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Tensions between Secondary Mathematics Teachers and Educational Policy Regulating Academic Acceleration in Korea

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ABSTRACT. The Korean government initiated an educational policy regulating academic acceleration in schools (e.g., regulating teaching or assessing above-grade-level content) in order to normalize public education and prevent the growth of private tutoring. To analyze whether the policy is achieving its intended goals, this study examined how high school mathematics teachers responded to the policy. The findings indicate four distinct teacher responses: the teachers would teach above-grade-level lessons in classes, but not assess them on a test; the teachers sought academic acceleration to prevent excessive private tutoring, although the policymakers thought that teachers' academic acceleration results in an excessive demand for private tutoring; the teachers were willing to teach above-grade-level content for students, but they were reluctant to teach below-grade-level content due to the time constraints; and the teachers recognized that the policy limited their curricular autonomy, even though it was intended to ensure their autonomy. Implications for mathematics teacher educators and policymakers are discussed.

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Ⅰ. INTRODUCTION

Academic acceleration of students in mathematics education (e.g., early access to formal algebra) remains a common educational practice, particularly for academically advanced students (Ma, 2010). Existing research has demonstrated that academic acceleration has beneficial effects on student outcomes (Finau, Treagust, Won, & Chandrasegaran, 2018; Lubinski & Benbow, 2000; Ma, 2005, 2010). However, there are also several detrimental effects as well as variations in the objectives and prevalence of academic acceleration in different cultures (Allensworth, Nomi, Montgomery, & Lee, 2009; Clotfelter, Ladd, & Vigdor, 2015). In South Korea (hereinafter Korea), for example, parents demand academic acceleration because they believe that early access to advanced courses improves their students' academic achievement and increases their chances of being admitted to an elite university (Choi, Calero, & Escardíbul, 2012). They also believe that graduating from one of the elite universities will ensure success in their children's careers and social lives (Choi & Choi, 2016). Consequently, parents' demands for academic acceleration have caused a proliferation of private tutoring in Korea.

Private tutoring, also known as cram schools or shadow education, takes various forms in different countries but generally refers to "tutoring in academic subjects (such as languages and mathematics) [which] is provided by the tutors for financial gain, and is additional to the provision by mainstream schooling," not including "extra lessons given by teachers or family members on a voluntary basis" (Bray, 2003, p. 13). Although private tutoring has historically prevailed in East Asian countries such as Korea, Japan, Hong Kong, and China (Bray & Lykins, 2012; Choi & Choi, 2016), it has now become a worldwide educational phenomenon (Kim & Jung, 2019; Kim, Gough, & Jung, 2018). However, there exist substantial differences in private tutoring needs and policy responses to private tutoring between Eastern and Western countries. In Korea, for example, private tutoring is mainly a way to satisfy "college aspirations and enrichment needs" for high-ability students, and it has often been regulated by the government because it is considered a threat to public education (Lee, 2007, p. 1226). In contrast, private tutoring in the United States is more popular among

low-ability students to address “academic remediation needs” and has been supported by the government (Lee, 2007, p. 1226).

Educational authorities in Korea have argued that a high reliance on private tutoring for academic acceleration in a particular subject threatens the public education system by making students lose interest in learning the subject in schools (Choi et al., 2012). They therefore proposed several policies for reviving public education and tackling private tutoring (Arani, Kim, & Malek, 2017; Lee, Lee, & Jang, 2010). Prior research on educational policies regulating private tutoring and academic acceleration has generally focused on the impact of these policies on reducing household expenditures and average hours spent on private tutoring (Choi & Cho, 2016; Choi & Choi, 2016; Kim, 2016; Kim & Chang, 2010). In 2014, in a new attempt to eliminate any factors that may cause parents to seek private tutoring for academic acceleration, the Korean government initiated a policy that bans primary and secondary school teachers from teaching and assessing any content ahead of the curriculum prescribed by the nation or state. According to the educational policy, for instance, teachers are prohibited from teaching Grade 10 mathematics concepts to 9th-grade students.

As has been noted by prior studies, it is imperative to analyze how the new policy has played a substantial role in reducing indexes related to private tutoring (e.g., total private tutoring expenditures and average hours spent on private tutoring). However, it is also important to investigate how teachers have responded to the policy because the policy affects the ways in which teachers implement and enact the national and state curricula (Siegle, Wilson, & Little, 2013). The aim of this study is to examine the impact of the educational policy from mathematics teachers’ perspectives and provide new insight into how the policy has influenced teachers’ curriculum implementation with respect to academic acceleration. Accordingly, the research question that guided our study was: How do secondary mathematics teachers respond to the educational policy on academic acceleration?

Ⅱ. THEORETICAL BACKGROUND

1. Academic Acceleration

Academic acceleration refers to instructional strategies that teachers can use with the aim of allowing students to have early access to advanced academic concepts or courses rather than being taught a common curriculum (Ma, 2002). Advocates have argued that academically advanced students in a particular domain (e.g., gifted students) learn the content faster than their peers (Kanevsky & Clelland, 2013; Peters, Rambo-Hernandez, Makel, Matthews, & Plucker, 2017). Thus, academic acceleration allows them to "progress through school at a more rapid pace than their peers or to take courses at ages younger than typical students" (Steenbergen-Hu, Makel, & Olszewski-Kubilius, 2016, p. 852) without being bored and disengaged by simply repeating what they have already learned (Stamps, 2004; Stanley, 2000). There are various forms of academic acceleration (Southern & Jones, 2015), but researchers have generally classified them into two overarching categories. Rogers (2015) conceptualized academic acceleration as *content-based acceleration* and *grade-based acceleration*. In content-based acceleration, students are placed with peers of the same age and/or grade but receive higher-level content at an accelerated pace, such as *single-subject acceleration* and *curriculum compacting* (Southern & Jones, 2015). Grade-based acceleration, on the other hand, allows students to be placed with older students with the aim of shortening the number of K-12 school years, which includes *grade skipping* and *early entrance to school* (Southern & Jones, 2015).

Researchers have examined the effects of academic acceleration on student outcomes. Conducting a second-order meta-analysis, for example, Steenbergen-Hu et al. (2016) demonstrated the positive impact of academic acceleration on students' academic achievement. In a longitudinal study, Ma (2010) found that half of the accelerated students who had early access to formal algebra (in Grade 7 or 8) took calculus in high school, whereas non-accelerated students were unlikely to take the advanced mathematics course in high school. With respect to student performance, high-ability Asian students benefited the most from mathematics content-based acceleration. For middle-ability students, teacher autonomy (i.e., how much influence teachers had in their school and classroom) was an important factor that influenced students' likelihood of doing advanced mathematics coursework in high school (Ma, 2010). Ma (2005) also revealed that

low-ability middle school students in mathematics were not burned out from early access to formal algebra and grew faster than non-accelerated high- and low-ability students in mathematics achievement.

Despite the previous research supporting academic acceleration, there exist ongoing debates and mixed evidence on the practice. For example, a state policy in the United States that required all students to take algebra in an earlier grade was found ineffective in improving student achievement and increasing college entry rates (Allensworth et al., 2009). Moreover, academic acceleration of students into formal algebra was shown to have a negative impact on low-ability students, exacerbating inequality in mathematics achievement between low- and high-ability students (Clotfelter et al., 2015). Teachers tended to give more weight to perceived negative aspects of acceleration than potential benefits from acceleration (Rambo & McCoach, 2012). Gonzalez and Jung (2019), however, found that teachers' attitudes toward acceleration were more likely to be supportive as they perceived school administrators' support for acceleration and socio-emotional benefits of acceleration for students, indicating the importance of a collaborative atmosphere for promoting acceleration. Therefore, investigating how teachers' perspectives on academic acceleration are influenced by internal and external factors (e.g., school supports or educational policies) and what difficulties they face by those factors will provide an insight into the implementation of academic acceleration.

2. Teachers' Curriculum Transformation

Content-based acceleration can be implemented by individual teachers who attempt to incorporate above-grade-level content into their teaching and therefore their decisions on curriculum transformation play a significant role in implementing content-based acceleration (Southern & Jones, 2015). In general, the term "school curriculum" refers to "the substance or content of teaching and learning" (Stein, Remillard, & Smith, 2007, p. 321), but it also includes "what students are intended to or actually experience to support their learning" (Remillard, & Heck, 2014, p. 707). Researchers use different terms to distinguish curricula according to the participants' perspectives. Stein et al. (2007), for example, proposed three perspectives on school curriculum, identifying the *written curriculum*, the *intended curriculum*,

and the *enacted curriculum*. The written curriculum refers to written guidelines and resources that curriculum developers or administrators expect teachers to use for their instruction. The written curriculum, however, cannot simply be implemented (Ball, Maguire, & Braun, 2012). Stein et al. noted when planning and preparing their lessons, teachers interpret the written curriculum in ways that are different from what curriculum developers imagined. The written curriculum, therefore, is transformed by teachers based on various factors (e.g., teachers' knowledge, beliefs, and experience), and this transformation becomes the intended curriculum. Finally, Stein et al. conceptualized the enacted curriculum as the curriculum implemented in the classroom based on interactions of teachers and students. Charalambous and Hill (2012) stated that instructional quality is formed by the interactions between teachers and curriculum materials, which indicates the critical role teachers play in constructing and reconstructing the school curriculum (Dolma, Nutchey, Watters, & Chandra, 2018; Kilpatrick, 2009).

Researchers have paid attention to distinct ways in which teachers modify and implement the written curriculum (Son & Kim, 2015; Thompson & Senk, 2014) and categorized them according to the extent to which teachers use contents and materials as described in the written curriculum (Brown, 2002; Lambdin & Preston, 1995). A review on mathematics teachers' uses of the written curriculum shows that teachers are more likely to transform it than rely on it completely (Remillard, 2005). In a study of middle school mathematics teachers' textbook use, for example, Tarr, Chávez, Reys, and Reys (2006) found that teachers did not follow the sequence of the lessons offered in the written curriculum.

Researchers have examined different factors that influence the ways teachers use curriculum materials when planning and enacting their lessons. First, teacher-related factors such as teachers' knowledge of mathematics (Charalambous & Hill, 2012; Remillard & Kim, 2017), beliefs about mathematics teaching and learning (Son & Kim, 2015), and orientation toward curriculum materials (McDuffie, Choppin, Drake, & Davis, 2018) affect the ways in which mathematics teachers interpret and use curriculum resources and materials. Second, teachers design their intended and enacted curriculum based on students' mathematical competences (Son & Kim, 2015)

and their prior learning (Remillard & Heck, 2014). Finally, teaching context (e.g., time constraints, local culture, and educational policies) is an important factor affecting how teachers use curriculum materials, mostly by constraining them from enacting the written curriculum and intended curriculum (Stein et al., 2007). Abrams, Pedulla, and Madaus (2003), for example, reported that high-stakes testing programs in a state led teachers to enact instruction focusing on state test preparation activities and to develop assessments similar to the content and format of the state test, which contradicted the teachers' educational beliefs. This finding is consistent with the previous studies demonstrating that teachers were likely to skip a mathematics topic that was not included in the assessment even though it was important for students' mathematical development (Son & Kim, 2015; Thompson & Senk, 2014).

3. Government Policies on Private Tutoring and Acceleration in Korea

Private tutoring and a high demand for academic acceleration have been recognized as hindering the normalization of public education in Korea (Lee, 2007). Therefore, the government has responded to the proliferation of private tutoring with different types of policies. Because the demand for private tutoring is largely regarded as a response to the low quality of public education (Kim & Lee, 2010), the government implemented educational policies in the 2000s to improve the quality and competitiveness of public education (Lee et al., 2010). Despite the policies, private tutoring greatly expanded; about 75% of elementary, middle, and high school students were receiving private tutoring in 2010 (Korean National Statistics Office, 2011). Lee et al. (2010) characterized demand mechanisms that induce private tutoring at three levels: a social value system and credentialism at the macro level, unsatisfactory school systems and high-stakes examinations at the meso level, and individuals' beliefs at the micro level. This implies that the proliferation of private tutoring is not a one-dimensional problem, but rather a multi-faceted and complex phenomenon.

In 2014, the government initiated a new educational policy, called the *special act [for] the promotion of public education normalization and regulation [of] pre-curriculum education*, and it was revised in 2016 (Korean Ministry of Education, 2016). The aim of this policy is

> … to promote sound physical and mental growth of students by regulating activities inducing pre-curriculum education and pre-curriculum learning by education-related institutions to ensure normal implementation of the curricula of elementary, secondary and high schools providing public education pursuant to the Elementary and Secondary Education Act[2)].

Similar to academic acceleration, pre-curriculum education refers to "educational programs generally formulated or provided ahead of" a national, state, or school curriculum (i.e., written curricula), while pre-curriculum learning means "learning programs that a learner goes through ahead of" the written curriculum (Korean Ministry of Education, 2016). According to the government regulation of academic acceleration in Korea, teachers are not allowed to include any content or assessments in their instruction that precede those presented in the written curriculum because advanced content and assessments can lead students to pre-curriculum learning (e.g., private tutoring). At the same time, the government regulation states that the policy should be carefully applied to ensure that the autonomy of schools and teachers in implementing their curricula is not unfairly infringed upon (Korean Ministry of Education, 2016). However, it does not offer detailed explanations or examples illustrating how teachers' autonomy might be violated, which could make it difficult to interpret the policy.

Although there exist ample studies that analyze the effectiveness of educational policies by the government toward private tutoring (Choi & Cho, 2016; Choi & Choi, 2016; Lee et al., 2010), little attention has been paid to how teachers respond to the educational policy on academic acceleration and its influence on their instruction and assessment. Previous studies have reported that teachers responded differently to policy initiatives (Ben-Peretz & Flores, 2018; Flores, 2012). In international comparative research, Osborn (2006), for example, demonstrated that teachers in England tended to translate educational policies into practice, seeing themselves as free to develop their own curriculum, content, and teaching styles. In contrast,

2) Gifted education, grade-based acceleration (e.g., early graduation), and subject-based acceleration in such subjects as sports, arts, and foreign languages are exempt from the application of this policy.

teachers in France perceived themselves as less autonomous and were likely to react passively to and comply with an educational policy. Because an educational policy is directly related to teachers' instruction, it is important to explore the impact of the educational policy on teachers' intended and enacted curriculum. In this study, we focused on mathematics teachers' responses to the educational policy because mathematics is the subject with one of the highest demands for academic acceleration and private tutoring around the world (Bray & Lykins, 2012; Coombe, 2018).

Ⅲ. Methods

In order to gain insight into how high school mathematics teachers respond to the government regulation of academic acceleration, this research was designed as a qualitative study. We used a case-study method to contextualize the research within the educational environment in Korea through in-depth analysis (Yin, 2009). Focus group interviews were chosen to draw upon the experiences and perspectives of high school mathematics teachers on academic acceleration and to promote greater insight into this relatively new area of research (Kamberelis & Dimitriadis, 2011).

1. Participants

Ten high school mathematics teachers in Korea participated in this study. They were recruited from a larger study of mathematics teachers' uses of curriculum materials and curriculum transformation. We grouped the participants according to the number of years they had been teaching and their experience in mathematics textbook development to minimize potential conflict and discomfort among participants in each focus group. Specifically, First Group Teachers (FGT) had less than ten years of teaching experience and had no experience in developing textbooks. All four teachers in FGT were pursing master's degrees in mathematics education. The three teachers in Second Group Teachers (SGT) had 10 to 20 years of experience in teaching and had textbook development experience. One of the teachers in SGT was enrolled in a mathematics education master's program, while the other two had undergraduate degrees in mathematics education. Third Group Teachers (TGT) comprised three teachers who had more than 20 years of

teaching experience coupled with textbook development[3]. Among the three teachers in TGT, one had a master's degree and the other two had undergraduate degrees in mathematics education.

2. Procedure

Before conducting the interviews, the first author received consultation from experts consisting of one experienced teacher (with 17 years of teaching experience) and one teacher with a doctoral degree in mathematics education. In a semi-structured interview, consulting experts provided researchers the opportunities to refine the quality of the interview protocol (Rabionet, 2011). During the expert consultation, the first author freely described the purpose of this study and discussed participant selection, question prompts to direct conversation towards the research topic, and methods of collecting the interview data. The prompt questions were: (a) What do you consider to be a violation of the policy regarding academic acceleration in school mathematics? and (b) Do you think teaching and assessing above-grade-level content is a violation of the government policy regulating academic acceleration?

The issue of teaching below-grade-level content in classes and assessing it on a test is not a violation of the educational policy because the purpose of the policy is to prevent the movement of students through a curriculum ahead of their grade. For a better understanding of teachers' responses to the policy, however, we also investigated how high school mathematics teachers responded to teaching content below grade-level when there were students who needed further explanation of the material. Therefore, we added the following prompt question: Do you think teaching and assessing content that is below grade-level is a violation of the government regulation of academic acceleration?

The first author conducted two semi-structured interviews for each focus group in 2019 (ranging from 40 to 60 minutes for each interview). Through conversational dialogue during the interviews, we sought to capture mathematics teachers' direct thoughts and perspectives with minimal direct

3) One teacher in TGT had no experience in developing mathematics textbooks, but we included him in TGT because he had the most teaching experience among the participants.

influence on the responses from the researcher (Vaughn, Schumm, & Sinagub, 1996). However, we embrace Holstein and Gubrium's (2011) statement that an interview is "a process of experiential animation [that capitalizes] upon interviewers' and respondents' constitutive contributions to the production of interview data" (p. 151). All interviews were recorded using one camera and one audio recorder. The first author created transcripts from the video of the focus group interviews.

3. Data Analysis

For data analysis, the first author read transcribed interview data in detail and analyzed them using an open-coding method. Then, the second author read through the transcripts based on the codes developed by the first author and identified new codes. We compared the codes and identified emergent categories. In the second round of the analysis, we collapsed the categories and finally identified four themes from the recurring patterns of the teachers' perspectives on the government regulation of academic acceleration: (a) *teaching above-grade-level content, but not assessing,* (b) *teaching above-grade-level content to prevent excessive private tutoring,* (c) *having the option to teach lower-level content, but neither teaching nor assessing students on it in reality,* and (d) *limited curricular autonomy and confusion about the educational policy*. We compared and contrasted the themes identified in the three groups in order to identify any differences among the focus groups. We discussed any discrepancies until consensus on our analysis was reached. Member checking was employed to establish trustworthiness of the findings.

Ⅳ. Results

The purpose of this study was to examine how high school mathematics teachers responded to government regulation of academic acceleration. The focus group interviews showed four unanticipated and somewhat contradictory responses from the teachers in Korea. In subsequent sections, we illustrate how each theme emerged with specific excerpts from the interviews.

1. Teaching Above-Grade-Level Content, but not Assessing

In the interviews, some teachers stated that they would teach above-grade-level content to help their students stay ahead of the competition in such standardized tests as the college scholastic ability test (CSAT) in Korea. When discussing whether a system of three equations in three variables and L'Hôpital's theorem, which are outside the secondary mathematics curriculum in Korea, would be taught to high school students, FGT 1 said,

> To be honest, I teach L'Hôpital's theorem in my class because of the CSAT… But, I try not to put items related to the theorem on the midterm or final exam s… I think L'Hôpital's theorem is a shortcut to solve a problem easily. So, I could teach my students the theorem to prepare for the CSAT, and also the students might want it. But, I don't teach a system of three equations because it won't be on the CSAT. But, if some students ask me, I may tell them about it.

Paying attention to CSAT, FGT 1 stated that he taught L'Hôpital's theorem because he thought his students wanted to learn efficient ways to solve CSAT items. Also, FGT 1 was concerned that he might inadvertently include content related to L'Hôpital's theorem in a school examination. Likewise, SGT 1 and SGT 2 stated that they would teach content tested on the CSAT even though the lessons were outside the secondary mathematics curriculum. When asked whether they would teach L'Hôpital's theorem in their classes, SGT 1 and SGT 2 stated that they were willing to teach such a mathematics concept as L'Hôpital's theorem if some items from CSAT can be easily solved using the theorem. However, they commented that they would not assess students on the concept, indicating a gap between instruction and assessment.

> SGT 2: I don't know how to say this… It is like a trick. If this is advantageous to my students, I'll mention it to them. But, I will not assess whether my students know it in the midterm or final exams.
> Researcher: Are you saying you won't assess everything you've taught? Right?
> SGT 3: They [SGT 1 and SGT 2] think so.
> SGT 2: Yes.

SGT 2 stated that teaching L'Hôpital's theorem could be used as a "trick" in order for students to solve related problems easily. In order words, students can use L'Hôpital's theorem to evaluate limits of indeterminate forms (e.g., $\lim_{x\to 2}\frac{x-2}{x^2-4}$ and $\lim_{x\to\infty}\frac{2x+1}{3x^2-4}$). In general, although the educational policy prohibited teachers from including above-grade-level content in their assessment of students, it seemed to have little influence on the teachers' instruction. Rather, teachers taught advanced content so that their students could stay ahead of the competition on the CSAT or other standardized tests, which resonates with previous research demonstrating teachers' tendency to transform content based mainly on standardized tests (Son & Kim, 2015; Thompson & Senk, 2014).

In fact, there was one teacher, SGT 3, who consistently insisted on neither teaching nor assessing mathematics content ahead of students' grade level.

Researcher: You mean you're going to teach it to your students?
SGT 2: Yes.
SGT 1: I don't want to teach it, but I have to do…
SGT 3: I don't think that I have to teach it. But, at the same time, a law is a law whether it is good or bad. To me, the CSAT is a law whether it is good or bad. So, I am displeased with it.
⋮
Researcher: So, you're saying that you can teach it, but not put it on a test?
SGT 3: I think that's what they [SGT 1 and 2] think. But, I'm not. I don't think I have to teach it in class.

Although SGT 1 and SGT 2 said that they could teach above-grade-level content to their students, SGT 3 disagreed. Despite arguing that the CSAT is the (harsh) law, he criticized the notion that teachers should plan and implement a lesson according to the CSAT. Regardless of the CSAT, SGT 3 seemed to believe that a lesson should be planned according to a written curriculum.

2. Teaching Above-Grade-Level Content to Prevent Excessive Private Tutoring

Although the educational policy on academic acceleration allowed teachers to exclude above-grade-level content in their instruction in order to prevent

the growth of private tutoring, teachers seemed to have distinct perspectives on academic acceleration in school. They believed that students would rely more on private tutoring than public education if they do not teach advanced content in schools.

SGT 1: We have no autonomy in assessment. So, we have to follow the rule [government policy]. But, if there are CSAT items that don't follow the rule, we also have to teach how to solve the items to our students. If we don't do that, all I have to do is ask my students to use private tutoring to learn it.
SGT 2: I think so, too.

SGT 1 commented that if teachers do not teach an easier way to solve problems on the CSAT, more students will rely on private tutoring to learn it. Discussing the revised mathematics curriculum in Korea, teachers in FGT said,

FGT 1: Private tutoring does not seem to care much about the revised curriculum. So, they are free to teach any mathematics content. As we discussed earlier, for example, a system of three equations in three variables and L'Hôpital's theorem…
Researcher: Do you think that if we don't teach those concepts, we will lag behind private education?
FGT 1: I think so, too. Students say that private tutoring teaches these concepts, but the concepts are not taught in schools.
FGT 4: Students think so.
FGT 1: They trust private tutoring more.

FGT 1 and FGT 4 stated that students tend to show greater trust in private tutoring than in public education because private tutors can teach students useful content and concepts that they think of without regard for the educational policy on academic acceleration. Teachers in TGT discussed whether students could solve all problems on the CSAT using only the concepts presented in the secondary mathematics curriculum in Korea.

TGT 3: Yes, but some very difficult problems on the CSAT can only be solved by using multiple concepts simultaneously. So very few students can

solve such problems. Honestly, to solve the problems in a limited time, students need to learn above-grade-level content. Private tutoring usually teaches the content.

⋮

TGT 1: I hate CSAT problems. What I taught my students was not useful on the CSAT. I hate it. I can't solve some problems on the CSAT even though I have been teaching mathematics for 25 years. This is not normal…

TGT 2: I think so too.

TGT 3: I agree. This is not normal.

TGT 3 noted that some of the problems on the CSAT were very tricky to solve in a limited time without using college-level mathematics knowledge and that private tutoring tended to introduce content outside the secondary curriculum to assist students' problem solving. When discussing whether they would teach college-level mathematics content, TGT 1 mentioned private tutoring to explain why she wanted to teach higher levels of content to her students:

> If we don't teach it in class, students may think that learning mathematics at school is worse than learning it in private tutoring because they can learn more in private tutoring. But, well, I don't think it's good to teach students how to apply the formula without any explanation. We should teach the advanced content with sufficient explanation because our students will fall behind the others if we don't.

TGT 1 pointed out that students tend to learn above-grade-level content in private tutoring and compare the quality of a lesson in private tutoring with that of a school mathematics class. She did not seem to want her students to think that the quality of a school mathematics class is lower than that of private tutoring or to fall behind in learning mathematics due to the low quality of instruction in school. She might believe that teachers' content-based acceleration in school is beneficial for students' mathematics achievement on standardized tests (Ma, 2010) even if it goes against the educational policy and that it would improve the quality of public education.

3. Having the Option to Teach Lower Levels of Content, but neither Teaching nor Assessing Students on it in Reality

We asked groups of teachers whether they would teach and assess below-grade-level content if necessary. In contrast to their approach to advanced content, teachers stated that they could either teach or assess below-grade-level content, but they did not want such content to be the focus of a lesson or student assessment.

Researcher: All right, I asked you last time. Is it not a violation to teach 11th-grade students math content from Grade 10?

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FGT 1: This is not a violation. As I said previously, mathematics has a hierarchy, so I think that students should learn the preceding content to learn the subsequent content. But, I think that Grade 10 math should not be the focus of the assessment for 11th-grade students. Looking back on myself, however, I did it a lot…

Teachers in SGT commented similarly to FGT 1.

SGT 3: I think that I will not highlight Grade 10 math to assess 11th-grade students' math achievement.

SGT 2: I think I can assess it if the test items are not focused on Grade 10 math.

Researcher: Is it also okay for you to teach Grade 9 math to 10th grade students?

SGT 2: Yes, for example, when students learn trigonometric functions [Grade 10 content in Korea], they have to know an inscribed angle and central angle [Grade 9 content in Korea]. So, we can talk about Grade 9 content to 10th-grade students.

SGT 1: I think so too, we can teach it.

⋮

SGT 3: I'm going to add one more thing. Students in my school forget many things they've learned after a year, and so, it is actually possible to re-evaluate whether the students [11th-graders] know, for example, quadratic inequality [Grade 10 content in Korea]. It is possible because they already learned quadratic inequality in last year's class. But, if some contents are not related to what they've learned previously, for example, something they've learned a long time ago, it is not appropriate to assess it.

FGT 1, SGT 2, and SGT 3 believed that they could teach lower levels of content in their classes because of the hierarchical nature of mathematics. As illustrated by SGT 2 above, the teachers argued that learning mathematics often requires students to know more basic content in order to learn a new concept. However, they suggested that the content of lower grades should not be the core of a lesson or student assessment. The teachers seemed to believe that spending most of the time teaching below-grade-level content is not an ideal lesson. The teachers in TGT also agreed that they could teach and assess lower-level content, but they tended not to teach such content in real classes. It seemed that they identified conflicts between the time available for instruction and their need to cover specific content in a grade.

TGT 1: In terms of math content students have learned in previous years, I think I can teach the content if it is necessary for students, but considering the CSAT and other tests, I think I will let students learn that material on their own because I don't have enough time.

TGT 2: Teaching a lower-level math lesson will be possible when all students don't know about it, but I don't think that's common. I briefly mention the concepts that students forget, but it's not common.

TGT 3: Students in my class even find middle school math [Grades 7-9 in Korea] difficult, so I explain lower-level math content as needed. I think we can assess a lower-level math lesson because, in high school mathematics [Grades 10-12], there are many cases in which students have to use concepts that they have learned in middle school or earlier. So, I think we can not only teach but also assess it.

TGT 1 argued that students should learn what they lack about lower-level content on their own even though she commented that she could teach the content in class. She said that, in reality, she could not spend much time reviewing what students had learned previously because there is a lot of material that students have to learn in a particular grade and because students should prepare for standardized tests. TGT 2 also said that although it is not a common situation, she explains lower-level math lessons briefly only when there is a concept that is difficult for all students in her

class. Similar to the teachers in FGT and SGT, those in TGT believed that they could teach and assess lower-level content, but they recalled such practical situations as standardized tests and said that they rarely dealt with below-grade-level material in their classes. Previous research has reported that mathematics teachers adapted their lessons based on students' current level of mathematics (Son & Kim, 2015; Stein et al., 1996). The teachers in the present study, however, were more likely to be concerned with preparing their students for the CSAT and content coverage than meeting lower-achieving students' learning needs. This implies that increased pressure to improve students' test scores and meet content goals in the written curriculum is more likely affecting teachers' instruction and assessment than their beliefs about teaching (Abrams et al., 2003; Brighton, 2002).

4. Limited Curricular Autonomy

Teachers in this study commented that their curricular autonomy was limited by the educational policy on academic acceleration. When discussing curriculum transformation, for instance, teachers in SGT stated that they would transform the mathematics curriculum if there were no restrictions by the government or no pressure to prepare students for college entrance.

Researcher: It seemed that you all want to enact curriculum transformation in your own ways, but you can't because of the national curriculum and the need to prepare students to get into college?
SGT 1: Preparing for college admission … the most important thing is assessment.
SGT 3: In assessment, the main issue is preparing for college entrance.
SGT 1: But, in assessment, we have no autonomy. What should be assessed in schools is also determined by the government. The Office of Education monitors content tested on midterm or final exams under the educational policy of academic acceleration.
SGT 2: Yes, we can't assess students as we want.
SGT 1: Because we have no curricular autonomy, I think that it is difficult to transform the national curriculum.

The teachers in SGT said that their desire for curriculum transformation

was difficult to realize due to the educational policy. In fact, the Office of Education of each region in Korea collects information on midterm and final exams from schools and examines whether there is a violation of the educational policy. Although the policy officially guarantees teachers' curricular autonomy, the teachers in SGT believed that they had no autonomy over the written curriculum because of this government monitoring. During the focus group interviews, we found that all teachers in SGT perceived themselves as having the potential to successfully transform the written curriculum for student learning, which is consistent with the perspective of British teachers on educational policies (Osborn, 2006). However, the teachers stated that the educational policy on academic acceleration regulated their curricular autonomy and that they had to comply with the regulation. As described earlier, this led them to teach above-grade-level content in their classes without testing students on it.

We also observed that some teachers were confused about the educational policy and had difficulties in using a clear criterion for judging violation of the government regulation. FGT 2, for example, seemed confused as to whether she could teach mathematics content outside the secondary curriculum. Discussing whether she would teach a system of three equations and L'Hôpital's theorem, she said,

FGT 2: I think that [teaching L'Hôpital's theorem] is a violation … This is my personal feeling, and I think that L'Hôpital's theorem is not something that is usually taught in schools, but something that is taught in private tutoring. I feel like this. You know… Both of them [a system of three equations and L'Hôpital's theorem] are out of the secondary curriculum.

Researcher: Um…

FGT 2: I don't think I should teach L'Hôpital's theorem, but I feel like I can teach a system of three equations…

⋮

Researcher: What is the difference between L'Hôpital's theorem and a system of three equations in three variables in terms of academic acceleration?

FGT 2: In order to solve problems related to L'Hôpital's theorem, we have to know the theorem, but the way a system of three equations is solved is similar to a system of two equations that students have learned in school.

Highlighting that it was her "personal feeling", FGT 2 stated that she would teach a system of three equations, but she would not teach L'Hôpital's theorem nor assess it. Although she knew that both a system of three equations in three variables and L'Hôpital's theorem are outside the secondary curriculum, that fact was not her criterion for deciding whether she would teach those advanced topics. Rather, she believed that she could teach a linear system of three equations because it can be inferred from a linear system of two equations that students have already learned. In contrast, she stated that L'Hôpital's theorem is a new concept for high school students and hence the students do not need to learn it in schools. Regardless of whether a mathematics lesson is outside the secondary curriculum, FGT 2's decision was different depending on the mathematics content. Likewise, when discussing whether teaching lower-level content is a violation, FGT 3 said, "It is difficult to determine how far it is against and how far it is not." Although the educational policy on academic acceleration in Korea was initiated in 2014 and revised in 2016, it still seemed unfamiliar to some teachers, particularly those with relatively less teaching experience.

5. Conclusions and Discussion

The existing literature shows that the goals of a new educational policy are often not implemented as intended by the policymakers (Hong & Youngs, 2016). The educational policymakers sometimes ignore the complexity of the classroom and the roles of teachers as active agents, resulting in unintended consequences (Ball et al., 2012; Yang & Clarke, 2018). In the current study, we found several contradictory results of the educational policy of academic acceleration.

First, high school mathematics teachers in Korea tended to teach content ahead of students' grades, mostly to help their students get high scores on the CSAT and other standardized tests. However, they did not include such content on the midterm or final exams because they recognized that doing so would be a violation of the educational policy. In other words, the advanced mathematics content taught by the teachers was intentionally excluded from the assessment, resulting in a gap between the teachers' instruction and assessment. As described earlier, the central purpose of the educational policy was to ensure normal implementation of the school

curriculum (Korean Ministry of Education, 2016). However, the teachers in this study did not seem to implement the policy in the direction that the policymakers intended. Although not all lessons that are taught to students should be assessed, alignment between classroom instruction and assessments designed to measure student achievement is a necessary condition for high student achievement (Roach, Niebling, & Kurz, 2008). If teachers repeatedly fail to deliver consistent messages about instructional content and assessment, students will be confused about what they should learn and what they have achieved (Martone & Sireci, 2009). To achieve the ultimate goal of the educational policy, therefore, teachers need to be provided with opportunities and environments in which student assessment can be aligned with their instruction.

The second contradictory result is that the educational policy was initiated to prevent teachers from teaching and assessing higher-level content because doing so can result in an excessive demand for private tutoring. Ironically, however, the teachers in this study tended to teach such content to prevent the growth of private tutoring. That is, to resolve the same educational issue, the teachers took the opposite action to that proposed by the educational policymakers. The educational policymakers might believe that students receive private tutoring because teachers in schools teach and assess content beyond the level prescribed by the curriculum in a given grade. By contrast, the teachers in this study seemed to believe that students in a highly competitive society are more interested in achieving high performance on standardized tests and therefore students would rely more on private tutoring if the instruction in schools was not oriented towards students' interests. This discrepancy between the policymakers and teachers may stem from their perspectives and experiences. Policymakers, for example, pay more attention to such general issues as educational status in the society and educational systems, whereas teachers as implementers interpret the policy on the basis of classroom interaction with their students (Silver & Skuja-Steele, 2005). That is, because teachers make a decision based on their classroom reality, the ways in which they resolve an educational problem can be different from those suggested by policymakers (Wang, 2008). Furthermore, the proliferation of private tutoring is much more complicated, resulting from multidimensional phenomena (Lee et al.,

2010; Kim et al., 2018). Ricento and Hornberger (1996) argued that educational policies were multilayered and reinterpreted as they moved through different layers. Educational policymakers, therefore, need to examine the multiple factors inducing private tutoring and investigate more closely whether the regulation of academic acceleration in schools contributes to reducing students' dependence on private tutoring.

Third, as mentioned above, the teachers stated that they would teach students above-grade-level content to help them get high scores on the CSAT even though they recognized that doing so is against the educational policy. In contrast, they stated that teaching and assessing below-grade-level content is not a violation of the policy, but they were reluctant to include it in their instruction due to time constraints. This indicates that, regardless of the educational policy, the teachers might think it is more valuable to use class time to improve students' CSAT scores, even including college-level mathematics content, than to meet remediation needs for lower-achieving students. On the one hand, it is quite reasonable for the teachers to respond that below-grade-level content cannot be covered in their classes because there are national content standards relevant to students' grades. In addition, in a highly competitive society like Korea, instruction and assessment are focused on activities to prepare for high-stakes tests (Abrams et al., 2003; Brighton, 2002; Son & Kim, 2015; Thompson & Senk, 2014). As mentioned above, however, the main purpose of the educational policy is to normalize public education. If teachers continue to focus more on preparing students for standardized tests than on remedial assistance, it will be difficult to realize normalization of public education in Korea. A UNESCO report pointed out that more than half of students in the world do not reach the minimum level of proficiency in mathematics (UNESCO Institute for Statistics, 2017). Although students in Korea have consistently taken the top places in international assessments of student achievement in mathematics, 38.7% of high school students in a nationwide survey responded that they had given up or would give up mathematics (Korea Foundation for the Advancement of Science and Creativity, 2015). To achieve the policy's goal, therefore, teachers need to support low-achieving students as well as high-achieving students.

Fourth, in the educational policy of academic acceleration, the Korean

Ministry of Education (2016) states that the educational policy should ensure the autonomy of teachers in implementing their curricula. In the study, however, we found that teachers' curricular autonomy seemed to be constrained by the educational policy. Some teachers were confused as to how they could determine which mathematics content would be a violation of the educational policy, while others were critical of their limited autonomy in assessment. In a qualitative study, Hong and Youngs (2016) found that teachers tended not to welcome enhanced curricular autonomy by the central agency because of the gap between the desired autonomy by teachers and the granted autonomy by the government. In other words, teachers may regard seemingly enhanced curricular autonomy as forced autonomy because it was designed without regard for teachers' demands (Hong & Youngs, 2016). Therefore, the policymakers need to provide detailed explanations of teacher autonomy under the educational policy and take into consideration teachers' desired autonomy. We believe that teachers' autonomy will play a significant role in students' learning of mathematics (Ma, 2010) and in teachers' sense of professionalism (Pearson & Moomaw, 2005) because teachers will be able to make professional decisions taking the specific contexts of their students into account (Vieira, 2007).

As a case study in Korea, we recognize that the generalizability of the results from the current study is limited. Nonetheless, this study provides new insights into how teachers respond to the government regulation of academic acceleration. Based on the unanticipated and contradictory responses from the teachers in Korea, educational policymakers in different countries need to examine how they can assist teachers in normalizing public education and in improving the quality of their instruction, rather than regulating them.

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