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# Teacher Perspectives on Mathematics Education of Language Learners: Adapting ELL Education Models

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# Teacher Perspectives on Mathematics Education of Language Learners: Adapting ELL Education Models

## **Abstract**

Teachers in Korea have recently confronted new challenges as the population of linguistically and culturally diverse students increases. Ethnically diverse students as well as Korea-born students returning from long residences in foreign countries have great difficulties orienting themselves within Korean schools due to lack of Korean language proficiency and cultural differences. We named this student group as Korean language learners (KLLs) and investigated teacher perspectives on effective mathematics pedagogy for KLLs. Using two educational models for English language learners (ELLs)—Cummins' Quadrant Model and the Sheltered Instruction Observation Protocol (SIOP) Model—we examined survey results of a small group of elementary teachers in South Korea in terms of effectiveness and feasibility of the ELL models.

## **Keywords**

Equity and Diversity, Teacher Belief, Elementary School Education

## **Disciplines**

Bilingual, Multilingual, and Multicultural Education | Science and Mathematics Education

## **Comments**

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# TEACHER PERSPECTIVES ON MATHEMATICS EDUCATION FOR LANGUAGE LEARNERS: ADAPTING ELL EDUCATION MODELS

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*Teachers in Korea have recently confronted new challenges as the population of linguistically and culturally diverse students increases. Ethnically diverse students as well as Korea-born students returning from long residences in foreign countries have great difficulties orienting themselves within Korean schools due to lack of Korean language proficiency and cultural differences. We named this student group as Korean language learners (KLLs) and investigated teacher perspectives on effective mathematics pedagogy for KLLs. Using two educational models for English language learners (ELLs)—Cummins' Quadrant Model and the Sheltered Instruction Observation Protocol (SIOP) Model—we examined survey results of a small group of elementary teachers in South Korea in terms of effectiveness and feasibility of the ELL models.*

Keywords: Equity and Diversity, Teacher Belief, Elementary School Education

## Research Objectives

The classroom culture of Korean schools has recently changed as the population of linguistically and culturally diverse students increases. We associate immigrant students and Korea-born students, returning from long residences in foreign countries, in terms of their linguistic difficulty, and name them as *Korean language learners* (KLLs). Recent studies have found that students from international marriages and immigrant families tend to academically perform at lower levels than general Korean students (Cho et al., 2006; Song et al., 2010) and mathematics is one of the subjects they have the most difficulty with (Cho & Lee, 2010; Jang & Choi-Koh, 2009). Moreover, Korean public schools have failed to provide multicultural programs or linguistic supports tailored to the needs of KLLs (Kim & Kim, 2012), and teacher preparation programs have not prepared teachers for implementing multiculturalism in their instruction (Mo & Hwang, 2007).

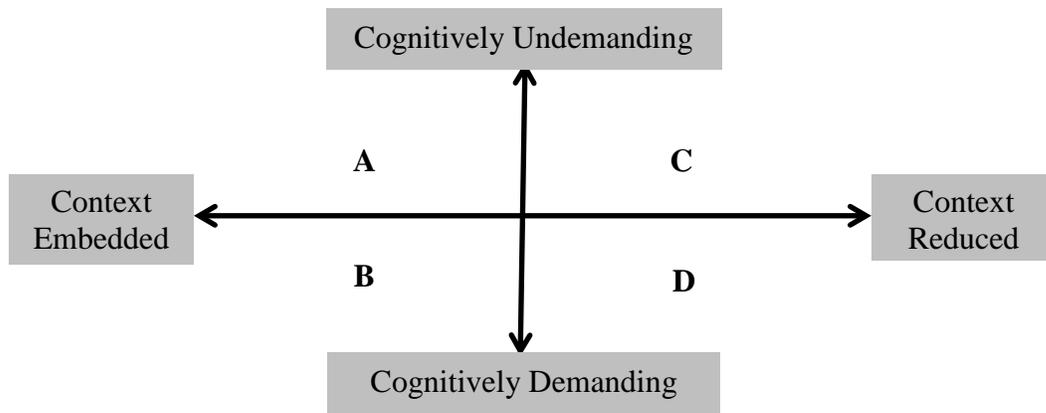
We investigated South Korean elementary teachers' perspectives on the use of effective mathematical pedagogies for language learners, especially KLLs. We specified several pedagogies within two educational models designed for English language learners (ELLs) and examined survey results of how teachers considered implementing the ELL pedagogies in Korean school contexts.

## Frameworks

One trend of ELL research has been to highlight the distinction between academic language and everyday language (Moschkovich, 2007) although they are not exclusively separated. Two ELL education models were chosen to address the importance of considering both language development and academic context: Cummins' Quadrant Model (Cummins, 2000) and the Sheltered Instruction Observation Protocol Model (SIOP Model: Echevarria, Vogt, & Short, 2004). We adapted and connected these models in a mathematical context.

## Cummins' Quadrant Model

Cummins (2000) considered a degree of context and a degree of cognitive demand in language tasks or activities to create a two-dimensional model (see Figure 1).



**Figure 1: Four - Quadrant Model** (adapted from Cummins 2000, p. 68)

Quadrants A and B include instructions that may be appropriate for language learners because contextual clues help them overcome language barriers. In the context-embedded instruction, students actively negotiate meaning through scaffolding and feedback provided by their teacher (Cummins, 2000). Further, students need to be challenged cognitively as well as provided with appropriate contextual and linguistic supports as emphasized in Quadrant B (Gibbons, 1998; Vincent, 1996).

### The SIOP Model

We chose the SIOP Model as one of the approaches to be placed in Quadrant B. The SIOP Model was designed to teach content subjects for ELLs. The eight components of SIOP Model are: lesson preparation, building background, comprehensible input, strategies, interaction, practice/application, lesson delivery, and indicators of review/assessment (Echevarria et al., 2004). Because we were interested in the strategy component, we chose five strategies that have potential for teaching mathematics to KLLs: Higher-order thinking questions, visual/physical activity, scaffolding, graphic organizer, and group activity.

## Methods

### Participants and Setting

We conducted a survey with 27 Korean elementary teachers in a large urban area where the population of multicultural students was relatively high compared with other places in South Korea. Due to the location, some participants had taken multiculturalism courses in various forms, although none of the trainings specialized in mathematics education. The survey asked them to evaluate a lesson plan designed by the SIOP Model developers (Echevarria et al., 2010) to teach geometric figures for second grade ELLs. Because the lesson included all five SIOP strategies mentioned above, we examined how Korean teachers identified and valued those strategies for teaching KLLs.

### Data Sources and Analysis

The objectives of the survey were (1) to examine if teachers identify the strategies designed for language learners, (2) to examine whether they consider the cognitive demands and contextual aspects, and (3) to see how they would choose to implement the lesson for their

students. The first part of the survey asked about previous experiences and beliefs on KLLs, and the second part included open-ended questions about teachers' insights on the SIOP lesson plan. To analyze the data, we used the constant comparative analysis method (Fram, 2013), which employed open coding, axial coding, and selective coding (Strauss & Corbin, 1990). Finally, we built a map of all categories and found themes that emerged in and across categories.

## Results

### Teacher Beliefs on KLLs

**Differentiation of mathematics instruction.** More than 90% of respondents agreed that they should differentiate their mathematics instruction for KLLs. The more experiences teachers had with KLLs, the deeper and richer the insights in their responses were. For example, one teacher who had a long-term experience teaching KLLs pointed out the difficulty of teaching conceptual knowledge to KLLs rather than teaching procedural knowledge. In addition, there was no relation between the beliefs on differentiating instruction and the multicultural trainings they received. One reason for the small influence of training might be that the multiculturalism courses were not specialized in mathematics.

**Appropriateness of the storytelling mathematics textbooks.** Recently, the Korean government issued storytelling mathematics textbooks, which included sufficient pictures and contextual clues. One of the survey questions asked how appropriate the storytelling textbook was for KLLs. The responses were prevalently negative. The teachers disagreed that the storytelling textbook was suitable for KLLs because it required teachers to use complicated discourse in order to make sense of the story contexts in the textbook. This reveals that teachers perceive language as a barrier for KLLs to understand mathematics. Even if pictures and contexts support word problems, teachers believe more sentences yield more difficulties rather than more contextual clues.

### Evaluation on the SIOP Lesson

Most teachers responded that the SIOP lesson would be effective for KLLs. They identified various types of linguistic supports: linguistic objectives, graphic organizers, or practicing sentence patterns. They thought these strategies were different from their typical mathematics lessons. One teacher articulated that linguistic supports would be useful, not only for KLLs, but all students, as follows:

I have seen many students who are capable in mathematics have great difficulty expressing their ideas in language. Particularly lower-grade boys have trouble with verbalizing an image in their head. This lesson is impressive in the sense that it guides students to learn how to express their understanding in sentences in concrete ways.

Among the five strategies, teachers identified visual/physical activities, group activities, (verbal) scaffoldings, and graphic organizers. However, none of them noticed the higher-order thinking question, although it was written at the top of the lesson plan. The series of teacher questions that explicitly appeared in the lesson plan multiple times were not mentioned either. In short, they were able to identify the SIOP strategies and generally agreed that the lesson would be effective for teaching KLLs. However, little recognition was found on cognitively demanding aspects such as the higher-order thinking question. Moreover, it should be noted that the Korean education system or Korean teachers' pedagogy has its own features and structures that could be an obstacle when implementing the ELL strategies in the classrooms in South Korea.

## Discussion

Although the teachers in Korea had not received any official training to teach mathematics for KLLs, it was a positive sign that they could identify important strategies that support language learners. However, the results imply that their understanding is limited because they did not pay attention to the aspects of cognitive demand and they heavily focused on language difficulty rather than providing contextual clues or scaffoldings. This view might be related to the conception that language learners are deficit learners (Moschkovich, 2007).

This study provides an international lens on teacher perspectives and openness towards multicultural education. Diversity is becoming prevalent internationally, so it is important to recognize other countries' situations and efforts in educating diverse learners because we can learn from their experience and also find some possible collaboration. This study contributes to teacher educators' understanding of the needs of language learners in mathematics education and teachers' adaptability of a linguistic education model in content areas. Based on the results of this study, the efforts of applying ELL education models can give a meaningful indicator for future education models for other language learners and teachers of language learners if there are adequate considerations about cultural and political situations.

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