fund the development of the curriculum resources teachers need to help CLD students learn content while also developing language and literacy skills. By developing the field of KSL, we can effectively introduce specialized language teachers in schools who can collaborate with content area teachers to support CLD students to learn science and develop language. Training KSL teachers to be able to support science teachers in mainstream classrooms to integrate discipline specific language and literacy skills with scaffolding techniques that use both inquiry-based and language-based strategies can improve science and KSL teachers' confidence and pedagogical knowledge for teaching CLD student populations (Durgunoglu & Hughes, 2010; Echevarria, et al., 2006). Beyond developing new teacher education programs, policies can be developed that allow teacher education programs to design add-on certifications that offer coursework designed to train specialized teachers how adapt curriculum and instruction to meet the needs of CLD students and model how to use content-specific strategies in content classrooms through co-teaching (Im & Martin, 2015).

In addition, policy initiatives can expand funding for designing and implementing long-term and short-term teacher professional development programs that target elementary or secondary teachers in general education or content specific areas. Funding can support the development of resources that help teachers attend to issues, such as pacing, scaffolding student understanding, and providing explicit instruction about science language by introducing components of research-based teaching models, such as the *Sheltered Instruction Observation Protocol* (SIOP) and the *Reformed Teaching Observation Protocol* (RTOP). Tools, such as SIOP and RTOP, can empower KSL and content-based teachers to identify good teaching practices in inquiry and language education that can improve CLD students' understanding of both the academic and everyday Korean language that is used to describe content in the K-12 classroom (Echevarria, et al., 2004; Echevarria, et al., 2009; Larsen-Freeman & Anderson, 2013).

Finally, we encourage funding initiatives aimed at fostering inter-disciplinary research and program development between faculty in content departments (i.e., science, math, social studies) and faculty in the Korean language, Language education, and social science departments. The issues that need addressing go beyond the expertise of individuals in single departments. For example, we need collaborative efforts to develop assessments to help determine a student's Korean language proficiency level and to design complementary curriculum standards and

resources to support teachers to determine what kinds of accommodations or modifications would be most appropriate for supporting students at different proficiency levels. Language assessment tools and curriculum resource materials take considerable time and effort to create, which requires support from funding agencies and policies that signify the value of these projects. We hope policy-makers and funding agencies will help to advance research initiatives that promote equity and access to education and science education in the future.

Transforming science teacher education and professional development

An essential point for consideration in our future research focuses on developing teacher education programs and professional development resources that can help transform Korean teachers' attitudes and teaching efficacy in ways that truly expand inquiry and language learning opportunities for CLD students in their classrooms. Specifically, we advocate for the development and integration of such courses in science teacher education programs, at both the elementary and secondary levels. Our research suggests an important way to meet this goal is by improving teachers' knowledge about diversity and supporting teachers to become aware of their biases. To do this, we recommend that multicultural education courses be developed and added to current teacher education programs that address the unique social, cultural, and historical issues related to changes in Korean society. These courses should incorporate research and pedagogies related to multicultural education, especially related to teaching science to CLD students (Banks, 1991; Atwater, et al, 2013; Martin, Wassell, & Scantlebury, 2013).

In addition, we believe that by increasing teachers' understanding of the process of second language acquisition, we can improve teacher empathy toward CLD students' language difficulties and cultural differences which can also give teachers more confidence in their ability to effectively implement strategies to support CLD students to access language and build content understanding (Lee, et al, 2007; Dong, 2004; Wassell, Martin, & Scantlebury, 2013; Im & Martin, 2015). Finally, we believe that it is critical that in-service teachers receive on-going professional development that focuses on introducing practical research approaches and examples for how to promoting student-centered inquiry-teaching pedagogy while providing the necessary language support needed to expand language learning opportunities for all CLD students in the science classroom.

Moving forward, we hope that our research can help influence policy and curriculum changes that improve teacher education and preparation and that offer more curriculum supports for CLD students in Korean schools. We also hope our research efforts can influence policy initiatives that expand funding to support research about how to improve education for CLD students. We conclude by encouraging policy decisions and school-based programs be informed by all stakeholders, including classroom teachers, CLD students and their parents.

Teacher attitudes and self-efficacy research

Using teacher efficacy beliefs as a way to determine whether teachers believe they can create a positive learning environment for CLD students has received little attention. We did this research to help us identify specific areas of concern for Korean teachers when using inquiry instructional practices to teach CLD students because we hope to target potential relationships between different domains so we can use these findings to help us design future research and to help us develop the types of teacher education courses and professional development programs that would most benefit Korean teachers and the CLD students whom they teach. We believe *K-TASILT* can be a valuable tool for both science and language teacher educators to access in-service and pre-service teachers' attitudes and teaching self-

efficacy on actual inquiry and language teaching practices in the classroom. By combining *K-TASILT* with classroom-based qualitative research, we can better understand teachers' ideas and beliefs associated with using inquiry and language teaching strategies with CLD students.

Currently we are working to refine *K-TASILT* for further use in Korean educational contexts and we are collaborating with colleagues in other countries, especially in Asia, who are facing similar societal changes so we can explore differences and similarities that exist in cross-cultural contexts. We want to encourage other researchers to develop transnational research teams when considering these broader issues and when conducting research with CLD children and their families. We feel our experiences as insiders and outsiders in Korean society and the Korean school system has enhanced our interrogation of the issues and our interpretation of our findings. In addition, it has supported our ability to make more meaningful connections with CLD students and their families as we also share some of the challenges they face as immigrants to Korea and emigrants to countries outside of Korea. We believe our research has been enriched by our ability to draw from not only our academic expertise, but also our lived experiences as insider/outside to culture and language. We offer our research as a model for other educators in the region who are seeking ways to support teachers, students and families in increasingly diversifying societies.

Research that enhances learning for CLD students

We believe it is critical that the Korean education system be better prepared to meet the needs of CLD learners because these students hold the potential for making important contributions to Korea's future in STEM education. CLD students bring diverse perspectives and experiences to the learning of science, and as such, they have much to offer Korea's future with regards to STEM education. However, science can be either a bridge or a barrier for CLD students' academic success. For this reason, it is critical that CLD students have equitable opportunities to learn science and language so they can benefit from expanding their science knowledge, as well as, be provided the skills needed to be able to access the same higher education opportunities as native Korean students.

We hope that our research can begin to build a recognition for the need to support these students and their families to not only survive in Korean society, but to thrive. To meet these goals, we believe that teachers and students need more support to conduct classroom-based research that can help to identify and develop teaching strategies that are appropriate for Korea's educational context. Currently, we are conducting a collaborative, ethnographic study with a Korean science teacher and CLD students from her class examining classroom teaching and learning practices using video analysis and cogenerative dialogues (Martin, 2006; Im & Martin, 2015; Wassell, Martin, & Scantlebury, 2013) to explore how all participants experience and make sense of science teaching and learning in real contexts. Using both the RTOP and the SIOP instruments as a structure for identifying instructional strategies that may enhance or limit either science or language learning, we are working with the teacher and her students to understand what kinds of practices are most effective for different kinds of lessons and different learners. By using inclusive, participatory research methodologies (Barton, 2001; Martin, 2006), we hope to learn more about how Korean teachers and the CLD students in their classrooms experience school and science so we can work collaboratively to affect positive changes in how teaching and learning occurs. By engaging teachers and students in collaborative research efforts, we seek to develop resources and course materials that can help individual teachers and students to identify the problems they are facing and to use research to collectively attend to these issues so teachers

can expand opportunities for CLD students to learn science through inquiry by while developing the language needed to communicate their understandings and wonderings.

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