

## Multiculturalism in Current and Future Mathematics Teacher Education in South Korea

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### Abstract

The recent increase of culturally and linguistically diverse student population in South Korea requires a fundamental change in the teacher education and curriculum. This chapter first describes why multiculturalism education became important and necessary in teacher education in South Korea that was once known as a monolithic society, and how the teacher education research has evolved with respect to multiculturalism education. We then synthesize research studies conducted to promote preservice and in-service teachers' knowledge and skills related to teaching multicultural students and emergent bilingual students. We explore and analyze relevant research studies in teacher education that suggested theoretical models for multicultural education for preservice or in-service teachers and that investigated teacher beliefs on culturally and linguistically diverse students. In doing so, we first synthesize research studies on general teacher education and then further explore research studies on mathematics teacher education

with the lenses of liberal and critical multicultural education. Lastly, we suggest future directions of multicultural education within Korean teacher education.

### **Introduction**

South Korea has been known to achieve excellence in teacher quality and considerable equity in students' learning opportunities through international assessments and research studies (e.g., Akiba, LeTendre, & Scribner, 2007). However, the recent increase of culturally and linguistically diverse students in South Korea requires a fundamental change in teacher education and school curriculum. In South Korea, multicultural students are inclusively defined as the students enrolled in public schools who are from families of foreign workers, international marriage, Korean diaspora, and North Korean defectors (Song et al., 2011). In 2015, the population of multicultural students exceeded 1% of all students in Korean history (Kim et al., 2015). Moreover, the gap of academic performance between racial and ethnic majority and minority students in South Korea has received attention recently (Park & Cho, 2020). Despite the small number of multicultural students before 2015, the international assessment revealed the academic challenge the non-native Korean speaking students encounter in Korean schools; TIMSS 2003 reported that 99% of students always use Korean at home, 1% use it sometimes, but TIMSS 2007 result showed 95% and 5% respectively. The student group who always used Korean scored 600 on average in the mathematics assessment while the other group scored 549 (Mullis et al., 2008).

Although the number of students with multicultural backgrounds is rapidly increasing in South Korea and struggling in academic learning, the teachers are not adequately prepared to teach culturally and linguistically diverse students (Kim et al., 2011; Lee et al. 2018; OECD, 2019). For example, TALIS 2018 Results (OECD, 2019) found the number of teachers who

teach or have taught students from diverse cultural, racial, linguistic, or national backgrounds is less than 25% of all teachers. Similarly, in the comparison study between South Korea and the U.S. teacher preparation programs for secondary teachers, Kim et al. (2011) found only one South Korean program stated equity in their aims, which reflects extreme homogeneity of the Korean society and indifference to multicultural education in South Korea. Accordingly, the Korean government bodies promptly responded to the recent changes and have provided various policies and guidelines to support teachers of culturally and linguistically diverse students. For example, the newly released standards emphasize multicultural education in all subject areas and include a guideline of Korean language programs (Ministry of Education, 2015).

With the increasing number of multicultural students, multicultural education is becoming important and necessary in teacher education in South Korea that was once known as a monolithic country. Although there have been many efforts to develop multicultural teacher education in both in-service teacher (IST) and preservice teacher (PST) training in Korea, multicultural education courses are not required in teacher preparation programs (I et al., 2019). In fact, most Korean teachers receive little multicultural training during their teacher preparation programs (Hong, 2010; Mo, 2009), and even when they do, it is more focusing on immigrant students' assimilation and adjustment into Korean culture rather than increasing their awareness of racial and cultural inequality (Kang, 2010). This chapter is about the current research of multicultural education within teacher education in South Korea, especially in mathematics education. We aim to deeply look at how the teacher education programs have equipped teacher candidates to effectively teach mathematics for multilingual/multicultural students.

### **Scope and Context**

We reviewed research articles on multiculturalism in Korean teacher education and

multicultural education for both ISTs and PSTs at elementary, middle, and high school levels. We do not include articles in early childhood because preschool and kindergarten are not mandatory education in South Korea. We include research in general education but have a specific focus on mathematics teacher education because our goal is to examine how mathematics teacher education programs counter the pervasive and historically long-standing misbelief that mathematics is culture-free and language-free and to prepare culturally and linguistically responsive mathematics teachers in all levels.

We included only the research journal articles published after 2006 in our review. Our rationale behind this decision is the historical fact that the Korean government proclaimed multiculturalism as the major political and education agenda and released the first Multicultural Family Children Education Support Measures in 2006. According to the dissertation review of Jun (2011), 93.2% of all dissertations published between 1994 and February 2010 came out after 2006, impacted by the governmental move. Since then, teacher education institutions have incorporated multicultural programs into teacher education for both PSTs and ISTs (Mo & Lim, 2013).

Although we do not include books, book chapters, theses, or dissertations, we considered journal articles that reviewed dissertations. We intended to include journal articles written in both Korean and English. For Korean written articles, we used Research Information Sharing Service (riss.or.kr) search engine by Korea Education and Research Information Service with several keywords. The combination of “multicultural” and “teacher education” showed 424 cases but the combination of “multicultural,” “teacher education,” and “mathematics” gave only 10 articles (see Table 1; searched on June 13, 2021). The results in Table 1 shows the research studies about multicultural education for mathematics teachers are significantly infrequent in

South Korea. We used the Korean keywords when searching the articles.

Table 1

*Keywords phrase and search results on riss.co.kr (on June 13, 2021)*

Keyword	Search term	Search term in Korean	Results
teacher	"teacher"	"교사"	20839
education	"teacher education"	"교사교육"	7672
math teacher education	"teacher" AND "mathematics"	"교사" AND "수학"	667
	"teacher education" AND "mathematics"	"교사교육" AND "수학"	288
multicultural teacher education	"teacher" AND "multicultural"	"교사" AND "다문화"	602
	"teacher education" AND "multicultural"	"교사교육" AND "다문화"	424
multicultural education for math teacher	"teacher" AND "multicultural" AND "mathematics"	"교사" AND "다문화" AND "수학"	10
	"teacher education" AND "multicultural" AND "mathematics"	"교사교육" AND "다문화" AND "수학"	10

To search English written articles, we used Google Scholar to search with several keywords: Korean teacher, multicultural education, and mathematics education. The initial search gave approximately 18,000 results, but we found only four relevant articles in the first 10 pages, which are not overlapped with our Korean article search. Two of the four articles we found are written by the same authors and about the international field experience to enhance social studies PSTs' awareness of multicultural education. Another article is a comparison study on teacher beliefs between South Korea and the U.S. Only one article (I & Chang, 2014) was specifically related to mathematics teachers.

### **Theoretical Backgrounds**

Well-designed multicultural education courses help increase teachers' awareness of diversity and the quality of their culturally responsive instruction (Banks & Banks, 2010). To

better prepare teachers for teaching in diverse classrooms, prior research has found multicultural education courses for teachers are a useful and viable approach (Choi & Lee, 2020; Irvine, 2003; Mollie, 2013). Those multicultural programs in teacher education generally focus on teachers' self-efficacy, defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3), because teachers with high self-efficacy in multicultural classrooms are able to support students in critical consciousness on sociopolitical issues and to question the existing social inequality and injustice by connecting their home and school culture (Banks, 2001; Gay, 2002; Ladson-Billings, 1995).

Parkhouse et al. (2019) also argued that professional development in multicultural education serves to "contribute to teachers' self-efficacy and success in working with culturally diverse students" (p. 416), when incorporating culturally relevant pedagogy (CRP, Ladson-Billings, 1995), culturally responsive teaching (CRT, Gay, 2002), and culturally sustaining pedagogy (CSP; Paris, 2012) into their multicultural programs for teachers (Choi & Lee, 2020). Grounded in Bandura's (1997) social cognitive theory, Siwatu (2007) also argued that teachers should be equipped with culturally responsive/relevant self-efficacy, which indicates teachers' beliefs in their ability to adopt CRP and CRT in their teaching.

Choi and Lee (2020) emphasized the benefits of professional development in multicultural education: (1) helping teachers abandon deficit thinking and challenge social injustice and inequality (Brown & Crippen, 2016; Schniedewind, 2001), (2) increasing teacher awareness of the forms of discrimination based on social group membership and encouraging students to discuss issues of discrimination and stereotyping (Schniedewind, 2001), and (3) helping teachers adapt their teaching to the cultural diversity of students (Bishop et al. 2009; Brown & Crippen, 2016; Lee et al. 2007).

Kim and Choi (2020) describe that multicultural education for teachers generally has two approaches, liberal multicultural education and critical approach. Liberal multicultural education focuses on maintaining cultural differences and identities so advocates a society where members of racially and ethnically marginalized groups can maintain their distinctive cultural identities (Howard, 2006; May & Sleeter, 2010). Generally, liberal multicultural education approach aims to get “along better, primarily via a greater recognition of, and respect for, ethnic, cultural, and/or linguistic differences” (May & Sleeter, 2010, p. 4). Aligned with this approach, when teachers first learn about multicultural education, they primarily conceptualize it as the contents related to racial, ethnic, and cultural groups. However, Banks and Banks (2010) warned that conceptualizing multicultural education exclusively as content related to only culturally marginalized groups is problematic because content teachers, especially secondary mathematics and science teachers, may not be able to relate their disciplines to cultural issues in the exclusive view. Moreover, this view has a critical limit that overlooks sociopolitical influences that apply to all lives in the society.

In response to this limit of liberal multicultural education, multicultural scholars and educators have sought a critical approach. When applying a critical multiculturalism perspective, the approach of simply tolerating cultural pluralism in liberal multicultural education has led to de-racialized and color-blind discourse, which may silence voices raising issues of racial inequality and systemic injustice (Howard, 2006; May & Sleeter, 2010). Conceptualized with critical race theory (Delgado & Stefansic, 2017; Ladson-Billings & Tate, 1995), critical multicultural education prioritizes awareness and deconstruction of sociopolitical power relationships and the role of institutionalized inequities. Kim and Choi (2020) contend that educational and structural inequities and the critical consciousness of the larger sociopolitical

context was not sufficiently addressed in multicultural teacher education courses while they are generally designed to prepare teachers with cultural sensitivity, cultural pluralism, and tolerance.

Based on these theoretical backgrounds, we synthesize research studies conducted to promote PSTs and ISTs' knowledge and skills related to teaching multicultural students and emergent bilingual students. We first synthesize research studies on general teacher education and then further explore research studies on mathematics teacher education. Within each category, we analyze relevant research studies in teacher education that suggested theoretical models for multicultural education for teachers followed by research studies on teacher beliefs on teaching multicultural students and research studies on classroom implementations.

### **Multicultural Education in General Teacher Education**

The articles found from our search are categorized into three thematic groups: theoretical model, teacher beliefs, and teaching practices. A majority of research studies were categorized into teacher beliefs, followed by theoretical model and teaching practices. In this section, we describe and synthesize the trends of research studies on these three categories related to multicultural education within general subjects in both professional development and teacher preparation programs.

#### **Theoretical Models of Multicultural Teacher Education**

The five research articles about theoretical models of multicultural education in general teacher education are categorized into two groups: (1) review studies that classify the types of multicultural teacher education through meta-analysis (Kim, 2014; Na, 2011; Um & Won, 2021) and (2) studies about composition and application of multicultural teacher curricula (Chang, 2008; Jang, 2009).

Regarding the former, Na (2011) applied meta-analysis to review 10 papers focusing on

the curriculum for multicultural teacher education from 2007 to 2010. He did not find any articles that conceptualize multicultural education from the perspective of conservative multiculturalism, which are not recommended by multicultural education scholars because it emphasizes cultural assimilation. There was only one paper that was based on critical multiculturalism. The conceptualization of the other papers was placed between the two. Similarly, Um and Won (2012) conducted meta-analysis by reviewing 62 studies from 2003 to 2012 and grouped them into four categories: basic research to present the direction of multicultural teacher education, the multicultural teacher education model, the status of multicultural teacher education, and the verification of the effectiveness of multicultural teacher education. Among the 62 studies, only 12 were related to multicultural teacher education models. Based on the analysis results, Um and Won suggested more qualitative research in the field of multicultural teacher education. In the same vein, Kim (2014) conducted the content analysis of 212 articles from 2003 to 2013 and reported that although there were a sufficient body of studies ( $n = 34$ ) related to teacher education curriculum and training in general multicultural education, these studies were mainly adopted literature reviews as the research method than qualitative or empirical approaches.

The other line of theoretical models of multicultural teacher education research studies is centered on composition and application of multicultural teacher curricula. In the studies of multicultural teacher curricula, several scholars suggest a curricular model of multicultural education for teachers (e.g., what contents and pedagogy needs to be included in multicultural teacher education programs) (e.g., Chang, 2008; Jang, 2009). Jang (2009), for example, discussed the importance of developing a curriculum suitable for teachers in the Korean context by including both basic and advanced courses in teacher education programs. The basic course

aims to increase teacher awareness of multiculturalism, and the advanced course focuses on instructional differentiation for diverse students. Both sets of courses include content knowledge, education pedagogy, and field experience. The content domain is for understanding the reality of multicultural people in South Korea, such as the life and culture of immigrants. The pedagogy domain consists of a course of understanding multicultural education, a course of composition and practice of multicultural education, a course of multicultural teaching and learning methods, and a course of assessment of multicultural education. Finally, the field experience domain consists of a variety of training courses to cultivate the ability to do so. Similar to Jang (2009), Chang (2008) explored a curricular model of multicultural teacher education that is suitable for the Korean situation. The suggested six-stage model of teacher curriculum for multicultural education consists of knowledge acquisition of race, ethnic, culture, and gender; awareness of global situation and dynamics; identifying self-identity and ethnic-identity; forming attitude of combating prejudice and discrimination; cultivating multicultural competences for curriculum reform; and building social action skills for social justice. While Jang (2009)'s suggestion is mainly made in the liberal multicultural education approach, Chang (2008) includes several aspects of critical approach such as identifying identities, opposing discriminations, and action for social justice. Although two approaches of multicultural education for teachers—liberal multicultural education and critical approach—have been emphasized in the literature as theoretical models of multicultural teacher education, it is not clear whether educational and structural inequities and the critical consciousness of the larger sociopolitical context was sufficiently addressed in multicultural teacher education courses to prepare teachers with cultural sensitivity, cultural pluralism, and tolerance.

### **Teacher Beliefs in Multicultural Education**

A large body of literature in multicultural teacher education in South Korea focused on teacher perspectives about multicultural students and multicultural education or how their perspective shifts through multicultural teacher education. The review of Kim (2014) found that most of these studies used quantitative approaches to measure teachers' awareness, knowledge, or perspectives towards multicultural students or to examine the changes in their views by taking a course or PD of multicultural education. For example, Ahn (2010) examined PSTs' attitudes and perspectives about multicultural education through a large-scale quantitative survey. The survey results indicate that PSTs have a generally positive perception towards multicultural education, but their expectation about the adequacy of the curriculum in teacher preparation was relatively low.

We found that multiple studies in this category investigated teachers' multicultural efficacy, which evolved from self-efficacy and defined within multicultural education. Hence, a teacher's multicultural efficacy means a teacher's self-efficacy about teaching multicultural students. Choi and Mo (2007) found that teachers' multicultural efficacy was low, especially related to developing and implementing culturally relevant lessons. Moreover, Mo and Hwang (2007)'s study revealed that most social studies and language art teachers had low expectations of students with multicultural backgrounds. Other studies found that multicultural efficacy is related to teachers' age (Mo & Hwang, 2007), gender, and multicultural teacher education experience (Park et al., 2008). As for teacher preparation programs, Jang (2010) measured secondary PSTs' multicultural efficacy, using the revised Multicultural Efficacy Scale developed by Guyton and Wesche (2005). More specifically, he included sub-scale of efficacy including general efficacy, efficacy in instructional competence, efficacy in caring perspectives, and efficacy in helping minority families and children. The results show that the PSTs' efficacy in

instructional competence was lower than in other areas while their efficacy is high in general. These studies are grounded in the belief of previous research (e.g., Siwatu, 2007) that teachers' culturally responsive or relevant self-efficacy is an important indicator for their ability to implement teaching practices in multicultural classrooms.

The other group of the multicultural teacher education studies measured teachers' improvement or change in awareness or perspectives of multicultural students and education through multicultural courses or PD while measuring the effectiveness of the programs/courses. Most research studies in this category used quantitative surveys, but some studies included interviews, open-ended surveys, written reflection, or observation. For instance, using the Teaching and Learning International Survey 2018, Choi and Lee (2020) examined whether the teachers' experience in professional development in multicultural education improves their self-efficacy in multicultural classrooms, as well as whether teacher self-efficacy in multicultural classrooms mediates the relationship between professional development in multicultural education and teachers' perceptions of school climate in secondary schools in the U.S. and South Korea. They found that professional development in multicultural education is significantly positively related to teacher self-efficacy in multicultural classrooms, and teacher self-efficacy in multicultural classrooms positively mediated the relationship between professional development in multicultural education and the perception of school climate in both Korea and the U.S.

Similar to Choi and Lee (2020), most research shows that the PDs and courses of multicultural education have a positive impact on teachers' attitudes, multicultural efficacy, or multicultural competencies while several limitations and challenges remain. Mo (2009) examined the effects of a short-term teacher training program about multicultural education and the teachers' multicultural efficacy and attitudes towards diversity after completing the program.

The survey results of 115 elementary teachers and interviews with three teachers who participated in the one-week program show that the program was effective to increase positivity in both the teachers' multicultural efficacy and their attitudes with respect to racial diversity.

Park and Sung (2011)'s study has a more critical and specific view. Their study included only the teachers in multicultural education schools that have a high population of multicultural students and provide specially designed multicultural programs for the students and teachers. Based on a Likert-scale survey, they found that the teachers with multicultural education experiences had more positive attitudes towards multicultural education, higher multicultural efficacy, and higher self-confidence than teachers who had not experienced multicultural education. However, the teachers in this study were relatively negative on the implementation of multicultural education and generally possessed assimilation views. They did not think a goal of multicultural education is to foster critical thinking capacity to solve social inequalities and believe that multicultural students' cultural contexts—such as food, clothes, or family life—or social discrimination and injustice are not appropriate as multicultural education contents.

A large body of research studies also investigated the effectiveness of multicultural education or programs for PSTs in various formats including multiculturalism courses (Koo, 2010), international field experience in a diverse country (Kim & Choi, 2020), and multicultural films and books (Kim et al. 2015). Koo (2010) developed a multicultural education course in a 4-year university teacher education program and found the PSTs shifted their assimilated view and attitude towards more positive ones while their views on multicultural families were relatively negative. In contrast, Kim et al. (2015)'s study illustrated how the PSTs who read/watched and discussed books/films about multicultural families showed positive shifts in their perspectives towards immigrant families and students. Through their qualitative studies, Kim and Choi (2020)

and Park and Kim (2012) investigated PSTs' change in their attitudes and perspectives towards multicultural students and education. Similar to the results of the quantitative research mentioned above, Park and Kim (2012) found the PSTs increased their multicultural competence after taking a multicultural education course. The study of Kim and Choi (2020), guided by critical multicultural teacher education framework, examined how social studies PSTs changed their perspectives on multiculturalism through the international practicum, consisting of (1) teaching practicum, (2) lectures and seminars, and (3) socio-cultural activities throughout 10 days. Although there was more grasping the reality of multiculturalism, the participants showed a more liberal multicultural approach to multiculturalism in the U.S. and reproducing American cultural superiority and unchallenged racial privilege and institutional racism in South Korea.

Our findings about multicultural teacher education were aligned with Lee et al. (2018) where they stated the multicultural education courses are not sufficient or adequate to address the deficit views and assimilationist approach to multicultural students.

### **Class Implementation of Multicultural Education**

There is only one research article (Cho et al., 2010) that investigated general teaching practices in multicultural classrooms (Although there are several government documents on multicultural education, we did not include them in synthesizing classroom implementation of multicultural education). Cho et al. (2010) investigated teaching practices of multicultural education in elementary and secondary schools with respect to goals, content, target populations, and structure and organization. Cho et al. carried out qualitative comparative case study mainly using content analysis methods on the school multicultural education programs and in-depth interviews on teachers. They found that the multicultural education programs for schools were 'cultural education' and 'language education.' While in the majority cases multicultural education

programs were provided for students, especially students of multicultural families, many schools ran multicultural education programs in the irregular curriculum as like after school programs. Cho et al. reported that many teachers perceived the goal and characteristics of multicultural education as the education of foreign culture or education for adaptation to Korean society and transformed bilingual education into foreign language education. Multicultural teachers expressed difficulties resulting from scarcity of teachers' professionalism, budget limits, criticism on the reverse discrimination and distinctions. Cho et al. provided suggestions to improve the current situation of multicultural education in elementary and secondary schools. Despite a large body of research on multicultural education, we found a lack of research that examines how ISTs and PSTs implement multicultural education in diverse classrooms. It is essential to explore how teachers provide learning opportunities to multicultural students and what factors promote or prohibit in providing equitable learning opportunities to them.

### **Multicultural Education in Mathematics Teacher Education**

In this section, we particularly discuss how multicultural education has been studied with mathematics teachers. Following the previous section, we examine the prior studies in three angles, theoretical models, teacher beliefs, and classroom implementation. Although relatively a small number of research studies paid attention to multicultural mathematics teacher education, a similar tendency appears in research on multicultural education in mathematics teacher education with that in general multicultural education. A majority of research studies were categorized into teacher beliefs, followed by theoretical models and teaching practices.

#### **Theoretical Models for Multicultural Teacher Education**

There are three research studies on theoretical model exploration related to multicultural education in mathematics teacher education (Song et al, 2010; Song & Ju, 2014a, 2021). While

Song et al. (2010) explored principles and methods of multicultural mathematics teacher education with recognition that the systematic implementation of the multicultural mathematics teacher education process is insufficient. Song and Ju (2014a, 2021) suggested effective multicultural teacher education program for mathematics teachers after analyzing participating mathematics teachers' multicultural competency and pedagogical design capacity for multicultural mathematics education (i.e., the ability to appropriately identify and mobilize curricular and personal resources—for constructing multicultural curricula for their students).

Song et al. (2010) set up three sub-objectives of multicultural mathematics teacher education: teacher competency for multicultural mathematics education, content elements of the curriculum, and practical method knowledge as the teaching principle. In the teacher competency for multicultural mathematics education, three domains were extracted: affective (belief system and attitude toward diversity and difference), cognitive (knowledge required for cultural diversity reflection class), behavioral domain (affective and cognitive competencies are implemented in actual class). For the content elements of the curriculum, mathematical culturality, diversity, equality, and self-identity were extracted, and implementation details and methods for each were suggested. For example, for the content element 'diversity', 'presenting culturally relevant examples of teaching methods,' and for its methods, 'showing mathematics classes taught within a cultural context' and 'learning, applying, and demonstrating a variety of teaching methods for students from various backgrounds' were suggested. Song et al. (2010) argued the necessity of preparing a curriculum that satisfies the characteristics of the current multicultural society and the educational demands.

Song and Ju (2014a), based on the analysis of the contents of two previous domestic studies conducted in 2009, pointed out that research studies on multicultural teacher education in

Korea have been conducted at the theoretical level and therefore have a tendency to introduce a cross-curricular and content-free theory of multicultural education in terms of content, which is inadequate in developing the practical capacity of multicultural education that reflects the unique characteristics of individual subjects. To address such limitations, Song and Ju investigated the multicultural competence of Korean mathematics teachers and the demand for multicultural education. As a result, they developed 6 steps of the multicultural mathematics teacher education model (Practice analysis-demand/need analysis-principal extraction-goal setting-contents and methods selection-evaluation). They further presented a 16 week-teacher education program aligned with six steps of the multicultural mathematics teacher education model. Although this study has an implication to the field, Song and Ju did not apply or test out the validity and educational effect of the developed model.

They further investigated the teachers' pedagogical design capacity for multicultural mathematics education by collecting lesson plans created by ISTs in a multicultural mathematics teacher education course (Song & Ju, 2021). The results revealed a few limitations such as difficulty in adapting the levels of multicultural mathematics education coherently, returning to teacher-centered approach, and placing mathematical contents and social issues separately. Based on the results, they suggest implications for the future development of multicultural mathematics teacher education.

### **Mathematics Teacher Beliefs in Multicultural Education**

We found a quite few research articles that address the perceptions of mathematics teachers towards multicultural education, including language learners. Two articles examined PSTs' perception of multicultural education and five articles addressed understandings, recognition, beliefs in practices, and multicultural competence of ISTs. The results of these

studies are mixed with the counterpart research findings in general teacher education.

Oh (2013) conducted a large-scale survey to examine mathematics PSTs' perception of multicultural education in four categories: experience of multiculturalism, multicultural efficacy, understanding of multiculturalism, and multicultural sensitivity. Similar to the prior studies in general teacher education, the survey results show that the mathematics PSTs had low confidence in developing and implementing a multicultural curriculum although they generally have positive perception on multicultural education. Moreover, their perception of the multicultural population was widely negative with the belief that Korean culture is superior to the cultures of multicultural people. A vital difference from the previous studies is that the result of this study had statistically significant differences between female PSTs and male PSTs. The female PSTs had much higher results in multicultural efficacy, multicultural understanding, and multicultural sensitivity than the male PSTs who participated in this study.

While Oh (2013)'s study analyzed the current perceptions of PSTs about multicultural education and population, the qualitative study of Moon and Ju (2010) investigated how their developed multicultural course influenced mathematics PSTs. The multicultural curriculum was designed as discussion-based and included three themes: multicultural education literature in mathematics, understanding cultural aspects of mathematics, and culturally responsive/relevant mathematics teaching. The authors found that the participating PSTs generally had positive changes in being legitimate cultural agents in mathematics classrooms, but they also encountered difficulty in connecting theories and practices at a more than superficial level.

The teacher survey results of I and Chang (2014) were not different from those of PSTs. I and Chang asked elementary teachers to analyze a mathematics lesson based on the Sheltered Instruction Observation Protocol (SIOP) Model. They found the ISTs were able to identify the

strategies designed to support Korean language learners (both non-Korean and returning Korean students) and generally agreed with the benefits of the lesson for teaching multilingual students. However, they had little recognition of the necessity to provide rigorous mathematics to multicultural students. While I and Chang (2014) specifically focused on instructional strategies for multilingual students, Song et al. (2011, 2013) widely investigated multicultural competence of mathematics ISTs through a survey (2011, 2013) and classroom observation (2011). These studies revealed a significant difference between mathematics teachers and teachers in general subjects. The mathematics teachers had a low score in mathematics-related questions in the survey. For instance, they did not recognize the importance of integrating cultural and linguistic experiences in mathematics instruction and believed mathematics has less influence from language. Most importantly, the authors found the negative attitude of the teachers toward multicultural students was transferred to other students and resulted in an inequitable learning environment by limiting multicultural students' participation in the mathematics lesson. The result suggests the necessity of content-specific professional development in multicultural education for mathematics teachers. Responding to this need, Song (2017) investigated how the multicultural competence of mathematics teachers changed through a semester-long multicultural course specifically designed for mathematics teachers. The course curriculum included the benefits of ethnomathematics, culturally responsive teaching, implementation of multicultural education into school sites, and multicultural education lesson presentations. The mathematics teachers who completed the course showed an increase in their multicultural competence and knowledge.

Among the mathematics education research articles that addressed multicultural education, probably the qualitative study of Song and Ju (2014b) has the most critical approach.

Their in-depth interviews with two mathematics teachers taught in middle and high schools revealed the color-blindness of the teachers and their liberal view on multicultural education as they believed multicultural education means merely adding ethnic contexts to mathematics curriculum. They first questioned why mathematics curricula need to include multicultural aspects and believed it is unnecessary to differentiate their mathematics instruction for multicultural students. They also shared the common resistance against multicultural people, such as attributing low performance to individual inability or lack of efforts rather than racial discrimination, being considerate of educational discrimination against non-multicultural students by focusing on equality rather than equity, and lack of knowledge about structural injustice and inequality in school.

### **Classroom Implementation of Multicultural Education in Mathematics**

We found only one research article (Song et al., 2011) that investigated the ISTs' classroom implementation of multicultural mathematics education. Song et al. (2011) investigated elementary and middle school teachers' multicultural mathematics teaching practices using qualitative and quantitative methods. Each participating teacher first completed the survey that measures teacher multicultural competence of mathematics. They were then observed and interviewed after their first lesson implementation of a unit in their mathematics curriculum. Based on the five guidelines/standards for multicultural education suggested by the Center for Research on Education, Diversity, Excellence, authors reconceptualized four categories as an analytical framework for multicultural mathematics classrooms. The four categories include (1) contextualizing curriculum to real-life context (making contexts of learning to students' lives), (2) designing curriculum based on student language development and ability (connecting informal language to academic language), (3) Teaching through mathematical

talking/instructional conversation (facilitating classroom conversation aiming at critical thinking and higher-level thinking) and (4) positive expectation (holding high expectations for all). 10 classroom instructions in seven elementary and three middle multicultural classrooms were analyzed with respect to the four categories.

Overall, it was found that all categories were not suitable for achieving the goals of multicultural mathematics education in both elementary and middle school mathematics instructions. Song et al. (2011) reported that there are different tendencies of multicultural mathematics education between elementary teachers and middle school teachers. In the categories of 'student life and contextualization' and 'the composition of class contents considering language and literacy skills' were observed only in elementary school. For example, three types of integrating the students' lives and context into class instructions were observed: (1) present the situation of the problem using real life materials, (2) use real life materials when explaining mathematical concepts, and (3) make it easy for students to encounter in their lives. In contrast, in the case of middle school, no contextualization of students was observed. All three classes in elementary relied on procedures such as explanation of concepts through whole lecture-style classes, demonstration of problem solving, provision of activity time for problem solving, and confirmation of problem solving. When life related activities were presented in the textbooks, middle school teachers tend to ignore them by reading and passing. Interview results revealed teachers' preference towards the traditional view of learning and teaching that demonstration-type explanatory classes were the most effective at the middle school level learning abstract mathematics.

Similarly, the situation in which such language and literacy skills were considered did not appear in the observation of the middle school mathematics class. For abstract content,

unfamiliar mathematics terms and symbols, the teacher's explanation through everyday terms and examples, considering the student's language and literacy skills, will be effective in helping students, especially students from non-Korean backgrounds, understand unfamiliar mathematics terms and symbols. Yet, Song et al. (2011) reported that mathematics teachers were unaware of the linguistic abilities of mathematics learners from various backgrounds, and it could act as an important variable in mathematics learning. The teachers tended to think that it was not necessary to take into account the student's language and literacy skills in teaching mathematics because mathematics learns through numbers.

The 'mathematical dialogue' category was observed in both elementary and middle school classes. However, both elementary and middle school teachers were unable to ask guided questions to expand students' mathematical thinking and guide them to a higher level. While both elementary and middle school teachers believed that class conversations should expand students' mathematical thinking, some teachers did not develop the competence sufficiently to design students' cultural resources or cognitive competencies into practice. Other teachers possessed the traditional view on learning and teaching.

In the category of 'positive expectations of teachers', Song et al. reported that teachers' unequal beliefs and attitudes toward multicultural students. Elementary teachers tended to have a relatively positive belief in multicultural students, which allowed them to ask questions to multicultural students or give/empower multicultural students the right to speak. However, Song et al. also reported that elementary teacher's negative attitudes and expectations toward multicultural students were transferred to fellow students, creating an unequal power structure invisible in the math classroom. Interestingly, the unequal power structure observed in the elementary school mathematics classroom did not appear in the multicultural middle school

mathematics classroom. The authors suggested the importance of future research studies that more closely investigate, analyze, and reform the unequal power structure resulting from teachers' unfair expectations toward multicultural students, and an educational plan that allows all students to participate in classes equally.

In general, there is a lack of research studies that examine both ISTs and PSTs' implementation of multicultural mathematics education. There is a book written by the three authors (i.e., I et al., 2019) that reports on elementary teachers' implementation of multicultural mathematics education by specifically focusing on how teachers provided mathematics learning opportunities for Korean language learners. Yet, we only focused on research articles in this book chapter. In addition, we could not find any research article that explored PSTs' classroom implementation of multicultural mathematics education or lesson planning in relation to multicultural mathematics education. Furthermore, despite the importance of assessment, there is no study on what assessment techniques are used and need to be used for multicultural students in mathematics instruction.

Based on Song et al.'s study, we can synthesize four major findings regarding implementation of multicultural mathematics education in South Korea: First, teachers' lack of understanding about multicultural education and multicultural students lead to unequal learning opportunities to students. Second, teachers' traditional beliefs of mathematics (e.g., math language is universal), mathematics teaching (i.e., content coverage and show-tell approach) and mathematics learning (product vs process) causes a failure of implementation of multicultural mathematics education. Third, teachers' lack of knowledge, skills, and attitude (competence) for multicultural mathematics education led to unequal learning to multicultural students. In particular, there are some common beliefs about the positive beliefs and attitudes towards

multicultural students, teachers' lack of knowledge and skills leading to higher-level thinking could cause low quality learning to all students. Lastly, different teacher education opportunities need to be provided depending on teacher needs. These findings suggest the directions for future research.

### **Guiding Research Questions on Multicultural Education for Korean Math Teachers**

Our analysis on the studies of multicultural education for Korean mathematics teachers help us identify several main themes.

- Most research studies and teacher education programs mostly focus on liberal multicultural education rather than critical multicultural education.
- With the small number of relevant studies, the foci and framework of research are not various and not deep enough while the studies about teacher beliefs were most pervasive.
- Most studies used quantitative approach, but qualitative research studies better revealed teachers' unawareness of multicultural population and education.

Based on these results, we suggest future directions of research about multicultural education within Korean teacher education in this last section.

### **Directions for Research about Theoretical Models**

Our review on multicultural education literature in Korean teacher education found that there is a recognition of the necessity of the Korean teacher education model, and some studies (e.g., Chang, 2008; Jang, 2009) have been conducted on this topic. However, many studies on the multicultural teacher curriculum models were based on foreign literature or prior research rather than based on empirical studies in South Korea. Since education must be based on the convergence of theory and practice, it is necessary to prepare a curriculum in a bottom-up

approach that reflects the educational field in South Korea. The teacher education curriculum should be prepared with high applicability based on empirical research results.

In a similar vein, several studies emphasized multicultural teacher education should be implemented in a way of reflecting the specificity of the Korean situation. Particularly, the diversity among multicultural students in South Korea should be recognized, such as immigrant students based on foreign labor, biracial/binational students from international marriage families, North Korean refugee students, returning students, and Korean language learners (I & Chang, 2014). The configuration of multicultural students in South Korea is different from that of other diverse countries, and the uniqueness of each subgroup multicultural students should be addressed in teacher education.

Based on our review in this chapter, we would like to propose a variety of concrete theoretical frameworks to be applied in the multicultural mathematics teacher curriculum. For example, teacher education researchers and curriculum developers can consider the four approaches to multicultural curriculum reform (Contributions Approach, Additive Approach, Transformation Approach, Social Action Approach) proposed by Banks (1997). Banks and Banks (2010) also suggest five dimensions of multicultural education: (1) Content integration, (2) Knowledge construction, (3) Equity pedagogy, (4) Prejudice reduction, and (5) Empowering school culture. We found the prior research in South Korea paid little attention to the three domains of equity pedagogy, prejudice reduction, and empowering school culture, which are essential for critical approach in multicultural education. Other examples of concrete framework include the Sheltered Instruction Observation Protocol (SIOP) Model, used in Choi and Chang (2019) and Cummins' Quadrant Model employed in I & Chang (2014).

### **Directions for Teacher Beliefs**

While the amount of multicultural education research related to teacher beliefs has been increasing, various research foci, designs, and framework should be implemented, especially more qualitative research and research in critical approach. Most prior studies about teachers' beliefs in multicultural education used quantitative surveys focusing on multicultural efficacy and competence. We suggest future research studies employ various frameworks and theories that have recently been highlighted in research of culturally and linguistically diverse student populations and their teachers, such as Positioning Theory (Harré & van Langenhove, 1999), Critical Race Theory, or Community Cultural Wealth (Yosso, 2005).

Next, more rigorous application of culturally relevant/responsive/sustaining pedagogy in mathematics education should be encouraged. These culturally related pedagogies have been centered in multicultural education, but we found Korean literature in multicultural education rarely used these culturally related pedagogies as a main framework although some articles mentioned about them as a prior study. How to implement culturally relevant/responsive/sustaining pedagogy into mathematics instruction should be deeply discussed in the mathematics education research field.

To increase research studies of the critical approach in multicultural education, decent understanding and discussion of Critical Race Theory will be necessary to do the research focusing on critical approach. We found a positive start of this approach in the discussion of Song and Ju (2014b) where they applied the concept of Whiteness into Korean teacher education. They contend that Whiteness does not just mean skin color but refers to the mainstream culture of the ruling class whose cultural background belongs to the safe ruling class. The authors designate the ruling class in education as a group that has succeeded in school education, belongs to the mainstream in terms of race, ethnic background, and socioeconomic

status. From this point of view, Korean teachers may also implicitly continue the existing power structure without recognizing the various unjust factors that are acting on students due to the cultural background they have as successful learners in Korean schools. Therefore, Song and Ju argue that a process of self-reflection and critical deliberation is required in multicultural education for teachers.

Lastly, we suggest conducting research that explicitly defines the relationship and examine the influences among teacher belief, knowledge, and skills in the context of multicultural education and students. To do this rigorously, interdisciplinary research combining with psychology, sociology, or history may be helpful to deeply look at the sociopolitical influences, identity development, and historical/systemic discrimination in teaching mathematics to multicultural students.

### **Directions for Research on Class Implementation**

A little attention is given on class implementations of multicultural mathematics education as we identified only one research article for ISTs' class implementations of multicultural mathematics education, and no research on PST classroom implementation. Without knowing what challenges PSTs and ISTs experience and what strategies PSTs and ISTs use in their multicultural mathematics classrooms, we do not know the benefits of professional development and/or teacher education program in multicultural mathematics education and what and how to help teachers adapt their mathematics teaching to the culturally diverse students. More research needs to be done focusing on PSTs and ISTs' implementations of multicultural mathematics education. Specifically, given that a majority of the Korean research studies employed quantitative research methods (e.g., surveys), we suggest the importance of using qualitative research methods (e.g., classroom observations and interviews).

In addition, it is important to rethink about and expand the framework that could capture the principles of multicultural mathematics education. Although Song et al. (2011) revealed valuable information on how Korean teachers implemented multicultural mathematics education, they failed to consider assessment components in exploring classroom implementation of multicultural mathematics education. Research on what assessment techniques teachers use in their multicultural mathematics instruction and how they use such assessment techniques is needed.

Furthermore, reconsideration on the framework for multicultural mathematics classroom implementation needs to pay attention to including unique features of multicultural mathematics education. By comparing elementary and secondary teachers' multicultural competencies that emphasize not only knowledge and skills but also teacher attitudes and beliefs, Song et al. (2011) revealed the complexity of teachers' competencies in teaching mathematics for all. However, the findings from Song et al. (2011) were not new given that their findings were not much different from those without multicultural education. Future research needs to pay attention to reveal the complexity of teachers' multicultural competencies in implementing multicultural mathematics instruction, which can be distinguished from the complexity of teachers' competencies in implementing mathematics instructions for all.

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